

Buzzards Bay National Estuary Program

Implementation Activities

Federal FFY22 Funds Work Plan and Budget

Pursuant to Section 320 funding under

A Cooperative Agreement with the U.S. EPA

For work beginning July 1, 2022, to June 30, 2024

June 17, 2022



PRACTICAL ILLICIT DISCHARGE DETECTION AND ELIMINATION FREE ONE-DAY WORKSHOP

The Buzzards Bay National Estuary Program and the Massachusetts Maritime Academy are hosting one-day IDDE workshops. This free training includes field demonstrations in mapping, sampling, inspecting structures, and using investigation equipment. Participate in a comprehensive assessment of a stormwater catchment. This workshop prepares you to provide IDDE training to others and fulfills MS4 permit training requirements. This workshop will help propel your IDDE program forward.

Training applicable for anyone involved with an MS4 permit
Workshops will take place 8 AM to 4 PM at the scenic MMA Campus
Refreshments and lunch will be provided
Dates: March 24th, April 19th, April 21st, or May 3rd (Rain Date: May 5th)
[View promotional video here](#)
[Take this 3-minute survey to receive priority scheduling](#)
To RSVP or for more information email: Kevin.Bartsch@mass.gov

NEP -Mass Maritime Workshop Flyer (Spring 2022).

File: BBNEPwork plan_FFY2.docx

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Section 1: Introduction and Overview

Since the completion of the *Buzzards Bay Comprehensive Conservation and Management Plan* (CCMP) in 1991, the ongoing focus of the Buzzards Bay National Estuary Program (NEP) has been to facilitate implementation of the recommendations contained in the CCMP. This mission was affirmed when the NEP Steering Committee approved the *CCMP 2013 Update* on November 26, 2013.

The U.S. EPA has made available to the NEP \$750,000 in 2022 federal fiscal year (FFY22) Clean Water Act Section 320 funds. In addition, Region I has made available, through the Southeast New England Program for Coastal Watershed Restoration (SNEP), \$250,000 for NEP grants and targeted sub-awards that support the goals and objectives of SNEP. Thus, this year's work plan budget outlines \$1,000,000 in spending. Sections 3 (FFY22 Tasks) of this work plan describes the tasks and activities planned with the use of federal FFY22 funds to meet NEP goals, and how the SNEP funds will be spent. Section 4 provides a detailed budget, and Section 5 summarizes the match to the grant.

A summary of NEP funding since 2011 is shown in Fig. 1. In the FFY14 and FFY15 funding cycles, the NEP administered \$728,000 and \$1,000,000 in EPA add-on funds (principally SNEP funds that were awarded as SNEP grants at the request of the U.S. EPA). In FFY18, EPA awarded \$500,000 in SNEP funds, and then beginning in FFY20, SNEP provided \$250,000 annually for NEP targeted subawards and municipal grants.

Any grants or assistance from the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) or Massachusetts Office of Coastal Zone Management (CZM) mentioned in this work plan are not considered match to this award unless expressly identified in the “Match to Cooperative Agreement” section in the final Cooperative Agreement. Mention of any non-match efforts by other agencies in this work plan are meant to demonstrate the collaborative or coordinating role of the NEP in achieving specific goals contained in the CCMP. For example, under the FFY22 Work Plan, CZM is providing \$5,000 toward the NEP’s rental agreement in support

