



Department of
Environmental
Conservation

State of the Ocean 2023

A FIVE-YEAR REVIEW OF *OCEAN ACTION PLAN* IMPLEMENTATION

Kathy Hochul, Governor | Basil Seggos, Commissioner



Shellfishing boats
moored during winter
in Cold Spring Harbor,
Long Island.



Message from the Commissioner

The ocean, with its connecting waters and abundant natural resources, is an infinite source of beauty that supports and sustains New York's prosperity. In recognition of the important and irreplaceable role the ocean plays in supporting our state's environment and economy, the New York State Department of Environmental Conservation (DEC) collaborated with several key stakeholders in 2017 to develop the *New York Ocean Action Plan* (OAP), providing a framework for an integrative and adaptive management process that will ensure the ecological integrity of our shared ocean ecosystem for generations to come.

In 2019, New York State passed the landmark Climate Leadership and Community Protection Act (CLCPA), the strongest environmental law in the nation, that commits our state to an ambitious clean energy and climate agenda. This laudable commitment reinforces priority actions in the OAP and will leverage additional resources to accelerate the plan's implementation. Many actions in the plan are supported by Ocean and Great Lakes annual appropriations through the Environmental Protection Fund (EPF) in enacted State budgets.

DEC is proud of the progress being made to implement the OAP and pleased to present the *2023 State of the Ocean Report* to provide an update on priority issues and key actions over the first five years of OAP implementation. The report also highlights the indispensable collaborations among government partners, nonprofit organizations, environmental and community groups, and local residents, who all work together to fulfill shared goals outlined in the OAP.

We hope you enjoy learning about the incredible progress being made to protect our ocean and look forward to continuing our important work to achieve the ambitious goals established by New York's OAP.

Sincerely,



Basil Seggos, Commissioner



Basil Seggos,
Commissioner



Scientists holding fluke during the New York nearshore trawl survey. Learn more on page 11.

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List of Abbreviations and Acronyms

AIS – Aquatic Invasive Species

AMSEAS – Atlantic Marine Conservation Society

CCE – Cornell Cooperative Extension

CLCPA – Climate Leadership and Community Protection Act

DEC – New York State Department of Environmental Conservation

DMR – Division of Marine Resources

DOS – New York State Department of State

EBM – Ecosystem-based management

GSB – Great South Bay

LIISMA – Long Island Invasive Species Management Area

LINAP – Long Island Nitrogen Action Plan

LWRP – Local Waterfront Revitalization Program

NOAA – National Oceanic and Atmospheric Administration

NYNHP – New York Natural Heritage Program

NYB – New York Bight

NYCDOT – New York City Department of Transportation

NYMRC – New York Marine Rescue Center

NYPA – New York Power Authority

DOT – New York State Department of Transportation

NYSERDA – New York State Energy and Research Development Authority

NYSG – New York Sea Grant

OAP – Ocean Action Plan

OATF – Ocean Acidification Task Force

ODP – Ocean Data Portal

PEP – Peconic Estuary Partnership

SDM – Species Distribution Model

SoMAS – School of Marine and Atmospheric Sciences at Stony Brook University

SSER – South Shore Estuary Reserve

STP – Sewage Treatment Plant

UVVR – Unvegetated-to-Vegetated Marsh Ratio

Executive Summary

New York's abundant natural resources from the Atlantic Ocean are a staple of our economic vitality, cultural diversity, and breathtaking landscapes. The ocean and all connecting coastal and estuarine waters require sustainable management, and the *OAP 2017–2027* provides a framework for integrated and adaptive management, planning, and development. The *State of the Ocean 2023* report provides an overview of major efforts toward the implementation of the *OAP* from 2017–2021.


This report summarizes activities that advance the *OAP*'s four interconnected goals: ensuring ecological integrity, promoting sustainable growth, adapting to change, and empowering public stewardship. With an ocean-indicators system, whale monitoring program, and ocean research program, New York State and its partners have helped to ensure the integrity of the ocean ecosystem. Supporting efforts by DEC's Division of Marine Resources (DMR) and partners have also contributed to ecosystem-based management (EBM) and aquatic invasive species (AIS) education and management. Exploring the impacts of climate change (e.g., regime shifts, or large-scale changes in an ecosystem), utilizing marine spatial planning, diversifying energy supply, and expanding the State's artificial reef network support sustainable growth while helping New York understand and adapt. Efforts to tackle marine debris, encourage responsible recreation, and support local initiatives empower public stewardship of this resource.

These actions and interconnected goals support the *OAP*'s Vision Statement:

Restoring, strengthening and maintaining the ecological integrity of the state's ocean ecosystem, including estuarine and coastal waters, will benefit all residents and visitors of New York for this generation and those to come. Through an integrated and adaptive approach where management decisions are informed by the best available science, we will be able to promote better understanding, protection, restoration, resiliency and use of New York's ocean resources and the services they provide for the well-being of humans and the natural environment.

The next phase of *OAP* implementation will focus on undertaking long-term actions, continuing to investigate the effects of climate change to ensure effective management, and empowering communities to take proactive approaches toward enhancing the resiliency of their lifestyles.

The highlights in this report are brief summaries, and more information on various projects can be found on DEC's and partners' websites. Additionally, there are abundant opportunities for New Yorkers to participate in making this vision a reality. We encourage all to learn more about these opportunities and how to get involved by visiting www.dec.ny.gov.



People enjoying the beach at Coney Island.

Introduction

New York Ocean Action Plan: 2017–2027: Monitoring, Improving, and Ensuring Ocean Health for All New Yorkers

The ocean is an extraordinary treasure, providing the people of coastal and inland communities with resources, services, and recreation while also connecting them with regions across the globe. A healthy ocean is essential; oceans are vital to food supply and provide outdoor activities, tourism, and economic benefits, including prosperous fishing industries, sustainable energy development, and a widespread maritime trade.

Published in 2017, the *OAP* built on the work of the New York Ocean and Great Lakes Ecosystem Conservation Council’s report, “Our Waters, Our Communities, Our Future” (2009), and the New York State Department of State’s (DOS) “Offshore Atlantic Ocean Study” (2013). The *OAP* is a 10-year plan for the New York Bight (Fig. 1) that aims to ensure the long-term health of the ocean while promoting stewardship and sustainable use through an EBM approach.

Ecosystem-Based Management (EBM) is a type of natural resource management that takes a comprehensive, integrated approach that considers the entire ecosystem, including humans.

Development of the *OAP* involved a range of stakeholders, including resource management agencies, non-governmental organizations, and academic institutions. The *OAP* outlines 61 actions to provide direction on funding, research, management, and outreach efforts that help achieve the plan’s 4 overarching goals. DEC and DOS, working with many partners, oversee the implementation of the *OAP*.

The *OAP* supports DEC’s mission by assisting resource managers in making the best-informed decisions to conserve and protect our ocean for future generations, allowing New York to continue protecting its natural resources and adapting to climate change.

10 YEARS, 4 GOALS, 61 ACTIONS

The implementation of the *OAP* is well underway and includes work that supports fulfillment of the actions identified in the plan. These actions increase knowledge of oceanic processes and identify research and management needs, helping stakeholders and regulators—such as DEC’s Division of Marine Resources—to effectively

New York Bight

Bight: a curve or bend in a shoreline that forms a large, open, shallow bay

The New York Bight (NYB) is defined as the coastline from Cape May Inlet, NJ, extending northeast along the Atlantic Coast to the eastern tip of Long Island at Montauk Point. These waters are home to the busiest shipping port on the Eastern Seaboard and provide valuable habitat for diverse marine life.

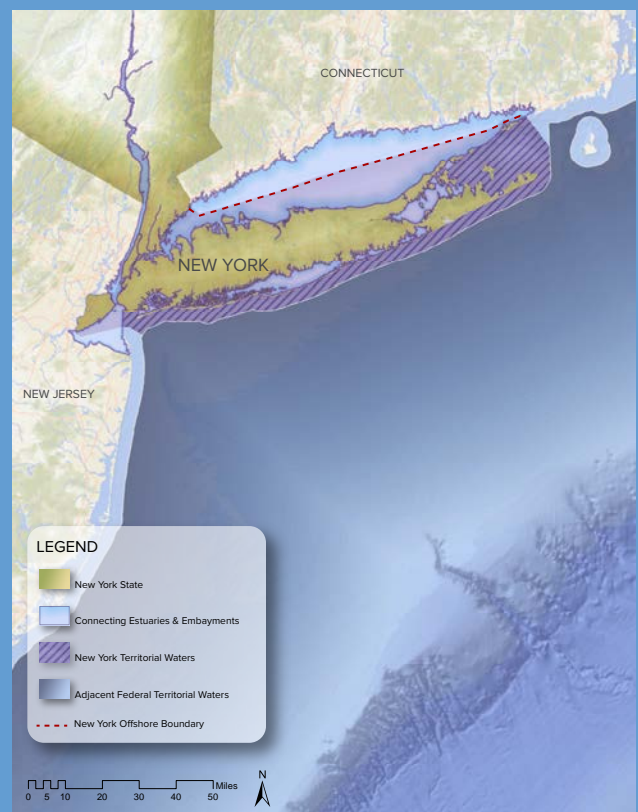


Figure 1. Map of New York Bight

manage fisheries, shellfisheries, marine habitats, and endangered and protected species in the marine waters of New York. This report outlines select progress made over the first five years of *OAP* implementation. Additional information is available on <https://www.dec.ny.gov/lands/84428.html>.

