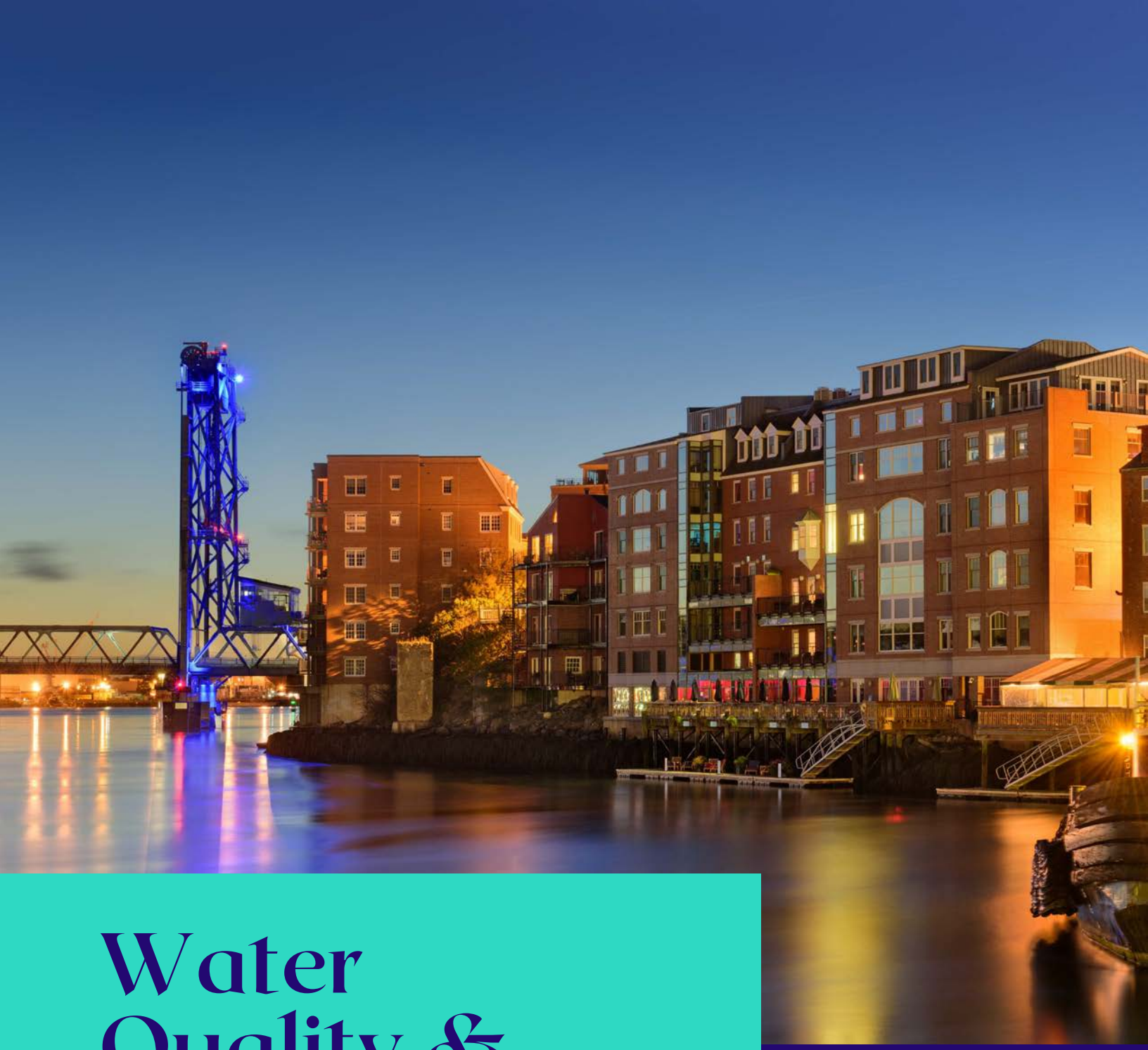
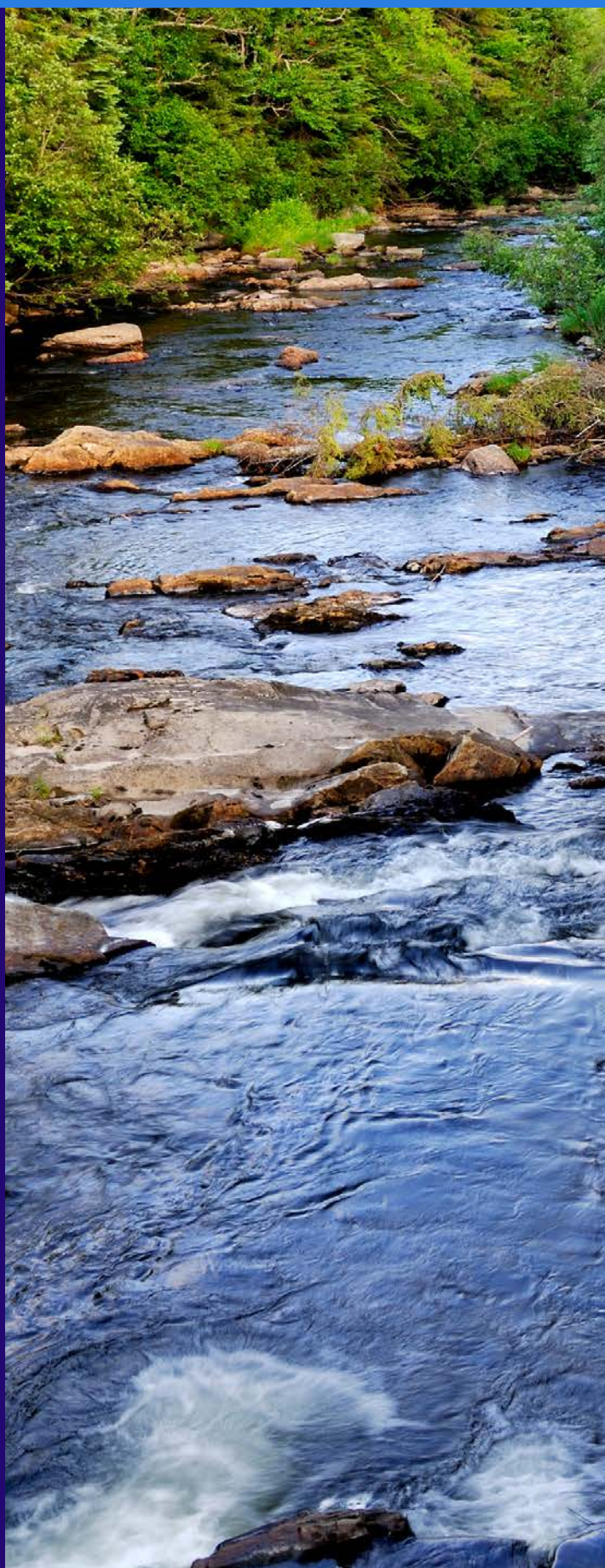


