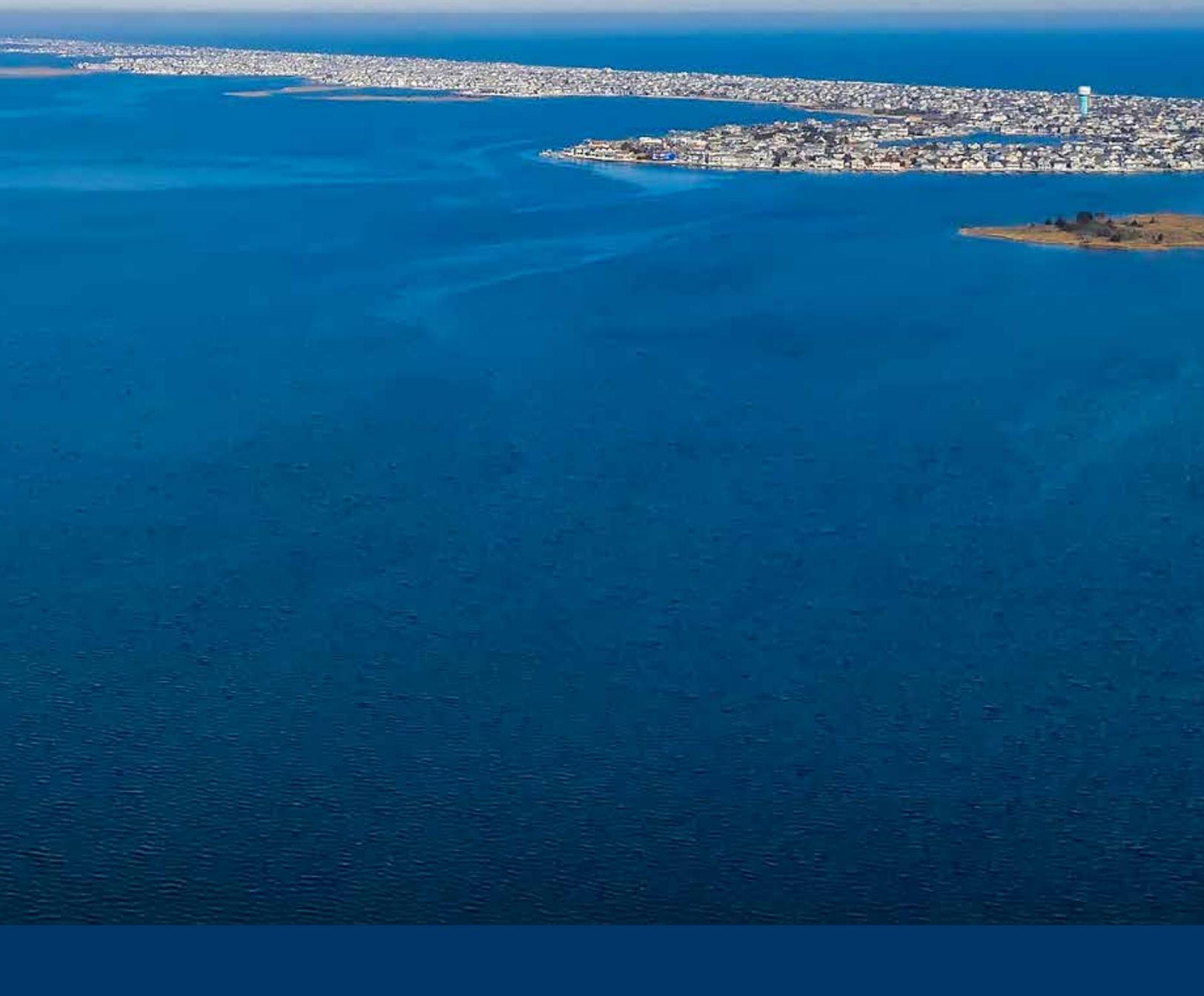




BARNEGAT BAY  
PARTNERSHIP  
RESEARCH · EDUCATE · RESTORE

## Annual Report | 2021 - 2022





## From the Director's Desk

Jersey-Friendly landscaping at a bayfront park in Pine Beach.