Goal 1: Ensuring Ecological Integrity

Goal 1 of the OAP is to “ensure the ecological integrity of the ocean ecosystem” and includes 34 actions to guide progress toward 3 objectives: protect and restore sensitive habitats, improve the management of important species, and evaluate the ecological integrity of the ocean ecosystem.

Numerous projects have been initiated and significant progress has been made toward achieving these objectives. They include developing an ocean-indicators system, funding an ocean research grant program and supporting various monitoring efforts, as well as funding numerous projects to ensure the health of our waters by mitigating the impact of invasive species, promoting bioextraction initiatives, and decreasing nutrient loading.

Project Highlight: Using Indicators to Monitor a Complex Ocean

The ocean is a vast and complex system. Food-web dynamics, water quality, variable weather patterns, terrestrial inputs, and human interactions all contribute to ocean health. Distilling this information into meaningful and straightforward indicators of ocean health is no easy feat. However, that is the intent of the partnership between DEC and the State University of New York’s Stony Brook School of Marine and Atmospheric Sciences (SoMAS): to create a system of indicators of ocean health from offshore ecosystem monitoring.

Indicators are basic ecosystem metrics that simplify understanding of complex systems—like the ocean. They are a vital component of EBM and can be used to assess ecosystem status, detect trends, and assess drivers of change and management efficacy. The NYB is an ecologically and economically important region that provides rich habitat for countless species, from tiny marine snails to large pilot whales. Development of a suite of ecosystem health indicators and an interdisciplinary ocean monitoring program began in earnest in the NYB in 2018. Using a stakeholder-inclusive process, the myriad of factors affecting ocean health were condensed into 42 indicators grouped into 3 categories: environment, marine community, and human populations. Detailed processes and results of indicator development are included in the NYB indicator reports available on <https://www.dec.ny.gov/lands/111178.html>. Monitoring in NYB is conducted through a seasonal ship-board monitoring effort; an underwater glider that can autonomously collect data on physical, chemical, and biological properties of the ocean for weeks at a time; and passive and active acoustic-monitoring technologies. All monitoring projects are ongoing.

Initial monitoring has already revealed several trends. Surface and bottom temperatures have been steadily increasing, showing extensive warming through-

out the water column (Fig. 2). Measurements of ocean chemistry indicate that acidifying waters may be stressful to shellfish larvae, especially in autumn months. Biological monitoring of commercially and recreationally important species shows biomass trends increasing from the 1980s with some declines in more recent years (Fig. 3). An underwater glider is used to characterize the water column profile and the characteristics of the Mid-Atlantic Bight Cold Pool (Fig. 4), a lingering collection of cold winter water that remains near the ocean floor and provides critical habitat to certain fishes and shellfish species during the warm summer months. Monitoring suggests the cold pool is diminishing earlier in the year and has been nearly absent during the month of October in recent years.

Overall, these efforts are vital to making informed management decisions. Ocean acidification monitoring informs the New York Ocean Acidification Task Force (OATF) and helps guide research and mitigation efforts. Increased understanding of the cold pool will benefit resource managers dealing with shifts in species’ ranges and timing of migrations. Observing and recording trends in species populations facilitates more strategic fisheries management decisions. The monitoring program in New York has not only filled critical data gaps in this region, but the program was developed to be as consistent as possible with broader mid-Atlantic efforts. Full reports from the first years of monitoring can be found on <https://www.dec.ny.gov/lands/111178.html>.

New York Bight Key Ecosystem Components

Environment

Surface water temperature
Water column temperature
Water Chemistry
Winds
Stratification
Freshwater inputs
Salinity
Climate variability

Higher order components
Habitat

Marine Community

Phytoplankton
Zooplankton
Invertebrates
Forage species
Mid-trophic level species
Upper-trophic level species

Higher order components
Biodiversity
Trophic interactions
Community characteristics

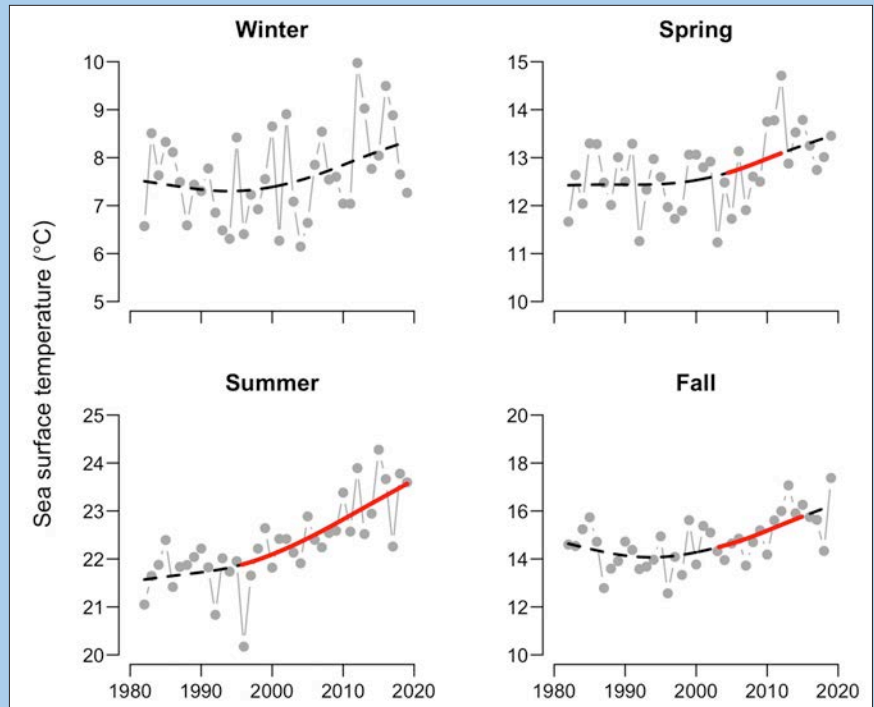
Humans

Recreational fishing
Commercial fishing
Energy development
Coastal communities
Contaminants

Higher order components
Stability

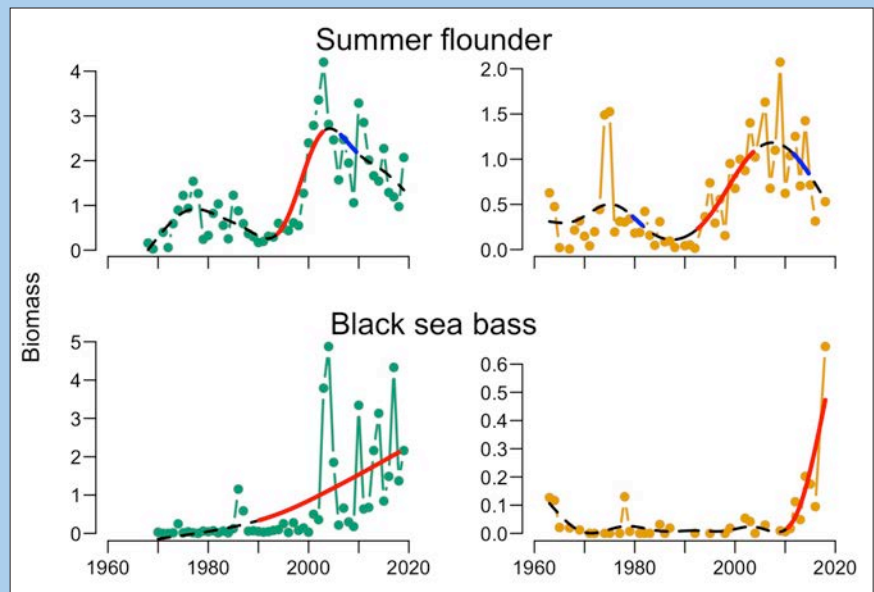
New York Bight Ecosystem Indicator Examples

Figure 2. Sea Surface Temperature Indicator Analysis showing mean sea surface temperature by season over time. Solid red lines indicate a significant increasing trend and dashed black lines indicate no statistically significant trend ($p < 0.05$).



SOMAS

Figure 3. Mid-Trophic Level Species Indicator Analysis showing black seabass and summer flounder biomass in spring (green) and fall (orange). Solid red lines indicate a significant increasing trend, blue lines indicate decreasing trend, and dashed black lines indicate no statistically significant trend ($p < 0.05$).