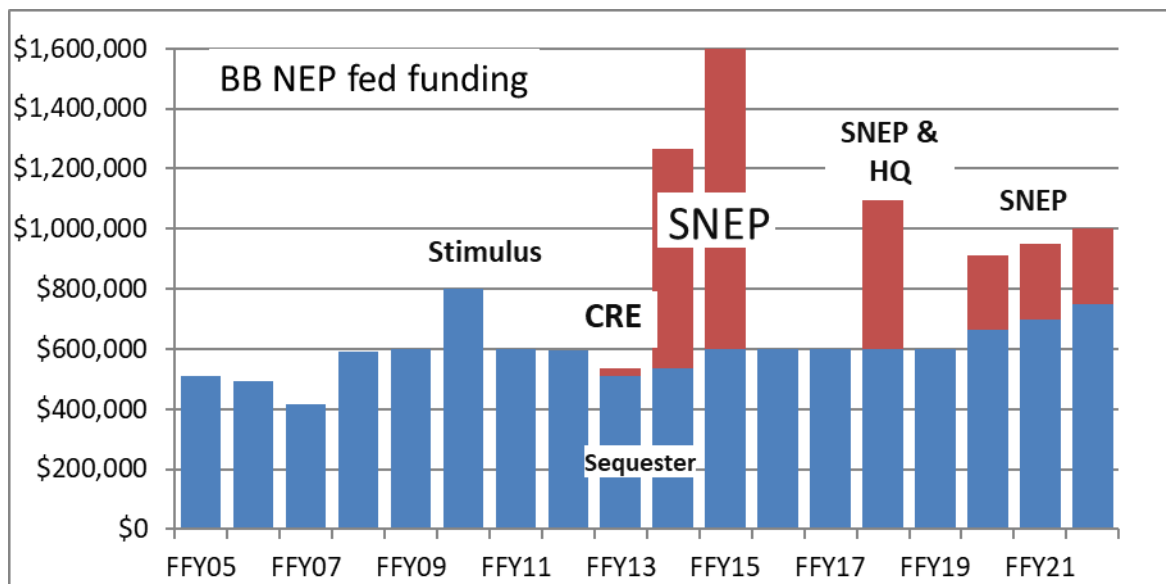


Fig. 1 NEP federal funding since 2005.

of the South Coast Regional Coordinator housed in the NEP office.

Organization of this Work Plan

In Section 2 below, we summarize the outcomes of activities of previous tasks funded with last year's Federal Fiscal Year 2021 (FFY21) funds, and in a few instances, carryover FFY20 work plan tasks. In Section III, we describe tasks undertaken with this year's (FFY22) funding. The target start date of this work plan is July 1, 2022, which is the start of the state fiscal 2023 year (SFY23). The actual effective start date of this work plan depends also on when EPA approves the federal Cooperative Agreement and establishes the appropriate federal accounts but will generally start before September 1. This work plan covers the period through June 30, 2024, to accommodate the time needed award grants and provide sufficient time for activities to be completed under the grant program and subawards.

Section 2 describes principally activities undertaken between July 1, 2021, and June 30, 2022, as described in last year's work plan. Section 3 describes what we plan to do under this work plan principally between July 1, 2022, and June 30, 2023. The work plan narrative summary of Section 3 of our previous work plans follows EPA's recommended logic model to the greatest extent possible. In this effort, we have conformed to EPA's terminology defined as follows:

- Activities: NEP work plan projects.
- Partnerships: involvement of local community partner agencies, organizations and/or individuals.
- Outputs: products and services resulting from the work plan (i.e., deliverables).
- Short-term outcomes: changes in knowledge, learning, attitude, and skills; raising awareness amongst targeted NEP partners and stakeholder groups.
- Intermediate outcomes: changes in behavior, practice, decisions, and involvement among targeted NEP partners and stakeholder groups.
- Pressures: changes, positive and/or negative, related to specific quantitative targets (e.g., percent of nitrogen reduction); and
- Long-term outcomes: changes in condition of the state, when possible.

We also identify how the proposed activities support EPA core programs. We define these core programs here as: 1) strengthening water quality standards, 2) improving water quality monitoring, 3) developing total maximum daily loads, 4) controlling non-point source pollution, 5) strengthening NPDES permits (including MS4), 6) supporting sustainable wastewater infrastructure, 7) supporting CWA and state wetland protection efforts, and 8) protecting coastal waters and large aquatic ecosystems through the National Estuary Program.

Besides these characterizations, we identify the specific CCMP Action Plans (2013 update) that are supported by each task. These action plans are:

- Action Plan 1: Managing Nitrogen Sensitive Embayments
- Action Plan 2: Protecting and Enhancing Shellfish Resources
- Action Plan 3: Managing Stormwater Runoff and Promoting LID
- Action Plan 4: Improving Land Use Management and Promoting Smart Growth
- Action Plan 5: Managing Onsite Wastewater Disposal Systems
- Action Plan 6: Managing Impacts from Boating, Marinas, and Moorings
- Action Plan 7: Protecting and Restoring Wetlands
- Action Plan 8: Restoring Migratory Fish Passage and Populations
- Action Plan 9: Protecting Biodiversity and Rare and Endangered Species Habitat
- Action Plan 10: Managing Water Withdrawals to Protect Wetlands, Habitat, and Public Water Supplies
- Action Plan 11: Managing Invasive and Nuisance Species