Water Quality & Ecosystem Health Projects

2016 - 2021

Table of Contents



By the Numbers

179
Volunteers engaged

25
Data sites across the Estuary

2
Tons of trash removed

48
Teachers trained

15
Miles of shoreline cleaned

9
Different organizations directly funded

44
Organizations engaged

1 mil
Oysters deployed for restoration

Overview

Investments in the water quality and ecosystem health projects described in this publication arose out of the City of Portsmouth's (Portsmouth) obligation under its Consent Decree, Second Modification, in *United States et. al. v. City of Portsmouth, No. 09-cv-283-PB.* Portsmouth's commitment included investments of $500,000 spread over five years to support water quality and ecosystem health efforts related to the Great Bay Estuary.

In a collaborative effort with the Great Bay 2020 Steering Committee, Portsmouth designated annual financial investments in local and regional organizations, all supporting the Great Bay Estuary and its watershed. This publication provides a snapshot of the programs, projects, and initiatives.

Discover the positive environmental impact, the meaningful regional collaboration between partners and volunteers, and illustrations of important work in water quality and ecosystem health projects through this publication.

Acronyms Used

City of Portsmouth (Portsmouth)
Conservation Law Foundation (CLF)
FB Environmental Associates (FBE)
The Nature Conservancy (TNC)
New Hampshire Department of Environmental Services (NHDES)
Piscataqua Region Estuaries Partnership (PREP)
Piscataqua Region Monitoring Collaborative (PRMC)
(voluntary group of municipalities, state agencies, and nonprofits coordinated by PREP)
Teachers on the Estuary (TOTE)
University of New Hampshire (UNH)

Year to Date

The City's investment in clean water and ecosystem health.