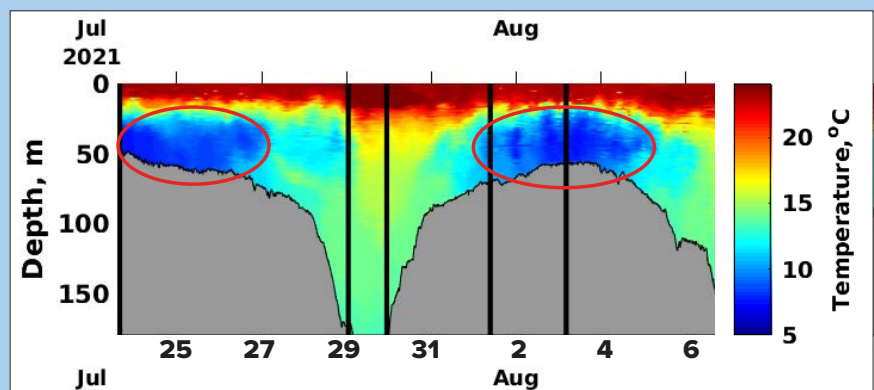


SOMAS

Figure 4. Cold pool off the coast of New York as shown by temperature profile map (right) from ocean glider (below) data collection; dark blue areas show cold pool, cold water underneath hot surface waters, even in midst of summer. In deeper sites, upwelling and currents create mixing that breaks up cold pool.



SOMAS



SOMAS



Fin whale surfacing with common dolphins, observed during whale monitoring program.

Monitoring Spotlight: Whale Monitoring Program

Successful conservation of large whale species in the NYB requires robust baseline data to understand occurrence, distribution, and abundance. In a collaboration with the New York Natural Heritage Program (NYNHP), DEC funded a the three-year New York Bight Whale Monitoring Program to collect essential data needed for resource management. The program was made up of two components: monthly aerial surveys, led by Tetra Tech; and year-round passive acoustic monitoring, led by Cornell University. In addition to collecting valuable data on the presence and relative abundance of the six priority large whale species found in the NYB—fin, sperm, humpback, blue, sei, and North Atlantic right—the aerial surveys collected behavioral information and opportunistic sightings of sea turtles, fish, sharks, and other cetaceans. The passive acoustic monitors recorded ambient noise that was assessed to identify the level of noise that whales encounter as they move through the area.

All six large whale species were sighted and heard during this effort (Fig. 5), and the data collected and significant findings were published in fall 2021. Fifteen sightings of 24 individual North Atlantic right whales were recorded—a significant contribution to vital studies on the critically endangered species that gives scientists and resource managers a better sense of shifting habitat use. Full reports covering all three years of the aerial and passive acoustic surveys are available on <https://www.dec.ny.gov/lands/113647.html>. While this initial monitoring project completes Action 19 of the OAP, to “design and implement a monitoring survey to determine baseline trends for large whales in the New York Bight,” planning is underway to follow up on this effort and initiate Action 20, to “design and implement focused, long-term monitoring surveys for large whales.” Information gathered from baseline and projected follow-up monitoring efforts will be useful to decision-makers balancing competing ocean uses—such as vessel traffic, sustainable energy development, and fisheries management—with protection of these sensitive species’ habitat and movement patterns.

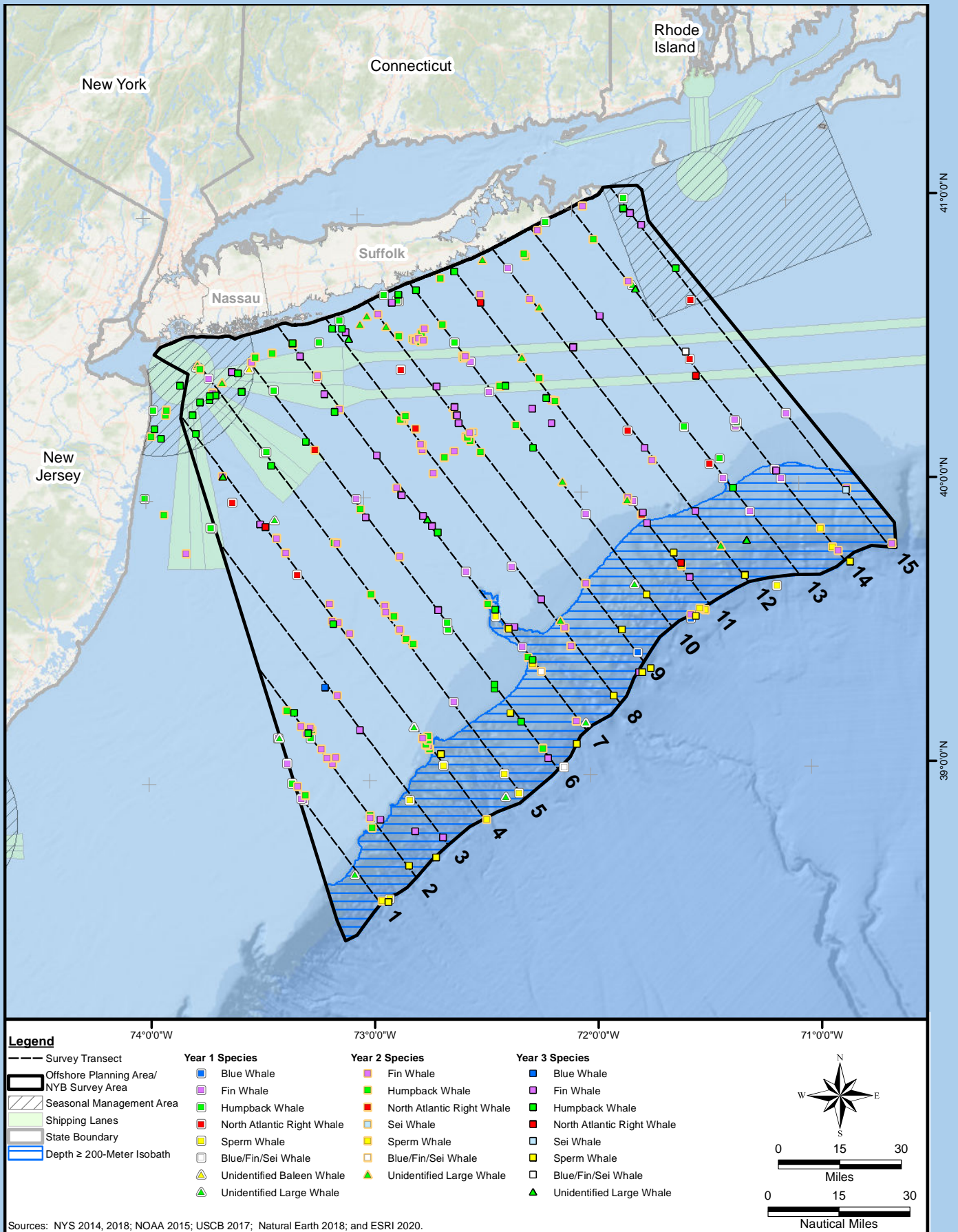


Figure 5: Survey lines and whale sightings observed over three-year New York Bight Whale Monitoring Program.

Monitoring Snapshots



Byron Young

Underwater image of alewife migrating upstream to spawn at Woodhull Dam in Riverhead, Long Island

River Herring Monitoring

Alewife and blueback herring are collectively known as river herring. They serve as an important forage base for many of New York's recreational and commercial fish species. River herring spend most of their adult lives in the ocean but return to freshwater to spawn in the spring. Many river herring runs have been blocked by dams and habitat loss, leaving these fish unable to reach their spawning grounds. DEC works with Seatuck Environmental Association, Long Island Sound Study, Peconic Estuary Partnership (PEP), and South Shore Estuary Reserve (SSER) on a community science effort to monitor streams for returning alewife (see [Call to Action](#)) and identify potential restoration projects. Once a remnant run is identified, DEC and partners can make plans to restore fish access. For example, volunteer surveys identified a remnant run at Bellmore Creek and now that site is undergoing a process to create access for returning river herring.

Great South Bay Beam Trawl Survey

A trawl survey was developed by DEC and SoMAS to collect relative abundance and biological data from non-larval life stages of blue crab, other macro invertebrates, and adult and subadult finfish within the Great South Bay (GSB). The data from these efforts (Fig. 6) allow resource managers to monitor changes in species abundance and diversity. A significant increasing trend in relative abundance of age-0 blue crab and a significant decreasing trend in abundance of calico (lady) crab were found over the course of monitoring.

Blue crab landings have been declining since the 1990s, but research suggests the effects of climate change may increase winter survival and productivity. Since blue crabs are an important commercial and recreational resource, monitoring is essential to ensure that management of this fishery is informed by the best available science.

Ocean Outfall Monitoring

Long Island's South Shore is serviced by various sewage treatment plants (STPs). The Bay Park STP currently discharges into the Western Bays, where excess nitrogen and subsequent hypoxia is deteriorating water quality. A project is underway to redirect 55 million gallons of effluent daily from the Bay Park facility to the Cedar Creek facility and ultimately to a 3-mile-offshore outfall pipe. Combining this infrastructure project with other efforts by the Long Island Nitrogen Action Plan, such as extensive septic upgrades, Nassau and Suffolk counties can dramatically improve water quality: <https://www.dec.ny.gov/lands/103654.html>. In light of this redirection of effluent, it is important to document the impacts of existing outfalls and to provide a realistic basis to forecast future conditions considering increased flows. Monitoring is underway to document conditions at existing ocean outfalls for Cedar Creek and Southwest Sewer District at Bergen Point, and to survey conditions at the proposed site of an ocean outfall for Bay Park STP. With this information, resource managers can consider the extent of impacts due to increased discharge at Cedar Creek outfall if augmented by wastewater from Bay Park.