- Action Plan 12: Protecting Open Space
- Action Plan 13: Protecting and Restoring Ponds and Streams
- Action Plan 14: Reducing Beach Debris, Marine Floatables, and Litter in Wetlands
- Action Plan 15: Managing Coastal Watersheds and the Waterfront
- Action Plan 16: Reducing Toxic Pollution
- Action Plan 17: Preventing Oil Pollution
- Action Plan 18: Planning for a Shifting Shoreline and Coastal Storms
- Action Plan 19: Protecting Public Health at Swimming Beaches
- Action Plan 20: Monitoring Management Action, Status, and Trends
- Action Plan 21: Enhancing Public Education and Participation

Section 2: FFY21 Outcomes: Highlights and Accomplishments July 1, 2021, to June 30, 2022

Status of FFY21 Work Plan, July 1, 2021, to present, EPA Cooperative Agreement CE-00A00860

This work plan continued during the COVID-19 Pandemic, and to the transition to normalcy and staff hybrid work schedules. Municipal grants, targeted subawards, the salt marsh studies, and the NEP's commitment to the Buzzards Bay Stormwater Collaborative were the tasks that dominated staff activities and focus.

This section summarizes the status of tasks in last year's work plan activities and describes key accomplishments by the NEP and our partners, under U.S. EPA Cooperative Agreement CE-00A00860, which will remain open to July 2023, to allow for the closure of all outstanding grants and subawards that have not yet been completed. In particular, the onset of many projects was delayed due to the COVID-19 crisis that began in March 2020. While this section summarizes many of the specific actions achieved, it is important to stress that our support of the Stormwater Collaborative and participating municipalities represented the single largest commitment of staff resources.

FFY21 Work Plan Task 1 - Wetland Restoration and Open Space Protection and Restoration

Summary of activity July 1, 2021 - June 30, 2022

As we have done in the past, the NEP continued to work and collaborate with the Buzzards Bay Coalition (Coalition), area land trusts, and municipalities in our ongoing effort to protect and restore valuable wetlands and upland wildlife habitat throughout the Buzzards Bay watershed. Through this effort, the NEP

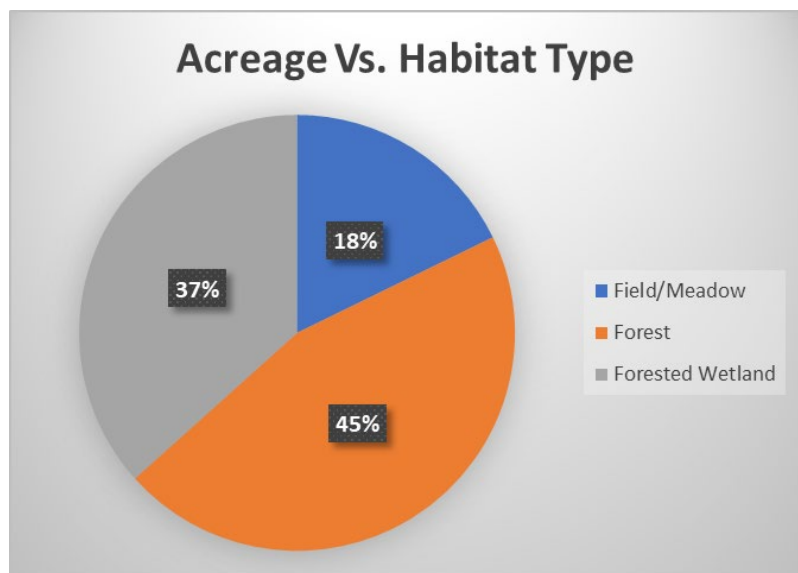


Fig. 2 Types of habitats reported in the 2021 GPRR report to EPA.