As noted in the Barnegat Bay Partnership's [2021 Comprehensive Conservation and Management Plan](#), improvements in the bay's condition require aggressive efforts to reduce nonpoint source pollution throughout the watershed. As people move into the watershed and more of the landscape is developed, an increasing portion of the bay's nutrient load is being delivered as stormwater runoff from the developed landscape<sup>1</sup> to the bay. It will take a watershed-wide effort to reduce stormwater runoff and the excessive nutrients which drive the bay's eutrophication.

Climate change is already affecting almost every component of the hydrologic cycle, complicating efforts to manage stormwater and its impacts. In the northeastern U.S., the timing and seasonality of precipitation will change, precipitation will fall in more intense events, and stormwater runoff and flooding will increase. In many cases, existing stormwater systems (storm drains, detention basins, culverts, etc.) designed for rainfall amounts from decades ago will not be able to handle the additional stormwater, exacerbating flooding that is already causing problems in our watershed. Increases in stormwater runoff and flooding will impact our communities in a variety of ways, including emergency services, businesses,

recreation, utilities, transportation systems, local environmental resources, government services, and municipal budgets.

To address these statewide stormwater issues, the NJDEP revised the [NJ Stormwater Management Rules](#) (NJAC 7:8) in 2020 to require the use of green infrastructure to better manage stormwater close to its source. Green infrastructure uses soils, vegetation, and other elements to restore some of the natural processes for managing water on a site (e.g., rain gardens, bioswales, downspout planters, tree filter boxes, bioretention basins, and pervious pavement).

Healthy soils are essential for healthy plants and critical to protecting water quality in our lakes, streams, rivers, and bays. Healthy porous soils act like a sponge, exhibit virtually no runoff, and reduce NPS pollution by increasing plant uptake of water and nutrients applied in fertilizers. Common development activities on residential landscapes often increase soil compaction. The nutrients in fertilizers, instead of infiltrating into the ground and assimilating into plants, run over compacted areas and into waterbodies, negatively impacting the quantity and quality of water reaching the bay. Reducing soil compaction and increasing water infiltration are perhaps the



Native plants capture stormwater at a Holiday City clubhouse.

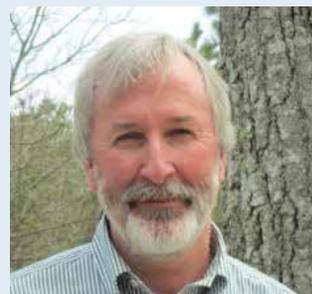
most critical and basic concepts to ultimately improve water quality throughout the Barnegat Bay watershed.

Native plants<sup>2</sup> not only add beauty to our surrounding landscape, they also establish our area's unique "sense of place" (e.g., think of Atlantic white-cedar forests, pygmy pine forest, coastal marshes, and sand dunes). By planting more native species in our yards, we can all help reduce stormwater runoff and NPS pollution. Adapted to local soils and climate, native plants conserve and filter water, protect soil resources, and reduce the costs and environmental impacts associated with fertilizers and pesticides. Native plants also provide foraging, refuge, and nursery habitats for native wildlife. See the BBP's [Jersey-Friendly Yards website](#) to learn more about these and other benefits.

On both an individual and community-wide level, green infrastructure can help us reduce stormwater runoff and protect the bay's water quality. Substantial infrastructure funding has become available recently through the federal Infrastructure Investment and Jobs Act, so get involved in local environmental planning and make sure the stormwater infrastructure being installed today is designed for the climate of tomorrow.

<sup>1</sup>Baker, R.J., Wieben, C.M., Lathrop, R.G., and R.S. Nicholson. 2014. Concentrations, loads, and yields of total nitrogen and total phosphorus in the Barnegat Bay-Little Egg Harbor watershed, New Jersey, 1989–2011, at multiple spatial scales. U.S Geological Survey Scientific Investigations Report 2014-5072. <http://dx.doi.org/10.3133/sir20145072>

<sup>2</sup> Native species = those species which occur naturally in a particular region, ecosystem, or habitat.



*Stan Hales*  
Stan Hales • Director



## Science and Research

Recording stream velocity during a stream assessment.

The Barnegat Bay Partnership is committed to increasing our knowledge of the estuary. Individually and collaboratively, we conduct research and monitoring activities to better understand the bay's condition and environmental trends, and provide a scientific basis for management and restoration decisions.