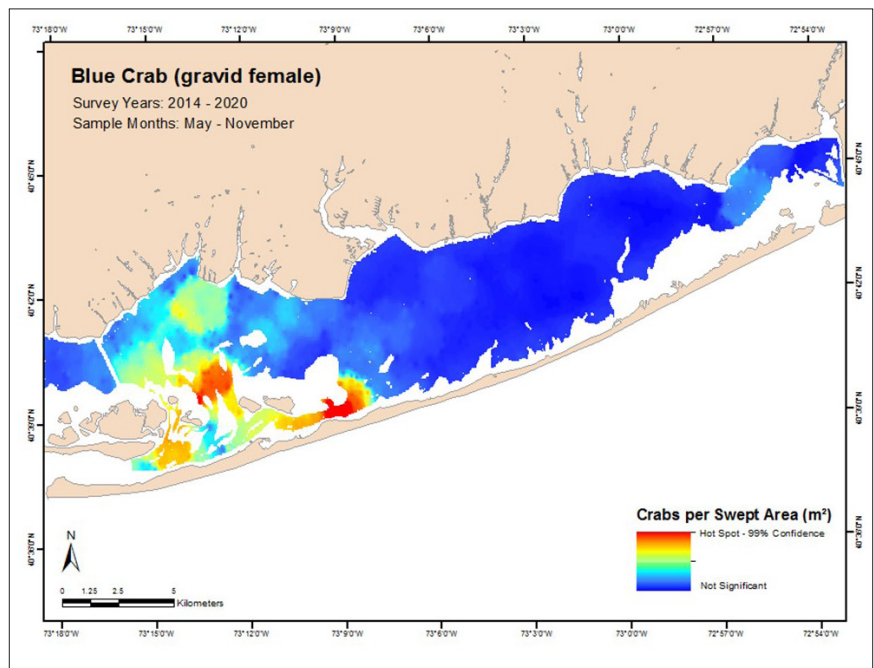


Figure 6: Hot spots of blue crab relative abundance from Great South Bay beam trawl survey

SoMAS has completed four one-month deployments of oceanographic instruments to monitor site conditions in the spring and fall. Initial findings show that diffusers at the outfalls are effective at mixing the discharge and effluent quickly becomes diluted beyond detectability. Regional flow patterns are not impacted by the outfalls. Some differences in the benthic community have been detected due to subtle changes in sedimentary habitat near outfalls.



John Madsen/University of Delaware

DEC biologist with Atlantic sturgeon

Sturgeon Monitoring

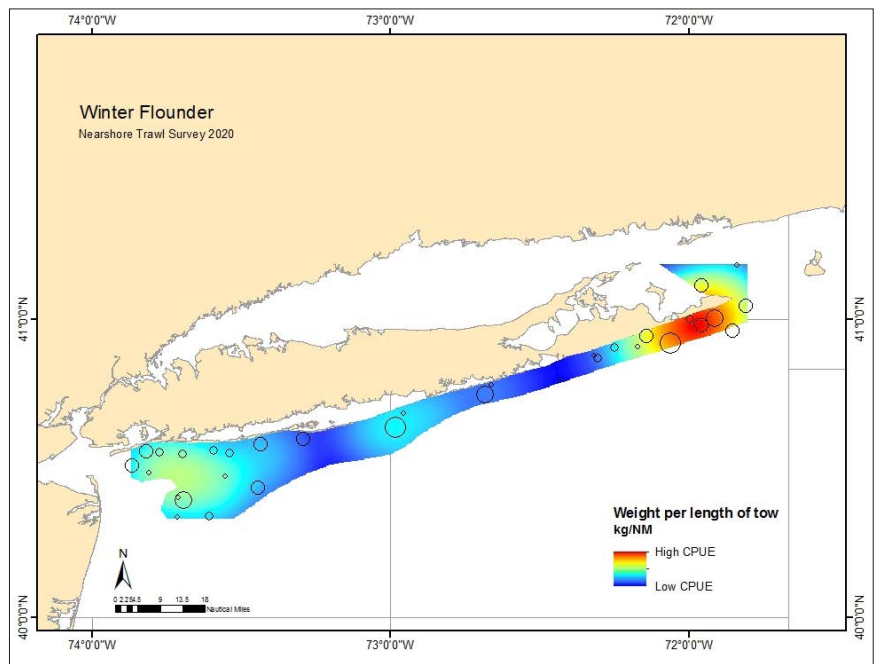
The decline of Atlantic sturgeon in the early twentieth century has been attributed primarily to overfishing for their eggs, which resulted in their inclusion on the endangered species list. Since these fish have slow maturation rates and can live up to 60 years, they are likewise slow to recover from population declines, but this impressive species is showing signs of recovery.

Since 2006, DEC and its Hudson River Estuary Program have been effectively tracking changes in abundance of juvenile Atlantic sturgeon. In cooperation with its partners, DEC also maintains a network of receivers that detect tagged fish along the coast and in the Hudson River. These receivers detect acoustic-tagged Atlantic sturgeon, as well as other species, such as shortnose sturgeon, sharks, black sea bass, and sea turtles, providing valuable information on habitat use. In coordination with the Atlantic Coast Telemetry Network, the Mid-Atlantic Acoustic Telemetry Observation System database allows for efficient data sharing to guide management. This includes determining preferred dredging times to minimize disturbance and potential seasonal closures that reduce bycatch in commercial fisheries. Results from this research show that seasonal trends in sturgeon habitat use can be used to reduce negative interactions in developing New York Wind Energy Areas (WEA).

DEC and its partners maintain a database of acoustic data for Atlantic sturgeon in the Hudson—which includes more than 7.8 million records of 564 Atlantic sturgeon—and are expanding the database to include acoustic data for marine areas. DEC also collaborates with researchers across the Atlantic seaboard, including Stony Brook University, Delaware State University, the University of Delaware, Monmouth University, and Cornell University, to identify and fill data needs. Modeling is conducted to assist conservation efforts by predicting the movements of Atlantic sturgeon, by distinguishing the drivers of broad-scale sturgeon behavior in the Hudson, and by helping to understand the relationship between seasonality and habitat use— all of which will facilitate recovery of this endangered species. Learn more at <https://www.dec.ny.gov/animals/37121.html>.

Nearshore Trawl Survey

The nearshore ocean trawl survey is a 10-year project initiated in fall 2017. It is conducted in partnership with DEC and SoMAS and samples New York’s nearshore ocean waters, from Breezy Point to Block Island Sound. The survey collects abundance and biological data from finfish and macro invertebrates, and provides additional tagging opportunities to better understand the life history of these fishes. The data collected provide information on the spatial and temporal trends in distribution and abundance and are crucial to the sustainable management of species of commercial and recreational importance. Catch and landing limits are managed collaboratively with the Atlantic States Marine Fisheries Council and Mid-Atlantic Fishery Management Council. Learn more at <https://www.dec.ny.gov/lands/111178.html#Nearshore>.



NYSDEC and SoMAS

Figure 7: Hot spot map shows winter flounder relative abundance, measured as catch per unit effort (CPUE), from nearshore trawl survey.

Supporting Ocean Research

New York's OAP aims to increase knowledge of the state's inshore and offshore ocean waters through exploratory questions pertaining to the ocean ecosystem, and data collection to inform future decision-making. New York State has prioritized ocean research to inform long-term monitoring programs and improve science-based understanding of how interrelated components of the state's ocean ecosystem function. DEC provided approximately \$570,000 in funding to research grants by partnering with New York Sea Grant (NYSG) to administer an ocean research grant competition. Grants were awarded to three investigative teams, including two from Stony Brook University and the Wildlife Conservation Society. These teams have long-standing experience in research related to biodiversity of the offshore ecosystem and species found in New York's ocean.

The three topics being investigated are:

- Ocean acidification in the NYB: Associations with eutrophication processes and implications for shellfish populations;
- Effects of current and projected climate conditions on Atlantic surf clam (*Spisula solidissima*); and
- Applying environmental DNA analysis to biodiversity assessment and long-term ecological monitoring across New York's marine waters.

These topics represent the first phase of projects from a \$1.1-million dedicated research fund, with a second round of projects scheduled for 2023–2025. This research will assist in defining the relationship between human use of the ocean and natural processes that drive offshore environmental conditions.

Initial data show evidence of coastal ocean acidification throughout the summer months, which could impact shellfish growth and larval fish development. Additional preliminary results suggest that there are three subpopulations of surf clams off Long Island that respond differently to environmental conditions, and harvests in various locations may be affected differently by changes in weather patterns.

Marine Mammal and Sea Turtle Stranding Networks

Marine mammals and sea turtles are commonly found along New York's coastal shores either physically compromised or deceased, requiring the assistance of trained responders. DEC provides support through collaboration with partner organizations authorized by the National Oceanographic and Atmospheric Administration (NOAA) to respond promptly and effectively to stranding events. The Atlantic Marine Conservation Society (AMSEAS) responds to stranded large whales, both alive and deceased, and deceased dolphins, porpoises, seals, and sea turtles.