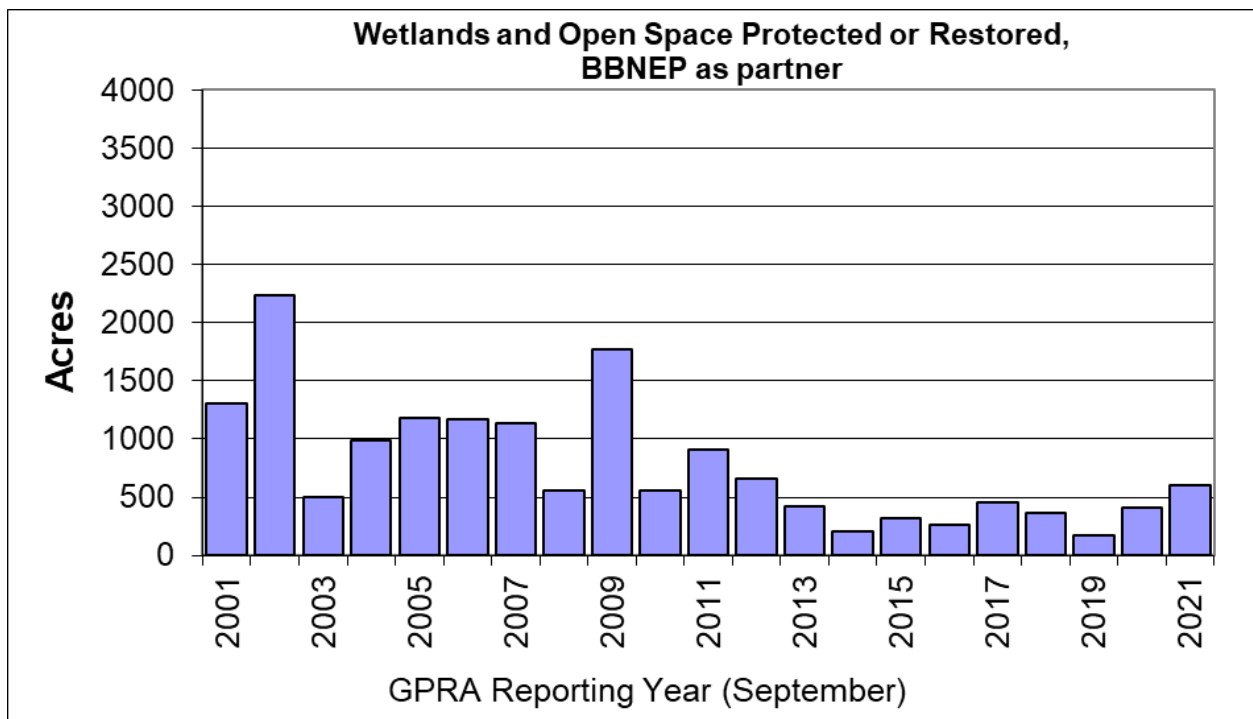


Fig. 3 Total wetlands and open space protected or restored since 2001.

provided maps, helped develop state and federal grant applications, wrote letters of partnership and support to granting agencies, and through the municipal grant program, provided mini-grant funds that help meet match requirements for leveraging grants from other programs. As required by U.S. EPA headquarters, the NEP reports on wetland and habitat protected or restored with support of the NEP in our annual Government Performance Results Act (GPRA) report submitted through the National Estuary Program Online Reporting Tool (NEPORT) each September.

The success of Buzzards Bay municipalities, the Coalition, and the area land trusts can be seen in the acres of open space and habitat protected or restored in which the NEP was appreciably involved through funding or technical assistance. Fig. 2 sums the acreage of the primary characteristic of the parcels protected and reported in the 2021 GPRA report to EPA. The total of 602.17 acres shown represent only those projects in the watershed in which the NEP provided some supporting role, mostly in the form of technical or financial assistance., Fig. 3 shows the amount of land protected with NEP technical or financial support since 2001.

The Coalition again had great success in the past year coordinating grant efforts on several projects in the Buzzards Bay watershed, many of which received supporting funding or technical support by the NEP in the last or previous fiscal years. The NEP directly funded three projects (two of which the Coalition was a partner), totaling \$110,640, and these are described in the summary of our municipal grants (Fig. 4 shows Doggett Brook Farm).

The Coalition is a responsible steward of the lands they protect, and they encourage the public's use and enjoyment of their properties. They have a strong record of restoring impaired properties by removing trash, derelict buildings, abandoned vehicles, and restoring wetlands and habitat. Most recently, the Coalition partnered with the Town of Rochester and the Rochester Land Trust (RLT) to permanently protect 20.5 acres along Doggett Brook (Fig 5), a principal tributary of the Sippican River. The project is part of a larger effort to protect a 58-acre undeveloped parcel along a principal road to the central village area of Rochester.

The property contains a mix of fields, upland forest, freshwater wetlands and some 1,600 feet of frontage on Doggett Brook. In addition, the property contains State-designated habitat for rare species. The project will protect water resources associated with Doggett Brook and the Sippican River watershed, as well as protect a variety of natural resources and wildlife habitats and provide public access to the property and the brook.

The Coalition plans to restore the riparian area to enhance ecological functions and natural climate solutions including flood/flow amelioration and carbon storage in wetland and forest soils. In addition, the Coalition, working with RLT, intends to create a small roadside gravel parking area with signage, and develop a trail with the potential of future connectivity to other existing conservation land in the immediate area. The NEP provided a grant through its municipal grant program to purchase a conservation restriction on the property. This project is expected to be completed by the summer of 2022.