### Water Quality

#### *Ambient water-quality monitoring*

The BBP is one of the partners in the New Jersey Department of Environmental Protection's (NJDEP's) Barnegat Bay water-quality monitoring network. In 2021, we continued to collect water-quality data on two bay tributaries, Mill Creek and Westecunk Creek. Visit the [NJDEP's website](#) to view the 2021 data.

#### *BBP continuous water-quality monitoring stations*

The BBP operates continuous water-quality monitoring stations at three bay sites: Seaside Park Yacht Club, Mantoloking Yacht Club and Morrison's Marina in Beach Haven. Every 15 minutes, instruments collect and transmit data (water temperature, salinity, dissolved oxygen, turbidity, and pH) in near real-time to the [NJDEP's continuous water quality monitoring website](#), where they are available for public downloading and use. During 2021, we conducted regular cleaning and maintenance tasks, and also replaced faulty equipment at the Mantoloking station. All three stations operated continuously without interruption from January through November, 2021.

#### *Monitoring for coastal acidification*

The Beach Haven station has additional high-precision sensors to continuously monitor water acidity (pH) and carbon

dioxide (CO<sub>2</sub>) levels in the Barnegat Bay. Climate change-related increases in CO<sub>2</sub> and decreases in pH levels in the world's oceans and estuaries impact the ability of marine life to build shells, bones, and other essential body structures. In 2021, BBP collected CO<sub>2</sub> data from March through July, after which the CO<sub>2</sub> sensor was sent to the manufacturer for repair and calibration. The sensor was then redeployed in September.

#### *BBP laboratory*

In 2021, the BBP maintained laboratory certification for four parameters (temperature, conductivity, pH, and dissolved oxygen), and became certified for two additional laboratory methods, dissolved oxygen by luminescence-based sensor and turbidity. We continued to analyze samples and report the results to state agencies for use in watershed assessments. The lab assists all BBP research by providing support with water-quality monitoring, methods development, and a Quality Control Program which ensures reliable data are collected and analyzed.

#### *Watershed protection and restoration plans*

The BBP received funding from the NJDEP in 2020 to develop two Watershed Protection and Restoration Plans, one for the Toms River watershed and one for the Cedar Creek/Oyster Creek/Forked River watershed complex. The primary goal of the plans is to protect and improve water quality in these two watersheds and the Barnegat Bay. During 2021, the BBP



Measuring a slippery adult American eel caught in the seine net.

completed a total of 160 stream visual assessments in the two watersheds and collected a year of water-quality samples. The data we collected will help us better identify local sources of pollution and inform development of the plans, which will be completed in the coming year.

## Living Resources

### *Juvenile eel monitoring*

Low population numbers of American eel (*Anguilla rostrata*) remain a concern up and down the Atlantic coast. The winter of 2021 was our tenth year of monitoring the ingress of juvenile American eels into the Barnegat Bay watershed. From February through April, we monitored eels at four watershed locations, completing 271 monitoring events and measuring a total of 721 eels. Data from this project are shared with our state and federal partners for use in state- and coast-wide assessments of the American eel population.

### *Long-term juvenile fish and nekton sampling*

2021 was also our tenth year of assessing variations in the abundance and distribution of juvenile fishes and jellyfishes in the bay. From May to October, we seined at 15 bay locations, identifying 60 different taxa (4 gelatinous zooplankton, 3 crabs, 1 turtle, and 52 fishes) and counting nearly 75,000 individuals. The data we collected will help identify trends in the populations of many recreationally and commercially important species, and examine the effects of changes in water quality, habitat, and climate on the bay's fauna.

### *Stream Connectivity*

Where roads cross over streams, the types of structures used (pipe culverts, box culverts, bridges) and their installation and maintenance can impact natural stream-flow characteristics and/or the ability of aquatic species to move above and through the crossings. These stream crossings can also serve as pathways for terrestrial animals to traverse roadways without human interactions. To better document how altered connectivity may be impacting aquatic and terrestrial species in the watershed, the BBP is conducting a census of the 2,000 reported crossings. Identification of problematic crossings will allow the BBP and its partners to target the crossings most in need of rehabilitation. In 2021, the BBP obtained a grant from the NJDEP Division of Fish and Wildlife's [Connecting Habitat Across New Jersey \(CHANJ\)](#) program, which allowed us to assess over 100 priority crossings. This effort will continue in 2022, with at least 50 additional assessments. All data are available on the [North Atlantic Aquatic Connectivity Collaborative's website](#).