Green sea turtle underwater



iMapInvasives user with record 1047057

Chinese mitten crab from Hudson River

The New York Marine Rescue Center (NYMRC) responds to live-stranded seals, sea turtles, and dolphins, and provides rehabilitation for injured seals and injured or cold-stunned sea turtles. Responses by stranding networks may include monitoring apparently healthy animals that have made their way inshore or are in unusual habitats near humans, treating sick or injured animals, and performing necropsies on deceased animals. The number of stranded marine mammals and sea turtles has greatly increased in recent years. Vessel strikes and fishing gear or marine debris entanglements are increasingly common for whales and sea turtles. Data collected in these response efforts are vital to effective management decisions. For example, necropsy data may provide information on the cause of death, which can help guide management strategies and future conservation needs for New York's local populations.

AMSEAS and NYMRC regularly conduct public outreach and education activities and perform additional research to enhance the conservation of marine mammals and sea turtles in New York. NYMRC leads a community science effort that encourages residents to monitor local beaches and report findings of cold-stunned sea turtles, which enables timely response efforts and proper rehabilitation.

Addressing Aquatic Invasive Species

AIS are a significant threat to freshwater, tidal, and marine environments. AIS may negatively impact these ecosystems (e.g., reduce species diversity, impair ecosystem function), the economy, and human health. The 2018 *New York Invasive Species Comprehensive Management Plan* addresses the need to increase awareness of AIS and develop integrated monitoring protocols. DEC works with the Long Island Invasive Species Management Area (LIISMA), the Long Island-NY Metro AIS Task Force, and the Northeast Aquatic Nuisance Species Panel to organize prevention, early detection, rapid response, eradication, and other management strategies for AIS. NYNHP supports these efforts by managing iMapInvasives, the statewide, GIS-based invasive species online database, equipped with an email notification system for early



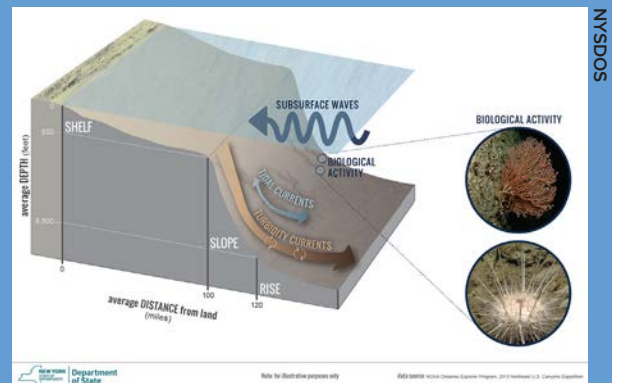
Ignacio Bárbara, Algaebase.org

Siphoned feather weed collected in Great South Bay, Long Island.

detection and rapid response. DEC, LIISMA, NYNHP, and partners conduct public education and outreach, hosting webinars and workshops on marine invasive species and encouraging the public to utilize the iMapInvasives reporting tool in order to help mitigate the potential impacts of AIS: <https://www.imapinvasives.org/>

Corals and Canyons

Underwater canyons are unique features in the ocean, disrupting the seafloor terrain with deep, wide crevasses. Miles off New York's shores, underwater canyons provide important habitat for diverse marine species and support recreational activities and marine-based industries. The Hudson Canyon is the largest submerged canyon off the Atlantic Coast and one of the largest underwater canyons in the world. It measures 3,500 meters (more than 2 miles) deep, rivaling the size of the Grand Canyon. The biodiversity that exists in these submarine canyons is largely attributed to undisturbed cold-water corals and sponges that have flourished for thousands of years. These canyons provide diverse and dynamic microhabitats that support an abundance of life. Accordingly, the Mid-Atlantic Fisheries Management Council and National Marine Fisheries Service put restrictions on bottom-trawling and dredging gear in deep sea coral zones to protect these habitats.



Canyons, shaped by various physical features including tidal and turbidity currents, provide dynamic microhabitats of biological activity compared to the surrounding waters.

Goal 2: Promoting Sustainable Growth

Goal 2 of the OAP is to “promote economic growth, coastal development and human use of the ocean in a manner that is sustainable and consistent with maintaining ecosystem integrity.” This goal has nine actions and two objectives.

Enhancing the Geographic Information Gateway, developing guidance for assessing and permitting offshore wind and energy production, creating an aquaculture policy and planning framework, and advancing the New York Artificial Reef Program are main objectives of this goal.

Project Highlight: Expanding Marine Habitat

Artificial reefs enhance marine environment by creating a biologically diverse area that provides food and shelter to a range of organisms. Over time, hard structures on the reefs are covered with algae, mussels, and a variety of encrusting organisms. Many fish and crustacean species, including black sea bass, tautog (blackfish), scup (porgy), and summer flounder (fluke), are attracted to these reefs for food and shelter. These marine resources not only play an important role in the ecosystem, but are critical to New York’s economy, supporting nearly 350,000 jobs and generating billions of dollars through tourism, fishing, and other maritime industries.

In 2018, New York’s Artificial Reef Program initiated the largest enhancement of reefs in state history. Fueled by unprecedented multiagency coordination, recycled and cleaned materials were deployed to all 12 artificial reef sites off Long Island. From 2018–2020, 22 vessels; 4,700 tons of jetty stone; and numerous railcars, pontoons, steel turbines, steel buoys, turbine shells, and bridge materials were deployed. Various State, Federal, and private entities collaborated on this project including DEC; New York Power Authority (NYPA); New York City Department of Transportation (NYCDOT); United States Army Corps of Engineers; National Grid; Tutor-Perini Corporation; Mill Basin Bridge Constructors; the Wells Fargo Rail Corporation; and the New York State DOT, Conservation Council, Transit Authority, and Office of Parks, Recreation and Historic Preservation. Additional expansion of existing reefs and creation of new reefs are planned in the near future.

In 2019, DEC secured funds to conduct a comprehensive side-scan sonar study of all artificial reef sites to provide the Artificial Reef Program with information on the status of previously deployed materials and assist in locating optimal places for deploying new patch reefs. An additional study to understand movement patterns and quantify the abundance and size of black sea bass and blackfish around artificial reefs by DEC and SoMAS began in 2020. As of December 2021, there were more than 700,000 detections of various species on the reef sites and evidence that individual fish are moving between reef sites. Learn more at <https://www.dec.ny.gov/outdoor/7896.html>.

Marine Spatial Planning

In 2015, the Ocean and Great Lakes Atlas was replaced with the Geographic Information Gateway (Gateway) by DOS: <http://opdgig.dos.ny.gov/#/home>. The Gateway is an award-winning, state-of-the-art website providing public access to real-time data, interactive tools, and expert knowledge relevant to state activities. Interactive maps allow users to download, visualize, and explore geographic data, including over 460 datasets related to the Atlantic Ocean (Fig. 8). The Gateway offers real-time information across the state, such as water quality, tide levels, and beach conditions. This tool is a resource for New York’s communities and schools, and serves as a guide for responsible residential and commercial development. Since its launch, the Gateway has been visited by more than 50,000 unique visitors from more than 100 countries.

The Mid-Atlantic Regional Council on the Ocean, made up of the federally approved coastal programs of New York, New Jersey, Delaware, Maryland, and Virginia, developed the Mid-Atlantic Ocean Data Portal (ODP), which provides geospatial information on the offshore ocean environment. New York has been a member of the ODP team since its inception, and the State has secured funding for supporting and developing the ODP. In early 2020, New York took over project management of the ODP, which provides map services for more than 2,000 datasets that can aid decision-makers. For example, as governments contemplate potential ocean uses, the Indigenous Nations, Communities & Cultures map collection can help ensure appropriate tribal nations are included in the process.

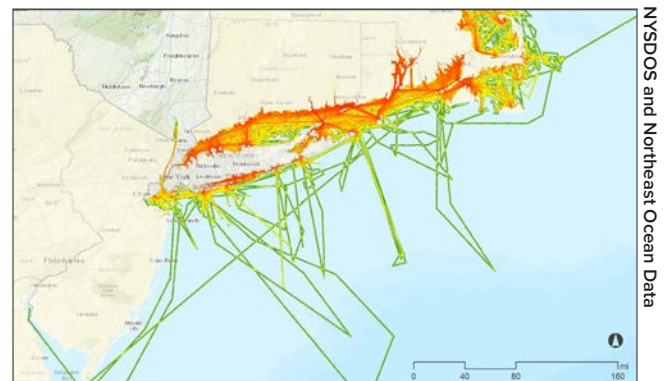


Figure 8: Recreational boating activity in New York Bight tends to concentrate near the coast (red), compared to less frequented routes (green).

Diversifying Energy Supply

Offshore wind is a critical component of the State's plan to generate 70% of its electricity needs from renewable energy sources by 2030, supporting the creation of thousands of jobs in the clean energy economy. New York State Energy Research and Development Authority (NYSERDA) and its State agency partners engaged community members, environmental advocates, and government colleagues to create the New York State Offshore Wind Master Plan, released in January 2018. Learn more at <https://www.nyserda.ny.gov/All-Programs/Offshore-Wind/About-Offshore-Wind/Master-Plan>. This comprehensive plan guides New York toward its commitment, under the State's Clean Energy Standard, to produce 2.4 gigawatts of offshore wind by 2030, enough to power up to 1.2 million homes. The plan advises the State on how to achieve this goal in a responsible and cost-effective way that is sensitive to environmental, maritime, economic, and social issues. The plan also addresses market barriers and aims to lower costs. In January 2019, New York's clean energy target was increased to 9 gigawatts of offshore wind energy by 2035 and was later codified into law in the CLCPA.