Fig. 4 Fundraising sign for Doggett Brook Farm, Rochester erected in 2021.



Fig. 5 Doggett Brook, Rochester, spring 2021.

FFY21 Work Plan Task 2 - Stormwater Remediation and Technical Assistance

Summary of activity July 1, 2021 - June 30, 2022

With the ongoing support of a SNEP grant and a Department of Environmental Protection (DEP) MS4 grant to Massachusetts Maritime Academy (MMA), the NEP was able to continue its support of the Stormwater Collaborative to assist eight Buzzards Bay watershed municipalities and conduct Illicit Discharge Detection and Elimination (IDDE). The NEP was a lead author and co-applicant on all these grant applications, and the NEP also provided funds for laboratory testing of stormwater samples.

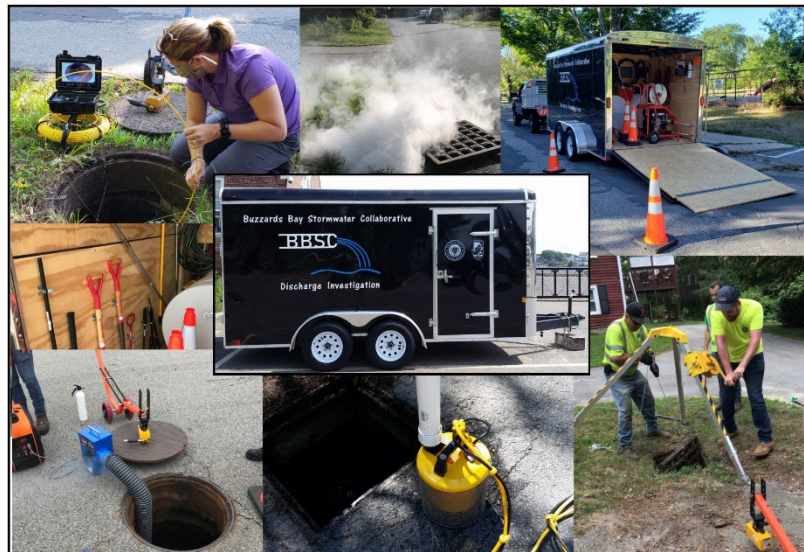


Fig. 6 Stormwater Collaborative IDDE trailer

This initiative remains a major time commitment of NEP staff during the past year. The NEP was not only one of the leads in founding the Stormwater Collaborative, but we were also responsible for many tasks, such as: Quality Assurance Project Plan (QAPP) update, training (Fig 6 and Fig 7), GIS support, and data management. During the past year, the NEP continued to update monitoring guidance documents, and train students and staff in the program. The NEP director worked with the MMA Marine Science, Safety, and Environmental Protection (MSSEP) Professor William Hubbard to coordinate MMA and NEP efforts. In addition, NEP staff maintains a Geographic Information System (GIS) database, updating mapping features and incorporating the field investigations, The NEP also oversees the collection of water quality data and conducts quality assurance checks of the data. Both the GIS and water quality data is used to prepare MS4 permit materials for Stormwater Collaborative participants.

MMA remains the lead in completing Stormwater Collaborative tasks with guidance from the NEP. Along with the full time MMA staff person, this year nine cadets completed their cooperative assignment with the Stormwater Collaborative. The cadets gained valuable experience and can now enter the workforce with sought-after skills in stormwater activities. The NEP was a partner on the first grant that began in January 2020 which resulted in the specification and construction of the trailer and the development of the techniques for effective catchment investigations. In February 2022, MMA received its third DEP MS4 grant of \$71,000 on behalf of the Stormwater Collaborative to use the IDDE trailer to conduct further catchment investigations. This year's grant also funded a series of hands-on IDDE workshops. Five all-day workshops attracted 52 participants from 20 communities.

From July 2021 to June 2022 an additional 200 catchments have been evaluated, over 150 stormwater outfalls have been inventoried and over 100 stormwater samples have been collected. The [Buzzards Bay Stormwater Collaborative page](#) has additional information about the Stormwater Collaborative, and these and useful stormwater monitoring training videos are on the Stormwater Collaborative's [Monitoring Discharges page](#).

December 2021 marked the end of the 2019 SNEP grant, and the final report was prepared in January 2022 by MMA. A proposal for another SNEP grant was submitted in April 2022 in an effort to expand the Stormwater Collaborative's mission to additional disciplines in neighborhood stormwater stewardship, optical brightener detection and advanced GIS analysis to determine suitable sites for stormwater treatment projects.