$500,000

Distributed from 2016-2021

Icon Key

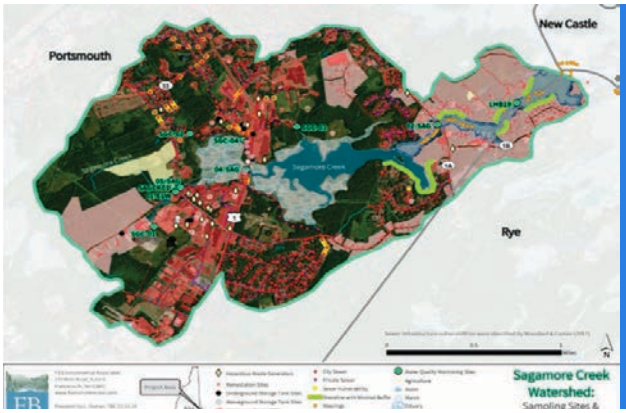
- Research/Data Collection
- Species/Habitats
- Education
- Cleanup/Pollution Control

Sagamore Creek Monitoring, 2017-2020

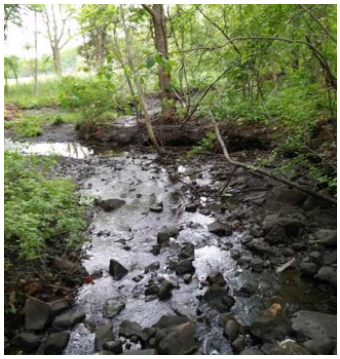
LOCATION: SAGAMORE CREEK, PORTSMOUTH
AMOUNT OF FUNDING: $198,814

Portsmouth engaged FB Environmental Associates (FBE) to develop a Sagamore Creek Water Quality Sampling Program and implement it over several years.

2017: FBE began developing the Sagamore Creek Water Quality Sampling Program. The program document outlines a multi-year water quality sampling schedule that characterizes and quantifies the type, amount, and location of potential pollutant sources to Sagamore Creek. It provides a broader understanding of the water quality of Sagamore Creek based on information gained from the watershed characterization, water quality analysis, pollutant source input identification, and data gap analysis. Investigative sampling work started in the summer.



Map of potential pollutant sources in the Sagamore Creek watershed, along with the selected ten sites for baseline water quality monitoring and investigative sampling work.



2018 & 2019: FBE collected data for the multi-year water quality sampling program to further characterize and quantify the type, amount, and location of pollutant input sources to Sagamore Creek. The program provided a broader understanding of the water quality of Sagamore Creek.

2020: Following water quality monitoring in 2018 and 2019, two sampling locations were identified for further investigation because of elevated parameters. This phase is currently in progress. FBE investigated the drainage areas to specific sites by collecting water quality samples in tributaries, catch basins, and at MS4 outfalls. Samples will be analyzed for pollutant indicator parameters. Areas for installing best management practices (BMPs) will be identified.

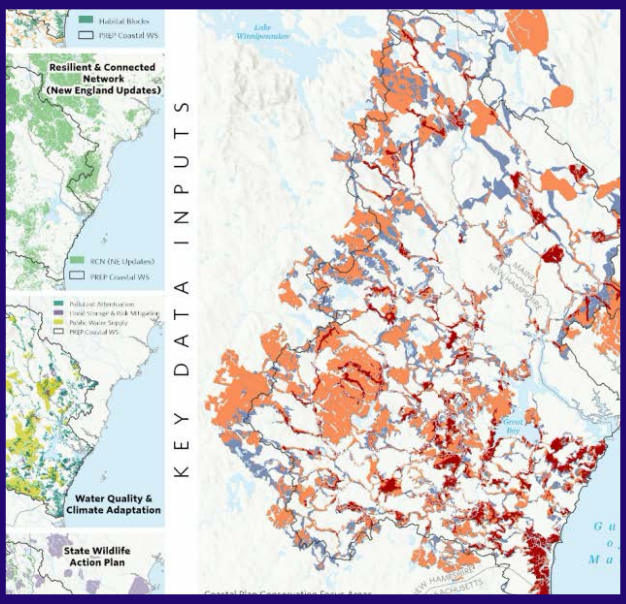
The Sagamore Creek Water Quality Sampling Program & monitoring reports are available on Portmouth's website.