Under NYSEDA's Offshore Wind Master Plan, the agency and its partner agencies, including DOS, DEC, and NYPA, convened four technical working groups to solicit guidance from various sectors as the State's plan for offshore wind energy advances: maritime, jobs and supply chain,

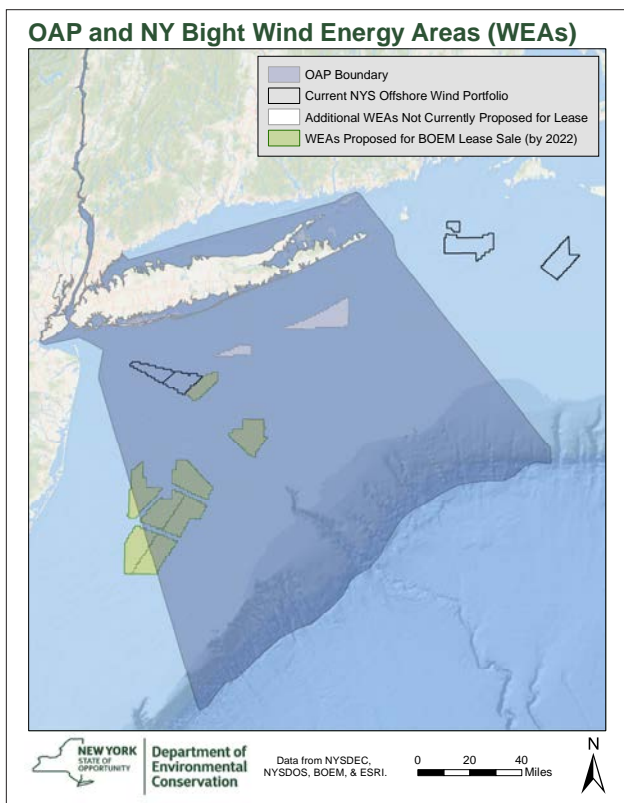
commercial and recreational fishing, and environmental sectors. Collectively, these groups will help ensure offshore wind is developed from an EBM perspective. In fall 2018, NYSEDA issued its first solicitation and subsequent award for project proposals to deliver offshore wind energy to the state. This solicitation process stimulates the development of the domestic offshore wind industry; reduces the cost of later offshore wind procurements; and allows the State to realize the direct benefits associated with the construction, operation, and maintenance of offshore wind resources. In 2020, a second solicitation and subsequent award was issued, resulting in a total offshore wind portfolio of 5 projects under development in New York that will generate more than 4,300 megawatts of energy. This award included roughly \$10 million in research and monitoring funds for both environmental and fishing sectors (totaling \$20 million) that will advance the State's offshore-wind research needs. A third solicitation was issued in 2022. Proposals are being evaluated and awards are expected to be announced in 2023.

Fisheries and Resource Management

Marine fisheries along New York's coast provide an abundance of recreational opportunities and support thousands of jobs and commercial industries for residents across the state. DMR's mission is to manage and maintain the state's marine, estuarine, and anadromous resources, and protect and enhance the habitat upon which these resources depend in order to ensure that diverse and self-sustaining populations are available for future generations. This includes managing the recreational marine fishing registry; issuing commercial fishing permits; setting harvest limits; and modifying regulations based on best practices, current research, and coordination with interstate fishery management councils and commissions. In addition, DEC strives to meet the need for increased fishing and boating access, and works to educate and encourage the public to enjoy these activities responsibly.



Aerial view of Hashamomuck Marine Waterway Access site in Southhold, officially opened by DEC in July 2021. The site provides unrestricted access to the Peconic Bay, including public fishing, a boat ramp, canoe and kayak launch, and a 37-vehicle parking lot that accommodates 31 trailers.



Map of New York Bight showing OAP boundary and overlapping WEAs.

Goal 3: Adapting to Change

The OAP's Goal 3 is to "increase resilience of ocean resources to impacts associated with climate change" and is carried out through 9 actions that contribute to 3 objectives. CLCPA regulations along with efforts to monitor coastal changes, promote living shorelines, develop flood risk maps, and investigate species-specific responses to the changing climate support this goal.



Charles Flagg, Stony Brook University

Charles Flagg & Justin Flagg, Stony Brook University

Charles Flagg & John Vahey, Stony Brook University

Figure 9: Aerial images of Great South Bay from before the breach (top), immediately after the breach (middle), and more recently (bottom), show the breach that occurred during Hurricane Sandy and subsequent closing that is in progress.

A Changing Coast

In October 2012, Hurricane Sandy significantly transformed the landscape of New York's coast. One major change was the breach of Fire Island and its effects on the GSB (Fig. 9). SoMAS has monitoring programs in the bay that provide baseline data to investigate the effects of the breach on water levels, chemistry, circulation, and storm surge. With support from DEC, NYSG, and the National Park Service, SoMAS was able to continue monitoring efforts to provide post-breach comparisons.

In 2019, DEC initiated a partnership with SoMAS to investigate underlying causes of these observed impacts by modeling circulation, water properties, and storm surge. The knowledge gathered from these investigations will help better predict future storm impacts. Initial findings indicate the breach minimally increased surge levels but also provided benefits to the bay, such as increased flushing, which reduces eutrophication and provides healthier habitat for fish, bivalves, and seagrass. One clear impact has been that salinities in the eastern GSB are increasing near New Inlet (Fig. 10). Barrier islands frequently close on their own due to natural processes, and recent studies have shown New Inlet filling in. Understanding the effects these natural phenomena have on coastal communities, habitats, and wildlife is essential to continued sustainable use. These studies can also inform barrier island management policies.

DEC partnered with the United States Geological Survey to evaluate the unvegetated-to-vegetated marsh ratio (UVVR) of the state's salt marshes and tidal freshwater wetlands. Wetland stability influences habitat availability, carbon sequestration, and coastal resiliency, and is affected by climate change. One of the best measures of wetland stability is UVVR ratio, and this project informs mitigation efforts by enabling managers to identify the most stable and most vulnerable tidal wetland areas within the state.

Ocean Acidification Task Force

One aspect of climate change is the increasing acidification of the ocean, which can adversely impact marine wildlife and ecosystems. To research and proactively manage this threat, stakeholders from government agencies, educational institutions, nonprofit organizations, and commercial organizations established the OATF in late 2018. The task force has been working to identify what New York can do to reduce acidification and minimize the negative impacts of this process. Learn more at <https://www.dec.ny.gov/lands/114877.html>.