Another noteworthy expansion of the Stormwater Collaborative was the introduction of an online map service in January 2022. This ArcGIS Online map hosted by MMA provides a clearing house for all the data and mapping efforts collected to date. It complies with standards set by the MS4 permit for features required to be illustrated on a map. This map is a valuable asset for the Stormwater Collaborative communities and provides a tool for them to evaluate their outfalls and catchments.

A task incorporated in the interagency service agreement between UMass Dartmouth and the NEP was an illicit discharge investigation in the Tub Mill Brook drainage basin in the Town of Mattapoisett. This project was undertaken by a master's student in the Civil and Environmental Engineering Department of UMass Dartmouth. The project began as a result of concerns raised by the town about discharges from Route 6 (state-owned highway) into Tub Mill Brook. In the spring and summer of 2021 an investigation of the Tub Mill Brook watershed was undertaken. Sampling and catchment investigations were carried out for 17 outfalls within the watershed. A final report was completed in August 2021. This effort furthers the town's compliance with its MS4 stormwater permit with EPA.

Besides the Stormwater Collaborative support, the NEP aids towns on stormwater issues in several ways. First, we review stormwater designs proposed by towns for remediation projects, or at the request of a town board as part of local permitting or site plan review. Second, we prioritize stormdrain outfalls to assist municipalities in making management decisions, fund and assist in developing assessment reports and fund and develop stormwater remediation designs for high priority discharges. The NEP further helps towns prepare grant applications for federal and state monies to help fund implementation of these stormwater designs. Third, we assist towns to de-



Fig. 7 IDDE hands-on workshop at the Massachusetts Maritime Academy.

velop and implement stormwater management plans, like the Phase II MS4 National Pollutant Discharge Elimination System (NPDES) municipal plans. Finally, we work with town boards to adopt local stormwater regulations and Low Impact Development (LID) strategies.

In early April 2021, the NEP helped each of the towns prepare model grant proposals that will assist the towns in applying for state and federal funds to help construct the stormwater treatment facilities, which include green infrastructure like biofilter, sand filters, and swales. Support for grant efforts continue in an effort to support the construction of these designs.

FFY21 Work Plan Task 3 - NEP Technical Assistance and Municipal Grant Program

Summary of activity July 2021 to June 2022

Through our grant and technical assistance programs, the NEP helps municipalities, and our other partners achieve the goals and objectives of the CCMP. In November 2021, EEA announced \$110,640 in federal grants for land protection that will protect water quality and habitat in the Buzzards Bay watershed. The Municipal mini-grants were awarded by the NEP through CZM with funding from SNEP. The three grants are being matched by over \$194,000 in private cash and state grants. In addition, the NEP released a second round of grant funding in the spring of 2022, which focused on stormwater and wastewater projects. One grant was awarded with a cash match of \$12,500 in local funds. The following grants were awarded through the two programs:

- **Town of Mattapoisett** - \$45,000 to work with its partner, the Mattapoisett Land Trust, to purchase and permanently protect a forested 4-acre parcel of riverfront land. The property is located on the west bank of the Mattapoisett River and contains important state-designated habitat, including habitat for rare species.
- **Town of Carver** - \$45,000 to work with its partner, the Coalition, to purchase and permanently protect 28 acres of undeveloped forest land on the southern side of the 600+ acre Great South Meadow Cedar Swamp on Mayflower Road in Carver. The property contains important state-designated habitat and lies over the Plymouth/Carver Sole Source Aquifer.
- **Town of Rochester** - \$20,640 to work with its partners, the Coalition and Rochester Land Trust, to purchase a conservation restriction that will permanently protect 20.5 acres along Doggett Brook, a principal tributary of the Sippican River. The property contains important state-designated habitat, including habitat for rare species.
- **Town of Carver** - \$12,500 to hire an engineer, to achieve and remain in, Municipal Separate Storm Sewer System (MS4) compliance. The engineering firm to perform the necessary fieldwork and to produce an updated stormdrain map to allow the town to prioritize direct outfalls that pose the most significant threat to the Weweantic River and thus to Buzzards Bay.

The NEP continued to assist municipalities and other partners with GIS analysis, proposal development, review of local projects, and training and support for municipal MS4 compliance. The NEP's Regional Planner also produced over 450 new or revised maps and fulfilled dozens of requests for data, calculations, or graphics to be used for newsletters, grants, etc. Numerous maps and GIS evaluations were prepared for the Coalition, area land trusts, and municipalities. Examples include municipal open space maps, Coalition fundraising maps and maps for their website, maps used by municipalities in open space reports and their grant applications, and for other purposes.