COMPREHENSIVE COASTAL CONSERVATION PLAN UPDATE, 2019-2020

Location: Coastal Watershed
Amount: $35,000 for 2 phases

The Land Conservation Plan for New Hampshire's Coastal Watersheds, started in 2006, is evolving and ongoing. More recent conservation planning is complete for the region, including the 2016 Land Conservation Priorities for the Protection of Coastal Water Resources, 2019 Connect The Coast Project, and 2020 Wildlife Action Plan.

There were two phases in the Comprehensive Coastal Conservation Plan Update. In Phase I, The Nature Conservancy (TNC) worked with partners to combine and prioritize spatial priorities from these separate conservation planning initiatives. In Phase II, TNC is working with partners to identify and complete final products to maximize the updated plan's usefulness and implementation. Phase II is scheduled for completion in the summer of 2021. Coming out of Phase I, many conservation values and ecosystem services are represented on prioritization maps.



RESEARCH ON OYSTER LARVAL DENSITIES, 2018

Location: 4 Sites in Great Bay Estuary
Amount: $8,000

This project attempts to provide a holistic view of oyster restoration efforts. Oyster larval densities were recorded weekly in the summer of 2019 at four sites to enhance knowledge of oyster restoration. These four sites have naturally occurring oyster reefs (Lamprey River, Squamscott River, Nannie Island, and Woodman Point). Larval densities were compared with concurrent natural settlement studies of oyster spat data collected by TNC. Preliminary results suggest a high degree of spatial and temporal variability in larval densities and oyster recruitment.

SEAWEED MONITORING, 2020

Location: Across Great Bay Estuary
Amount: $10,000

There was a funding shortfall due to COVID-19 in support of the Piscataqua Region Monitoring Collaborative (PRMC) for field season 2020. Additional funding from Portsmouth was critical to support Piscataqua Region Estuaries Partnership's (PREP) seaweed data collection program that has existed since 2013. Annual data collection is important to understanding short and long-term trends around this ecosystem resource. Portsmouth's contribution was critical and timely in helping to make seaweed monitoring possible in this field season.

Great Bay Monitoring Collaborative, 2016-2017

LOCATION: GREAT BAY
AMOUNT OF FUNDING: $11,000

Portsmouth provided funds for the most critical data collection needs in the Great Bay Estuary. There were funding shortfalls for collecting baseline water quality data, eelgrass/seagrass monitoring, and seaweed monitoring. Critical baseline data collection was completed with Portsmouth's contribution. These funds were in alignment with the decision-making provided through the PRMC. All data is publicly available through the NH Department of Environmental Services' environmental monitoring database.

Oyster Shell Recycling, 2017

LOCATION: REGION WIDE
AMOUNT OF FUNDING: $4,000

The Coastal Conservation Association of New Hampshire's Oyster Shell Recycling Program collects shells from local restaurants. The shells are then used by TNC and others to re-establish oyster beds. The program has two goals: acquire shells to re-establish the disappearing beds and increase public awareness of the problems facing the Great Bay Estuary. Problems include siltation, storm water run-off, point and non-point pollution, the disappearance of eelgrass, disease, and nitrogen loading. The funding helps to purchase and maintain shell collection equipment (trailer, buckets, etc.) and to create educational and outreach materials.

Volunteers Engaged

Great Bay Estuary Clean-up, 2018
Location: 10 mi. of Great Bay's shore
Amount: $4,500

Nearly 50 people cleaned up about 10 miles of shoreline and removed over one ton of trash from our estuary.

Soak up the Rain, 2018
Location: Portsmouth
Amount: $6,000

50 people attended an open house in March 2019 and learned about rain gardens, better buffers along the shore, and managing invasive species. They also learned about beautiful places to play around Sagamore Creek. Exhibitors included New Hampshire Department of Environmental Services (NHDES), University of New Hampshire (UNH) Cooperative Extension, Great Bay Stewards, Gundalow Company, PREP, Portsmouth Kayak Adventures, and others.