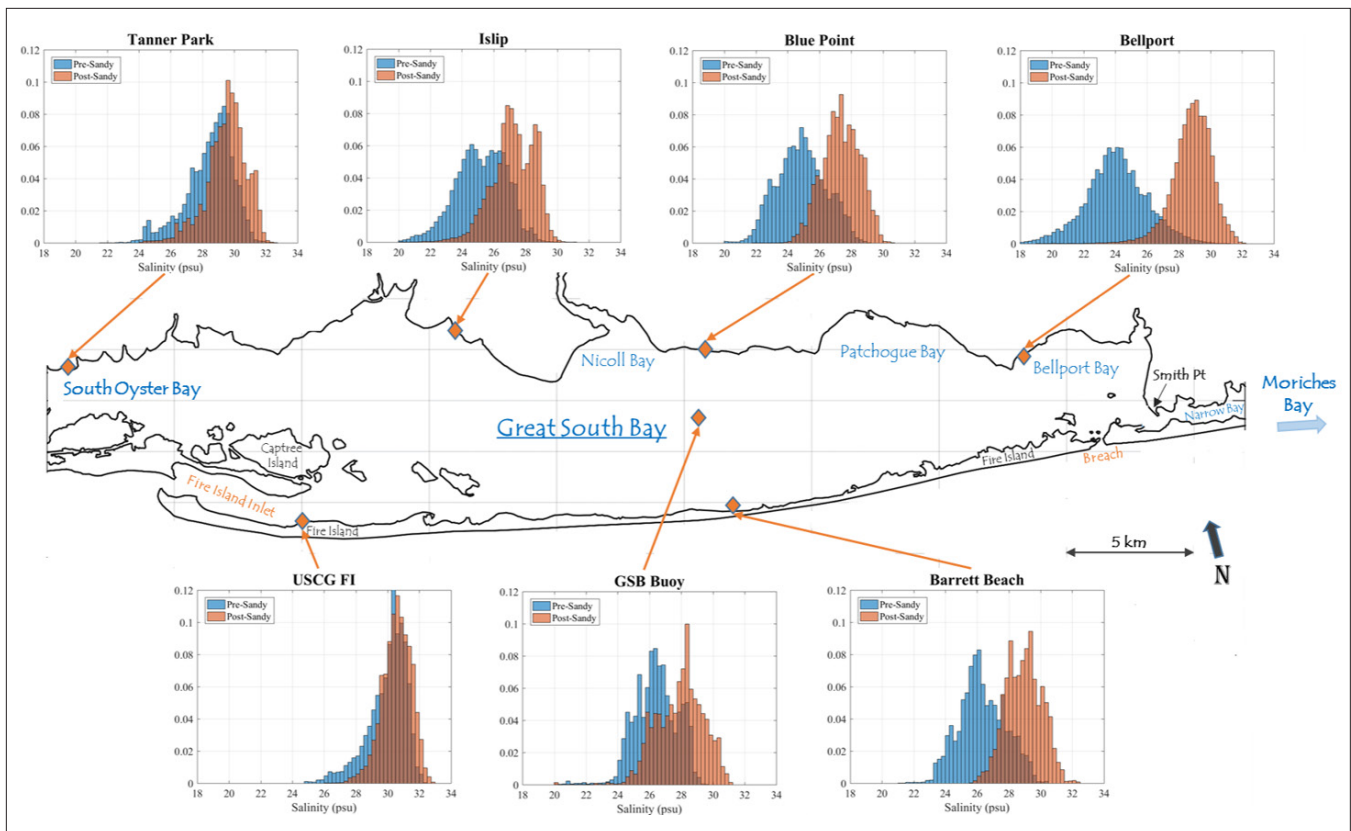


Figure 10: Schematic map of GSB and its landmarks to define sub-embayments; the red diamonds mark the location of long-term stations maintained by the GSB Monitoring Program at Stony Brook University, the histograms show observed salinity from a three-year period pre-Hurricane Sandy (blue) and a three-year period after Sandy (red). Reproduced from: Hinrichs, Claudia, Charles N. Flagg, and Robert E. Wilson. 2018. "Great South Bay After Sandy: Changes in Circulation and Flushing due to New Inlet." *Estuaries and Coasts* 41, 2172–2190 (2018). <https://doi.org/10.1007/s12237-018-0423-6>

Investigating Regime Shifts in Fisheries

As the physical properties of the ocean change, the ability of plants and animals to utilize associated habitats is affected. Species may expand, restrict, or shift their range or migration patterns to correspond with the changing environment and to maintain optimal habitat.

DEC and the University of Maine partnered on a yearlong modeling exercise to understand the impact of climate change on marine ecosystems. Exploring changes in species distributions helps minimize the potential negative ecological and economic impacts of offshore wind development. This project developed a species distribution model (SDM) for Atlantic scallop (*Placopecten magellanicus*) off the New York coast. The model projects an overall reduction of suitable scallop habitat in the Mid-Atlantic Bight area with an anticipated increase in habitat quality in select northern areas, suggesting a north-south gradient of habitat change over the simulated 80-year projections (Fig. 11). It is expected that this NYB SDM could be applied to other species of importance if appropriate survey and environmental data are readily available. In spring 2020, a project began to create a similar model for longfin squid (*Loligo pealeii*). Eventually, these model projections could help inform species management efforts.

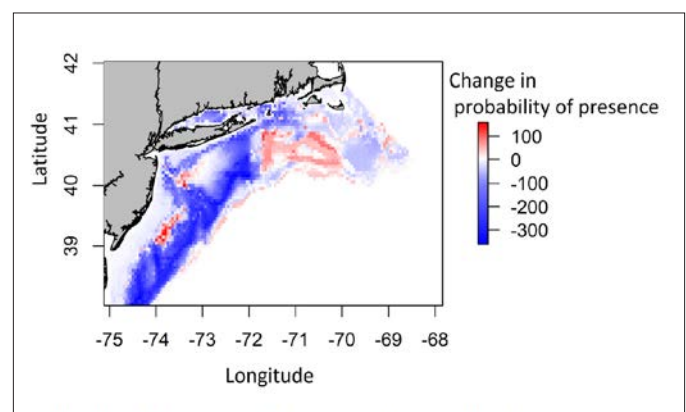


Figure 11: Change in probability of presence of Atlantic scallops over an 80-year projection, with red indicating increasing trends and blue indicating decreasing trends. Projections indicate that most of the mid-Atlantic will see a decrease in probability of occupancy. Reproduced from: Torre, Miguel, and Yong Chen. 2020. "Developing and applying ensemble species distribution modeling framework to assess the spatio-temporal distribution of Atlantic scallop in the New York Bight." Final Report prepared for the New York State Department of Environmental Conservation, University of Maine, ME.



Students participate in installation of living shoreline at Widow's Hole Preserve.

Implementing Living Shorelines

In 2017, DEC published a tidal wetlands guidance document, *Living Shoreline Techniques in the Marine District of New York State*, that emphasizes natural and nature-based solutions to erosion control. This guidance encourages the appropriate use of natural shoreline protection measures, such as oyster reefs, in place of hardened approaches, like bulkheads, to maintain habitat quality and control coastal erosion. Additionally, it provides information on types of living shorelines; reviews how permit standards relate to living shorelines; and addresses proper siting, maintenance, and monitoring considerations.

To educate community members about living shoreline alternatives, DOS created a story map in the Geographic Information Gateway: <http://opdgig.dos.ny.gov/#/story-Template/27/1/1>. DOS, with grant funding from NOAA and in partnership with NYSERDA, recently developed a Statewide Shoreline Monitoring Framework to provide a means of measuring success and to encourage the use of living shorelines or natural/nature-based features for shoreline protection. These protocols were released in 2020 and DOS, with additional funds from NOAA, is currently working to expand and apply the protocols to a variety

of sites around the state. More details can be found on <https://dos.ny.gov/statewide-shoreline-monitoring-framework>.

The Shinnecock Indian Nation was awarded funding for a habitat restoration project on the eastern shore of Shinnecock Bay in Southampton, Long Island, through the U.S. Department of the Interior 2013 Hurricane Sandy Coastal Resiliency Competitive Grants Program. This project aimed to restore natural resiliency and ecological diversity to a portion of the Shinnecock Reservation and increase tidal flushing of two wetland systems to combat phragmites invasions and reduce mosquito populations. PEP, with funding from the U.S. Environmental Protection Agency (EPA), partnered with Cornell Cooperative Extension (CCE), Suffolk County, and the Town of Southold to create a living shorelines demonstration project: <https://www.peconicestuary.org/demonstration-living-shoreline-project>. Held at the Suffolk County Marine Environmental Learning Center in Southold, the purpose of this demonstration was to promote stakeholder use of living shorelines. PEP also partnered with Peconic Land Trust to implement a living shoreline at Widow's Hole Preserve in Greenport.

Goal 4: Empowering Public Stewardship

Goal 4 of the *OAP* is to “empower the public to actively participate in decision-making and ocean stewardship.” Objectives of this goal include increasing stakeholder participation in resource management and offshore planning, advancing ocean outreach and education, and supporting local and regional stewardship programs.

In the first five years of implementing the *OAP*, progress was made in developing education and outreach materials while working with partners, like NYSG and CCE, to engage and empower the public to practice safe, responsible, and sustainable ocean use.

Tackling Marine Debris

A large number of manufactured items end up in New York waters, negatively impacting marine environment. Marine debris harms wildlife through ingestion or entanglement, creates hazards to navigation, reduces the beauty of New York’s coastlines, and even potentially impacts the economy and human health. *OAP* marine debris goals are being addressed through participation in the Mid-Atlantic Marine Debris Work Group by New York representatives. Membership enables New York to work with the other Mid-Atlantic states of New Jersey, Delaware, Maryland, and Virginia to address the problem of marine debris. This group received a grant from the NOAA Marine Debris Program to address the issue of balloon debris. As part of this project, New York conducts semiannual cleanups with balloon and marine debris surveys of Jones Beach. The information gathered by the surveys provides a baseline to compare how the presence of debris changes over time. During the first cleanup and survey event, 309 pieces of balloon debris were found across 1 mile of shoreline. This effort, in tandem with a community-based social marketing campaign at local aquariums, aims to reduce the occurrence of intentional balloon releases by educating, offering alternatives, and securing a commitment from patrons to reduce balloon litter.

Additional marine debris work has been completed throughout the state, including in the SSER, where a group of students from Massapequa High School collected 350 pounds of debris during a cleanup at Jones Beach in September 2018. Another Jones Beach cleanup, hosted by the SSER as part of Ocean Conservancy’s International Coastal Cleanup event that same month, collected 138 pounds of debris. DEC also worked with NYSG to develop and distribute an educational curriculum about marine debris and encourage communities to do their part in preventing plastic pollution.



Representatives from the NYSDEC, US EPA, and NYSG pose with some of the balloon debris that was collected from Jones Beach during a preliminary survey in the fall of 2018.



Casey Personius, NYSDEC

Volunteers participate in balloon survey at Jones Beach.

Encouraging Responsible Recreation



Seal viewing guidelines factsheet developed to promote responsible wildlife viewing in New York.

New York promotes NOAA's "No Selfies with Seals" campaign and conducts additional outreach to encourage local residents and visitors to respect and protect marine wildlife by maintaining a safe distance. These priorities of the OAP are addressed with the help of AMSEAS; NYMRC; and the Coastal Research and Education Society of Long Island, Inc., which provide opportunities for safe and responsible viewing of marine protected species.