The NEP continues to work with the Coalition’s Science Advisory Committee (SAC) and a team of scientists in Woods Hole to identify pressing issues related to climate change, nitrogen and toxic pollution, and the loss of wetlands habitat and living resources in Buzzards Bay.

The NEP continues to maintain the Buzzards Bay Action Committee (BBAC) website buzzardsbayaction.org (Created by the NEP in 2012). At the request of the BBAC, the NEP Director posts documents, meeting announcements, presentations, and videos.

FFY21 Work Plan Task 4 - Program Oversight and Administration

Summary of activity July 1, 2021 - June 30, 2022

The NEP Executive Director and CZM Fiscal Officer ensured the proper administration of the EPA grant, other grants, and Interagency Service Agreements (ISA) awarded to the NEP. The NEP Regional Planner, who manages the municipal grant program, assists in grant tracking and some reporting requirements. The stormwater technical assistance staff help manage stormwater related grants.

In 2021, the NEP staff moved to a hybrid work environment, working at the Mattapoissett NEP office on a scheduled regular basis, and as needed, and working from home. All staff meets at the office one day a week for collaboration purposes and meetings, with the remainder of the work-days spent working from home.

During the summer of 2021, the NEP and Boston finance staff worked together to close out Co-operative Agreement FC00A00515 (\$600,000; 7/1/2019 start), ends June 1, 2021. In August 2021, the NEP submitted the GPRA report information to EPA as specified in the EPA Funding Guidance. The GPRA report for NEPs includes annual estimates of habitat and wetlands protected or restored, and annual estimates of funds leveraged in some way by the NEP. As a requirement of this agreement, the NEP provides information on the GPRA performance measures to EPA by their required date.

FFY21 Work Plan Task 5 - Buzzards Bay Citizens’ Water Quality Monitoring

Summary of activity July 1, 2021 - June 30, 2022

The Coalition continued its nationally recognized Baywatchers water quality monitoring program (Fig 8), which began in 1992. The Baywatchers program is supported by the Commonwealth of Massachusetts, the NEP, citizens, Coalition dues, and other sources. The NEP continued to support the Coalition's Baywatchers program with a \$40,000 grant, and this award will end in the summer of 2022. The Coalition's Baywatchers program, which began in 1992 under the direction of the NEP, remains one of the most effective volunteer-based water quality monitoring programs in the coun-



Fig. 8 Baywatchers training videos are available on YouTube.

try. The data is being used as the basis for updates to the state's water quality assessment and integrated list of waters standards. It is also being used in models to develop watershed nitrogen Total Maximum Daily Loads (TMDLs) in Buzzards Bay embayment watersheds by the DEP's Massachusetts Estuaries Project. This work, together with efforts to help towns identify problem stormwater discharges and to support efforts for treatment through technical assistance and grants, directly supports EPA goals to better control non-point source pollution on a watershed basis.

During the 2021 season, the 30th consecutive season water quality data was measured weekly from May to September with more intensive nutrient sampling occurring every two weeks, in July and August. More than 196 individuals volunteered their time and energy for the 2021 water monitoring program. This totaled more than 5340 volunteer hours to collect 4,572 points of basic water quality parameter data. During the 2021 water sampling season, data was gathered for the basic parameters of weather conditions, water temperature, salinity, clarity and dissolved oxygen level (May-Sept) and in addition 875 coastal nutrient water samples and 131 samples for total phosphorous from freshwater inputs were collected for Health Index nutrient level analysis. Successful monitoring by this program provides another year of trend analysis data for regional assessments for the Bay (30 consecutive years) from more than 284 different sampling locations.

In March 2021, the Coalition published 27 years of Baywatchers water quality data in the international scientific journal, *Scientific Data* (part of the Nature Publishing Group). The publication will improve access to Buzzards Bay water quality data for researchers around the world investigating coastal eutrophication. Coalition Science Director Rachel Jakuba was the lead author of a team that included NEP Executive Director Joe Costa that published the data¹.