### *Seagrass Monitoring*

In conjunction with Dr. Elizabeth Lacey of Stockton University, eight seagrass beds were surveyed during June and October of 2021 to assess the condition of eelgrass (*Zostera marina*) and widgeon grass (*Ruppia maritima*) communities within the bay. The surveys, a continuation of a collaborative effort begun in 2015, are conducted every two years. The data collected assist the BBP and partners in understanding changes to seagrass communities over time, and provide additional context for the seagrass ecosystem target in the CCMP.



## Science and Research

Recording data from a Surface Elevation Table at one of the MACWA sites.

### *Oyster restoration project*

In 2016, the BBP funded a successful Stockton University partnership project to establish an oyster restoration program in the bay, and provided additional funding to Stockton in 2019 to enlarge and continue monitoring the Tuckerton oyster reef. During 2021, Stockton researchers assessed fish and invertebrate use of the Tuckerton reef, and collected data to better understand the impacts of these oysters on water quality in the bay.



Mid-Atlantic Coastal Wetlands Assessment

*Wetlands research and monitoring*

Coastal wetlands provide us with critical services (e.g., flood protection, maintenance of water quality, carbon and nutrient sequestration, and fish and wildlife habitat). As the sea level continues to rise, it is imperative that we monitor, manage, and enhance vulnerable wetlands in our watershed. The BBP has been a Mid-Atlantic Coastal Wetlands Assessment (MACWA) partner for the past 12 years, monitoring the extent and condition of our coastal wetlands and conducting special studies that investigate the impacts of sea level rise on tidal marshes.

This past year, we continued our long-term monitoring of four marsh sites in the bay (Reedy Creek, Island Beach State Park, Dinner Point, and Horse Point), and with funding from NJDEP, added a fifth site, taking over the monitoring at the Lighthouse Center in Waretown. We collected just over 625 combined measurements from surface elevation tables (SETs)

and marker horizon plots, which help us monitor changes in marsh elevation and determine if our marshes are keeping pace with sea level rise. The NJDEP's Tidal Wetlands Monitoring Network is using BBP data to develop a statewide perspective on the fate and future of our tidal wetlands.

In 2021, the BBP continued to provide technical support and data towards the development of the Bay Islands Restoration Planner (BIRP) tool, which is being designed by Stockton University's Coastal Resource Center with funding provided by the US Fish and Wildlife Service and The Nature Conservancy of New Jersey. The purpose of the tool is to monitor and assess bay islands for potential restoration or protection projects. The BIRP tool incorporates Mid-Atlantic Tidal Wetlands Rapid Assessment data collected by teams from the BBP and US Fish and Wildlife Edwin B. Forsythe National Wildlife Refuge, as well as data from the BBP's Paddle for the Edge community science program.

### *Nature-based shoreline projects*

In 2021, we continued ongoing assessments at the Iowa Court and Green Street shoreline stabilization projects in Little Egg Harbor. Through NJDEP 319 (h) funding awarded to the Township of Little Egg Harbor Township, the BBP collected standardized MACWA metrics to track changes in these two project sites over time. Once again, we teamed up with the NJDEP Office of Information Technology to use drone technologies to visualize and quantify project progression. Using high resolution imagery, we can track specific movements in vegetation communities, shoreline position, and project structures.



Shannon Vasquez, BBP Field Technician, paddling the bay.

## Citizen Science and Stewardship Activities

Much of the work of the organizations which make up the Barnegat Bay Partnership would not get done without the participation of hundreds of volunteers. From collecting data as community scientists to restoring wildlife habitat and educating others, they help us in countless ways – and we appreciate it!

### *Paddle for the Edge*

In 2021, the BBP trained over 140 volunteers to participate in our seventh annual [Paddle for the Edge](#) shoreline survey. Using a smartphone app to record information about shoreline conditions, these community scientists collected data from 1,567 locations throughout the bay, covering over 30 miles of shoreline. Over the past seven years, volunteers have paddled over 155 miles of shoreline and collected data at a total of 8,135 locations. Their data help us monitor current shoreline conditions, assess how shorelines change as sea level rises, and identify potential locations for shoreline restoration projects.