Citizen Science Seaweed Monitoring, 2019
Location: Great Bay
Amount: $7,500

Portsmouth supported PREP's effort to engage with the Coastal Research Volunteers through NH Sea Grant to increase data collection of seaweed in the intertidal zone in 2019. The funding complemented a grant PREP secured from the Davis Foundation to develop a pilot citizen science program in the Great Bay. The goal of the program is to engage trained and knowledgeable volunteers in high-quality, lower cost data collection in the estuary.

Teachers on the Estuary, 2017-2019

LOCATION: GREAT BAY
AMOUNT OF FUNDING: $26,000

Teachers on the Estuary (TOTE) is a program of the National Estuarine Research Reserve System. It offers field-based professional development on watershed and estuary topics that are aligned with Next Generation Science Standards. The Great Bay Discovery Center was able to offer three TOTE workshops for 48 teacher participants and two Middle School/High School classes in 2017, 2018, and 2019. The teacher workshops covered a range of topics including wildlife and fisheries, climate change, and stormwater. Two ecology classes joined their teacher in conducting research and monitoring on the saltmarsh and mudflats.

Outreach & Education, 2017

LOCATION: SAGAMORE CREEK, PORTSMOUTH & GREAT BAY
AMOUNT OF FUNDING: $14,000

Mitigation funding from Portsmouth helped support the Great Bay-Piscataqua Waterkeeper's three coastal cleanup events in Sagamore Creek, Little Bay, and Great Bay. Participants scoured more than five miles of shorefront and collected nearly one ton of trash. Funding also helped the Waterkeeper to participate in eelgrass monitoring studies. The Waterkeeper's program took dozens of local, state, and federal elected officials, including Senator Hassan, and concerned citizens, out on the water to better understand the values and vulnerability of our unique estuarine ecosystem.

OYSTER RESTORATION PROGRAM, 2020

Location: Great Bay
Amount: $10,000

The oyster restoration program in collaboration with UNH is working towards developing a sustainable & healthy network of oyster reefs. The program provides important ecosystem services to the Great Bay Estuary, including water filtration and habitat. Raising oysters started with remote-setting of 12 million larvae in June 2020 to produce spat-on-shell (SOS). Larvae were raised in rafts over summer months. More than 60 community volunteers served as "oyster conservationists" to help rear SOS off their docks and shoreline. The goal was to deploy 700,000-1 million baby oysters in early October to the restoration site at Woodman Point. TNC has an emerging partnership with local oyster aquaculture growers to rear SOS at their farms. TNC also purchased 20,000 adult "uglie" (non- commercially marketable) oysters to be deployed on the restoration site.

Photo credits: Brianna Group

CONNECT THE COAST, 2018

Location: Coastal Watershed
Amount: $11,000

Connect The Coast is an initiative to identify and protect pathways for wildlife to move within and beyond New Hampshire's coastal watershed. The project applied conservation science and planning tools to the more densely settled and rapidly developing seacoast region. The region extends south to Massachusetts, west to the Merrimack Valley, north to the Lakes Region, and east into Maine. The project identified critical connectors between regionally significant conservation land and habitat blocks. This is helping to prioritize land protection, inform land use decisions, and improve the management of important road crossings for wildlife. Many of the wildlife corridors coincide with riparian corridors. Protecting these corridors provides benefits to wildlife, water quality and quantity, and flood mitigation.

Collaboration: Over 25 team members from 15 organizations across New Hampshire, Maine, and Massachusetts contributed to the success of this project.

Data Sonde Purchase, 2018

LOCATION: GREAT BAY
AMOUNT OF FUNDING: $20,000

Funds from Portsmouth were used for a one-time purchase of a new EXO datasonde. The new sonde complements the fleet of existing sondes that are deployed annually throughout the estuary. Before the purchase, there were not enough sondes to cover data collection at all of the baseline sites. The additional sonde ensured uninterrupted data collection. Data collected includes: temperature, salinity, pH, dissolved oxygen, and PCO2. Each sonde's lifecycle is approximately seven years with proper maintenance.

SeagrassNet, 2019 & 2020

LOCATION: MOUTH OF THE PISCATAQUA RIVER
AMOUNT OF FUNDING: $50,000

Funding was used to establish a second SeagrassNet site at the mouth of the Piscataqua River, off of Fort Foster, where there is an established eelgrass bed. Establishing a new site was expensive. PREP and partners had not been able to establish a new site previously, even though it was a high priority for them. Additional support in 2020 allowed for full monitoring and data collection to take place. This support complemented the funding provided by PREP and NHDES to accomplish the fieldwork, data processing, and analysis. Initial results from the two years of data collection show an increase in the amount of seagrass at the site.