New York shares the ocean and coastal environment with a variety of marine animals. While it can be an incredible experience to witness marine life such as whales, dolphins, sea turtles, and seals in their natural habitat, it's important to keep distance and follow the responsible marine-life viewing guidelines established by the Marine Mammal Protection Act and Endangered Species Act. To that end, New York

Chris O'Brien, Friends of East River Esplanade



El Barrio Accessible Bait Station in use

Supporting Local Initiatives

Implementation of the OAP is dependent upon partnerships with different agencies and organizations, including collaboration between DEC and NYSG. This partnership has increased ocean ecosystem literacy, as called for in the OAP. One success from this partnership can be seen in the recently completed Marine and Coastal District Conservation, Education, and Research Grants, funds for which were provided through the sale of the Marine and Coastal District-branded license plates. These projects focus on recreational fishing and connecting stakeholders to ocean resources. For example, Friends of the East River Esplanade constructed the El Barrio Bait Station with support from these grants.

DOS leads the Local Waterfront Revitalization Program (LWRP), which dedicated over \$1.5 million to Randall's Island Living Shoreline, scheduled to be finished in 2023. This project replaces a crumbling seawall with modified waterfront stabilization infrastructure to allow small-boat access while improving ecological function and water quality. The Village of Patchogue Shorefront Park's living shoreline also received LWRP support totaling over \$2.3 million for 2 projects providing erosion control and flood protection while enhancing public access. The first project is developing final design plan to replace a bulkhead at Shore Road Park with an offshore breakwater, soft shoreline treatment, stormwater controls, boardwalk, and kayak launch. The second project will replace a deteriorating bulkhead with a living shoreline at Shorefront Park along GSB. Learn more at <https://seagrant.sunysb.edu/articles/t/marine-and-coastal-district-small-grants-program-resources>.

Flipper Files

Community members can support the conservation of marine mammals and sea turtles in New York by using DEC's Flipper Files survey to submit observations of these animals: <https://on.ny.gov/flipperfiles>. The information provided by the public helps biologists better understand where and when these species are present and how they are interacting with humans, adding to collective knowledge of local marine mammal and sea turtle habitat use and behavior.



Chelsea Miller, NYSDEC



Sperm whales surfacing, observed during whale monitoring.

Conclusion

In the first 5 years of the *OAP*, progress was made to advance 53 of the 61 actions. While some of those steps were highlighted in this report, more information can be found on the *OAP*'s summary of actions webpage: <https://www.dec.ny.gov/lands/100471.html>.

New York State is extremely grateful to the many partners who work hard every day to help protect, research, manage, and educate about the state's ocean resources. The success stories showcased in this report were largely the result of their industrious commitment to and passion for maintaining the ecological integrity of the natural environment. New York continues to rely on the institutional support, dedication, and ingenuity of its partners as implementation of the *OAP* continues over the coming years.

New York State looks forward to working with partners to reduce bycatch in New York's fisheries (Action 9) and to protect important habitat (Action 22). Assessing and mitigating the impacts of human activities on horseshoe crabs (Action 24), deep sea corals (Action 30), seabirds (Action 31), and other species (actions 20 and 25), while advancing New York's energy goals (Action 38) also requires ongoing support. It is imperative to continue investigating the effects of climate change (Actions 45 and 46), assessing the effectiveness of shoreline protective measures (Action 47), and supporting our local communities in developing resilience (Action 49) to storm impacts. New York will continue to engage partners and ensure stakeholder involvement in decision-making.

Call to Action

There are a variety of community science projects that need participation from as many observers as possible. Visit the DEC website to learn more and check out additional opportunities: <https://www.dec.ny.gov/outdoor/109925.html>.

Thank you for keeping New York's ocean, bays, and beaches clean and healthy!

Striped Bass Cooperative Angler Program: Log and sample striped bass when caught.

Artificial Reef Fishing and Diving: Share information about your experiences diving and fishing the artificial reefs.

Atlantic Sturgeon Salvage Program: Report dead sturgeon, if found.

Blue Crab Tagging Program and Recreational Survey: Report tagged blue crab catch and information from recreational fishing trips.

Shark Spotter: Submit your sightings of sharks in the wild.

Horseshoe Crab Spawning Survey: Count and tag horseshoe crabs.

Lobster Recreational Survey: Submit your catch numbers from any lobster fishing trip.

Long Island Volunteer River Herring Survey: Monitor streams and submit sightings to identify remnant alewife runs.

Diamondback Terrapin Monitoring: Submit diamondback terrapin sightings.

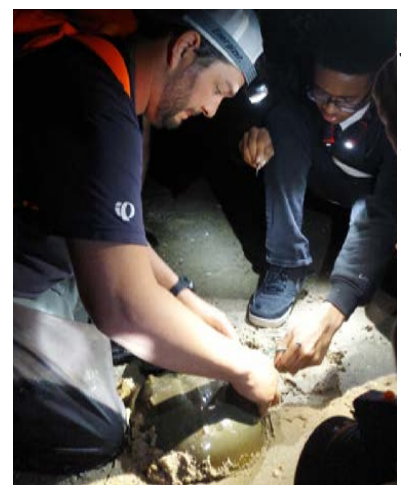
Invasive Species Monitoring: Easily submit observations of invasive species with the *iMapInvasives* app.

Flipper Files: Submit your sightings of marine mammals and sea turtles.



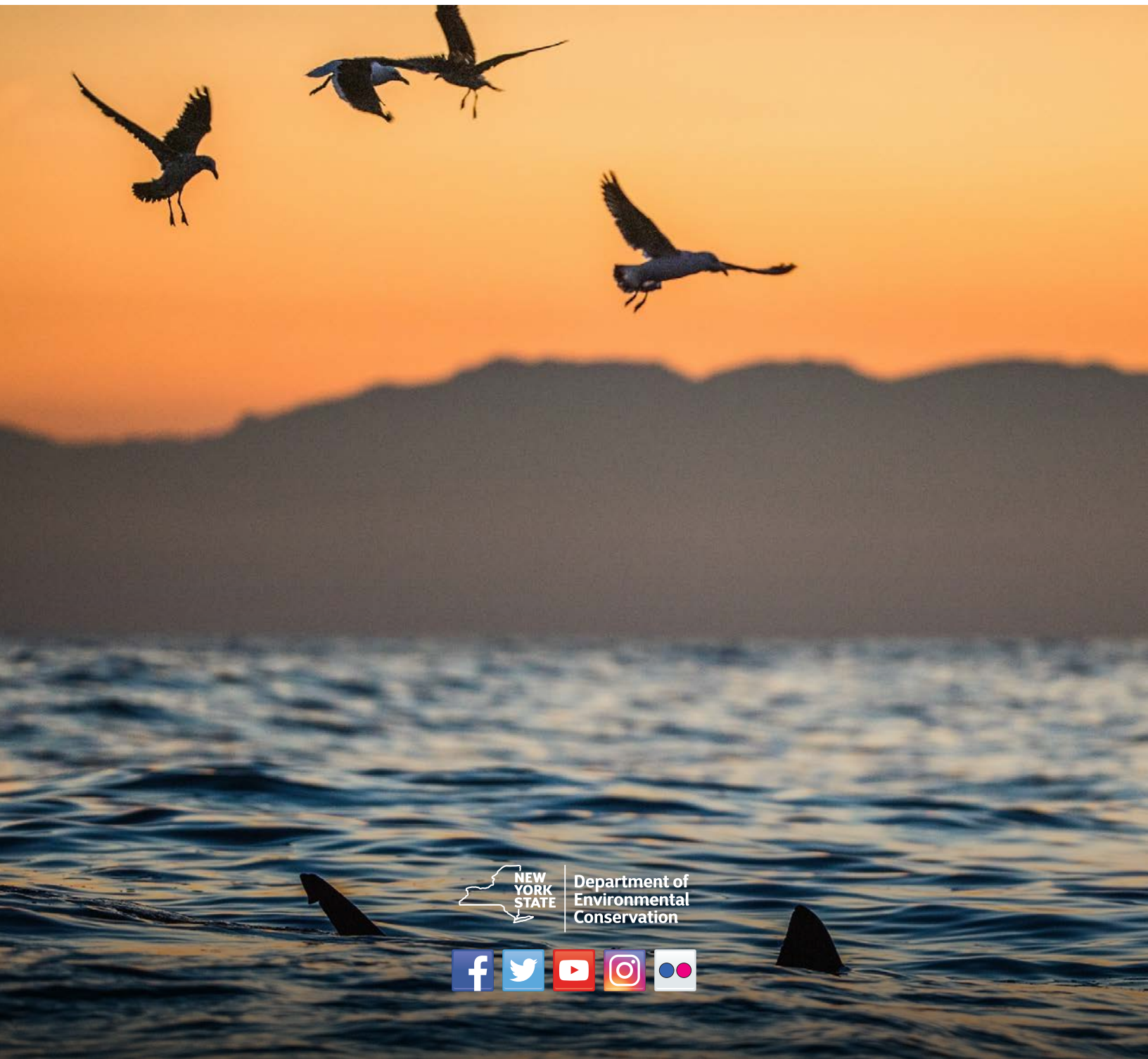
Chris Scott, NYSDEC

Blue crab tagging program



Casey Peronius, NYSDEC

Horseshoe crab spawning survey



Department of
Environmental
Conservation