### *Barnegat Bay Volunteer Master Naturalists (BBVMNs)*

The Master Naturalists provide hundreds of volunteer hours each year by educating others and assisting with watershed stewardship projects. Following up on a project started in 2020, BBVMNs returned to John C. Bartlett, Jr. County Park this past spring to continue the removal of invasive plants that are displacing native species. Later in the year, BBVMNs participated in a dune-grass planting event at Island Beach State Park, planting 900 culms of American Beach Grass (*Ammophila breviligulata*) to help stabilize and build sand dunes. They also published four issues of their newsletter, *The Naturalist*, which informs readers about Barnegat Bay ecology and wildlife. [Visit our website](#) to read back issues and learn more about the Master Naturalist program.

### *Watershed Ambassador*

For the tenth consecutive year, the BBP hosted the Barnegat Bay watershed ambassador, one of 20 individuals with the [NJDEP's Watershed Ambassador Program](#). These AmeriCorps volunteers educate thousands of individuals about their watersheds and how to protect water quality. While serving as the Barnegat Bay ambassadors, Emily McGuckin (2020-2021) and Marissa Mascaro (2021-2022) assessed stream health, planted dune grass, monitored microplastics, restored wildlife habitat, organized clean-ups, and completed other projects benefitting our watershed.

### *Stewardship Certification Program for the Barnegat Bay Watershed*

In 2020, the NJDEP awarded a grant to the BBP to develop a stewardship certification program for the Barnegat Bay watershed. Using the resources and tools of the [Jersey-Friendly Yards website](#), the new program will engage both individuals and communities in landscaping practices for a healthy environment. In 2021, we continued the development of three distinct certification programs, one each for residents, schools, and municipalities. In early 2022, the BBP will launch the three programs and start enrolling participants. Those who successfully complete the program requirements will be certified and publicly recognized as stewards of the bay.



## Education and Outreach

Emily Pirl, Wetlands Specialist, explaining shoreline monitoring at Sedge.

Guided by the BBP’s Communication and Outreach Plan, Partnership educators engage watershed residents and visitors in activities to increase understanding of the human impacts on the bay’s ecosystem, promote stewardship of the bay and its resources, and grow public participation in its protection and restoration.

### *Comprehensive Conservation and Management Plan*

This past year, the BBP released the [2021 Comprehensive Conservation and Management Plan for the Barnegat Bay – Little Egg Harbor Estuary](#) (CCMP), the revised long-term plan for protecting and restoring clean water and healthy living resources in the bay and its watershed. The revised plan, which replaces the BBP’s original 2002 CCMP, establishes four main priority areas for action – water quality, water supply, living resources, and land use – and incorporates education and outreach actions in each one. It also sets eight ecosystem targets – specific environmental outcomes which combine actions across multiple priorities and can be monitored to measure progress.



On October 26<sup>th</sup>, the BBP held a CCMP signing ceremony event at Ocean County College, during which BBP partners re-affirmed their commitment to implementing the actions in the revised plan. Visit the [BBP website](#) to learn more about the 2021 CCMP.

### *Education and Outreach Retreat*

This annual retreat fosters the exchange of information and promotes collaborative outreach efforts among Barnegat Bay watershed educators. In 2021, the retreat was held as a virtual event with the theme *Changing the Conversation on Climate Change*. Attendees discussed climate change science and communication techniques, and provided feedback to the Jacques Cousteau National Estuarine Research Reserve about *Know Your Tides*, a new coastal flooding communications campaign.

Watershed educators also participated in two professional development days this past year. They explored Pine Barrens habitats during a Pinelands Adventures kayak trip. While visiting the Sedge Island Natural Resource Education Center, they learned about shellfish restoration, diamondback terrapin research, tidal wetlands monitoring, and a living shoreline project.



Volunteers planting a new pollinator garden at Ocean County College.

## Webinars

In 2021, the BBP offered two webinar series, *Ask a Barnegat Bay Scientist* and *Jersey-Friendly Yards*. In the *Ask a Barnegat Bay Scientist* webinars, presenters shared information and answered questions about their Barnegat Bay research. A total of 135 individuals attended four webinars: *Adaptation to a Warming Planet*, *American Eel: Underappreciated Hero of Aquatic Ecosystems*, *Coastal Wetlands Resiliency in the Face of Sea Level Rise*, and *Using Rapid Wetland Assessments and Citizen Science to Help Prioritize Marsh Islands for Restoration*. Recordings of the webinars are available on the [BBP's YouTube channel](#).