TIDAL CROSSING DESIGN AND REPLACEMENT, 2021

Location: Chapman's Landing, Stratham, NH
Amount: $20,000

TNC has worked with coastal partners since 2015. They identify, assess, and prioritize tidal road-stream crossing replacements for both people and nature. TNC is working with the New Hampshire Department of Transportation (NHDOT) and communities on replacement designs at five high priority crossings. Two of these crossings, which are the focus of this project, are located along Squamscott Rd. in Stratham. The Squamscott Rd. crossings border two unnamed tributaries that drain to the Chapman's Landing salt marsh and the Squamscott River. Both crossings are undersized, 18-inch, round concrete culverts.

Engineering teams were hired to analyze and design replacement structures. The goal is to replace aging infrastructure with crossing structures that minimize future flood risk, eliminate tidal restrictions, enable upstream salt marsh migration, and benefit fish passage. Healthy salt marsh habitats are a key component of coastal resilience because of the many ecosystem services they provide, including important benefits to water quality in the Great Bay Estuary. This project aims to enhance these benefits over the long-term.

AERIAL IMAGERY FOR EELGRASS, 2021

Location: Great Bay Estuary
Amount: $30,000

Every two years, PREP and its partners secure aerial imagery for the purposes of monitoring the presence and absence of eelgrass in the Great Bay Estuary. Historically the aerial imagery technology has been costly.

In May 2020, the State of NH provided capital budget funding to UNH to purchase a new drone and other equipment. Due to budget constraints caused by COVID-19, Portsmouth's funding will help deploy the new drone and collect aerial imagery in the 2021 field season. The imagery is critical to tracking the presence and absence of eelgrass. It will also be useful to partners for observing other resources in the Great Bay, including seaweeds and salt marsh.

PILOT SCALE EELGRASS RESTORATION, 2021

Location: Great Bay
Amount: $34,186

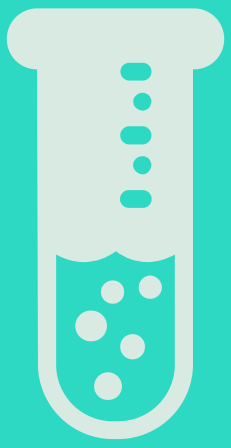
A 2020 white paper by a group from UNH and Boston University updated a site selection model for eelgrass restoration in Great Bay. The updated model, which is funded by Conservation Law Foundation (CLF), uses water quality data and spatial analyses to identify locations that are most suitable for restoration.

Phase II will use the results of the model to perform test-transplants and monitoring at the most suitable sites. There are five potential sites, two donor sources, and two planting techniques. The pilot transplants will be done with UNH Extension, PREP, TNC, and CLF Waterkeeper. This project will identify sites with the highest potential for the establishment and growth of eelgrass leading to a large-scale transplanting effort in the future.

Sagamore Creek, Portsmouth
Photo by David Muese

60%

of funds spent on Research/Data Collection

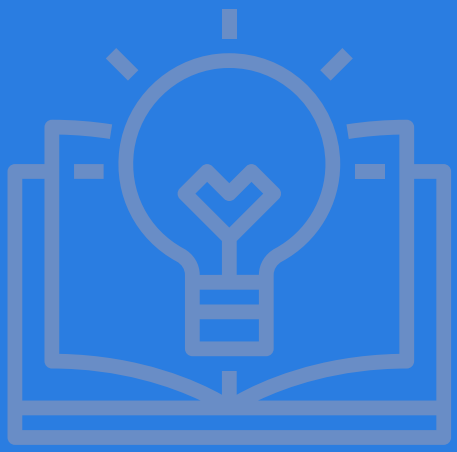


30%

of funds spent on Species/Habitat

6%

of funds spent on Education



4%

of funds spent on Cleanups/ Pollution Prevention

Acknowledgements

Contact:

The City of Portsmouth, NH
1 Junkins Ave.
Portsmouth, NH 03801
603-610-4344
www.cityofportsmouth.com

Report Design:

FARRELL STRATEGIC GROUP

fsgworks.com