In the *Jersey-Friendly Yards* series, participants learned about sustainable landscaping practices that protect water quality and wildlife habitat. Six *What's Bugging Your Jersey-Friendly Yard?* webinars provided information about how to reduce pesticide use and support beneficial insects, which play a key role in healthy gardens and healthy ecosystems. Three *Jersey-Friendly by Design* webinars provided information about how to plan landscapes that are both environmentally friendly and aesthetically pleasing. A total of 1,564 individuals attended the nine webinars in 2021. Recordings of the webinars are available on the [Jersey-Friendly Yards YouTube channel](#).

## New Pollinator Garden at Ocean County College

Ocean County College has a new pollinator garden, thanks to a program sponsored by The Xerces Society for Invertebrate Conservation. The Xerces Pollinator Habitat Kit awarded to BBP/OCC contained a total of 750 native plants grown by Pinelands Nursery. Volunteers, including Master Naturalists and Watershed Ambassadors, helped us install the plants in May, 2021. The new pollinator garden, located outside the Bartlett building, will serve as a demonstration Jersey-Friendly Yards landscape, where students and the community can learn about the value of planting native species that provide habitat for pollinators and other wildlife.

## Trash Free Waters Campaign

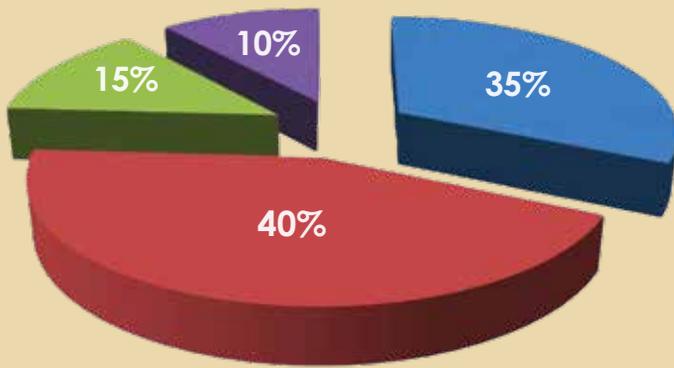
In 2021, the BBP began a collaborative effort with the U.S. Environmental Protection Agency (EPA) to develop a new Trash Free Waters marketing campaign for the Barnegat Bay watershed. The campaign goal is to reduce trash and litter in our watershed by engaging residents and visitors in positive behavior change. Three focus groups were held during the qualitative research phase of the project to identify effective communication strategies for the campaign, which is expected to be launched in late spring/early summer of 2022.



# Finances

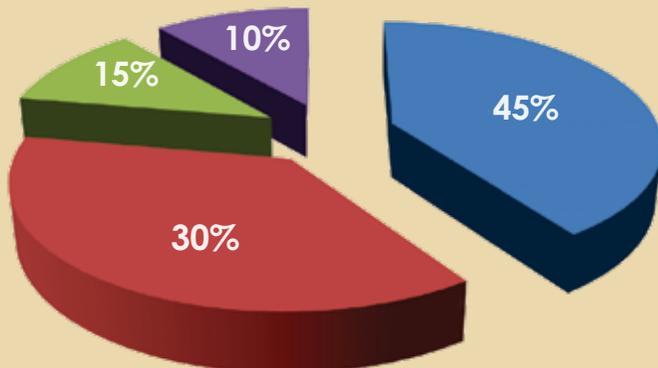
**As a National Estuary Program** established pursuant to the Clean Water Act (33 U.S.C. 1330; PL 100-4, et seq.), the Barnegat Bay Partnership receives CWA Section 320 grant funding from USEPA. The County of Ocean, through the Ocean County Natural Lands Trust and Ocean County College, provides the annual matching funds required for the grant. Through the BBP work plan and related activities, the BBP and its partners are able to leverage other investments to protect and restore the watershed. During the federal fiscal year 2021, the total amount leveraged was \$23.9 million, which resulted in a 21 to 1 total return on investment. We thank Ocean County College and all of our partners for their continuing support of our efforts to protect the bay.

## FISCAL YEAR 2021



- Habitat Acquisition, Protection, and Restoration
- Monitoring and Research
- Education, Outreach, and Stewardship
- Program Administration

## FISCAL YEAR 2022



### Funding during Fiscal Year 2021 (July 1, 2020–June 30, 2021)

#### USEPA Clean Water Act Cooperative Agreement

National Estuary Program Base Funding .....	<b>\$662,500</b>
Ocean County Natural Lands	
Funding Match .....	<b>\$551,447</b>
Ocean County College Funding Match .....	<b>\$111,053</b>

**Total \$1,325,000**

**Little Egg Harbor-Tuckerton Shoreline Monitoring Project Contract for NJDEP Restoration, Enhancement and Protection Grant:** *Continuation of Post-Construction Monitoring for Iowa Court (Little Egg Harbor) and S. Green Street (Tuckerton) Shoreline Resiliency Projects*..... **\$81,200**

**NJDEP Restoration, Enhancement and Protection Grant:** *Watershed Restoration and Protection Plan for the Toms River Watershed* .....

**\$456,093**

**NJDEP Restoration, Enhancement and Protection Grant:** *Watershed Restoration and Protection Plan for the Toms River Watershed* .....

**\$751,675**

**NJDEP Restoration, Enhancement and Protection Grant:** *Bay Friendly Stewardship Program* .....

**\$100,000**

**NJDEP Division of Fish and Wildlife:** *Streaming Crossing Inventory for Barnegat Bay* .....

**\$32,512**

**Stockton University:** *Benthic Macroinvertebrate Assessment for Sunflower Island*.....

**\$13,464**

**FY21 Total**..... **\$2,759,944**

### Funding during Fiscal Year 2022 (July 1, 2021–June 30, 2022)

#### USEPA Clean Water Act Cooperative Agreement

National Estuary Program Base Funding .....	<b>\$700,000</b>
Ocean County Natural Lands	
Funding Match .....	<b>\$628,678</b>
Ocean County College Funding Match .....	<b>\$71,322</b>

**Total \$1,400,000**

**Atlantic Shores Offshore Wind** .....

**\$100,000**

**NJDEP:** *Mid-Atlantic Coastal Wetlands Assessment Monitoring 2021* .....

**\$40,000**

**NJDEP:** *Mid-Atlantic Coastal Wetlands Assessment Strategy and Quality Assurance Project Plan updates* .....

**\$20,000**

**Total \$1,560,000**

**FY20 & 21 Grand Total**..... **\$4,319,944**

## Our Staff

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### Project Coordinator

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### Senior Program Scientist

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**OCEAN**  
COUNTY COLLEGE

Jon H. Larson, Ph.D.  
President



**The Ocean County Board of Commissioners**

Commissioner Liaison, Joseph H. Vicari



This document has been funded by the USEPA under a Clean Water Act grant agreement to Ocean County College; information herein has not undergone USEPA review and may not necessarily reflect the agency's official views.

## Our Partners

American Littoral Society

Brick Township Municipal Utilities Authority

Clean Ocean Action

Conserve Wildlife Foundation of New Jersey

Georgian Court University

Jersey Coast Anglers Association

Long Beach Island Foundation of the Arts and Sciences

Marine Trades Association of New Jersey

Monmouth County Division of Planning

Monmouth University

National Oceanic and Atmospheric Administration,  
National Marine Fisheries Service

NJ Department of Environmental Protection

NJ Department of Transportation

NJ Pinelands Commission

NJ Sea Grant Consortium

Ocean County Board of Commissioners

Ocean County College

Ocean County Department of Parks and Recreation

Ocean County Health Department

Ocean County Mayors Association

Ocean County Planning Department

Ocean County Soil Conservation District

Ocean County Utilities Authority

Ocean County Vocational Technical School

Pinelands Preservation Alliance

ReClam the Bay

Rutgers Cooperative Extension of Ocean County

Rutgers University:

Jacques Cousteau National Estuarine Research Reserve

Save Barnegat Bay

Stockton University

Trust for Public Land

US Army Corp of Engineers

US Department of Agriculture,

Natural Resources Conservation Service

US Environmental Protection Agency

US Fish and Wildlife Service

US Geological Survey

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**BARNEGAT BAY PARTNERSHIP**

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# Annual Report | 2021-2022

*One of 28 National Estuary Programs, the Barnegat Bay Partnership comprises federal, state, county, municipal, academic, business, and private stakeholders working together to help restore, maintain, protect, and enhance the water quality and natural resources of the Barnegat Bay estuary and its contributing watershed.*