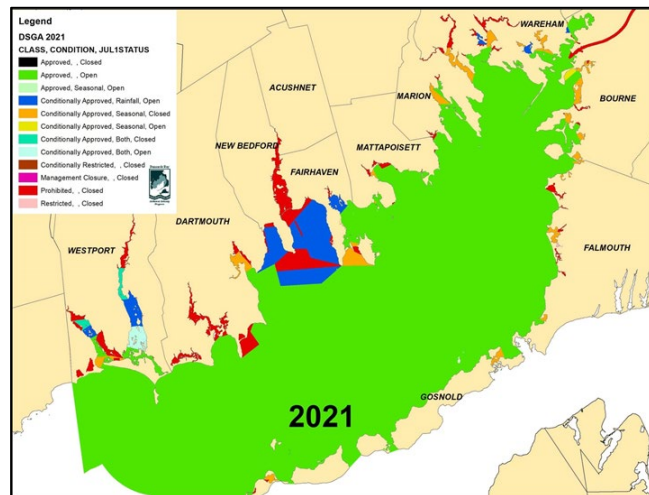


Fig. 9 Shellfish bed closure areas projected for July 1, 2021.

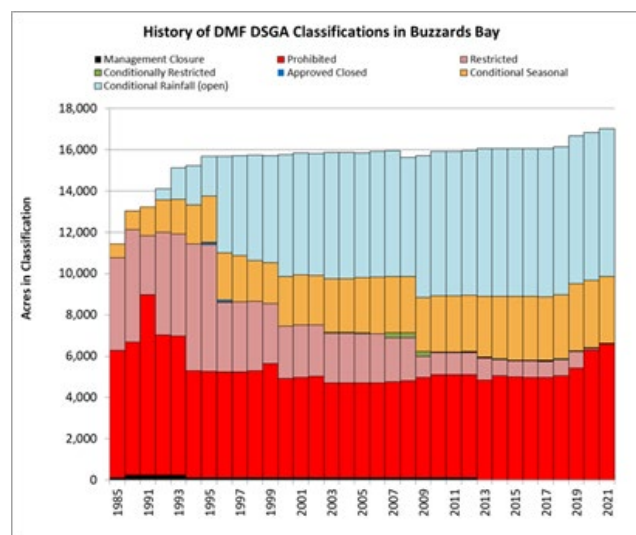


Fig. 10 Long-term shellfish bed closure trends for Buzzards Bay through 2021.

¹ Jakuba, R.W., Williams, T., Neill, C. et al. Water quality measurements in Buzzards Bay by the Buzzards Bay Coalition Baywatchers Program from 1992 to 2018. *Sci Data* 8, 76 (2021). <https://doi.org/10.1038/s41597-021-00856-4>

FFY21 Work Plan Task 6 - Environmental Indicators and Outcomes Tracking

Summary of activity July 1, 2021 - June 30, 2022

The NEP continued to track various environmental indicators on its website including shellfish bed closures ([BB Closures website](#), Fig. 9 and Fig. 10) and eelgrass abundance. The Buzzards Bay eelgrass estimates are based on DEP databases, and our own photointerpretation of aerial photographs in areas not covered by DEP's analysis. These data are also used during the Coalition's quadrennial State of the Bay reports (the next report is scheduled for July 2022).

The NEP has been a member of the Coalition's SAC since its creation in 2014, and the NEP director attends the group's quarterly meetings and provides data and information at the request of the group. The SAC's focus is to identify research and monitoring program priorities, assist in Coalition grant application development, and review results of environmental indicator studies in Buzzards Bay. The group has also been working to define water quality and habitat monitoring needs to support a permit application by the Town of Wareham to relocate the municipal wastewater facility outfall to the Cape Cod Canal. This work has been ongoing since 2018, a continuation of an earlier SNEP grant awarded by the NEP and supported by some water quality monitoring funding by the NEP in 2018.

FFY21 Work Plan Task 7 - Outreach and Education

Summary of activity July 1, 2021 - June 30, 2022

As a partner to the NEP on our work plan, the Coalition is the principal organization that targets outreach and education to the public. The Coalition undertakes outreach and education activities highlighting the condition and state of Buzzards Bay, progress toward restoration and protection goals, and its collaboration with the NEP in their activities.

After the COVID-19 pandemic subsided in the summer of 2021, the Coalition was able to resume a full schedule of free outdoor exploration programs. They led 76 Bay Adventures that hosted 1,019 participants. The Coalition was also able to resume its 4th and 5th grade school programs in the New Bedford school system's Sea Lab. In addition, at the Onset Bay Center, through a partnership with Massachusetts Maritime Academy, four cadets spent the summer teaching and mentoring young boaters.

The Coalition also held its 15th Annual Watershed Ride on October 3, 2021. Over 400 cyclists participated by pedaling across the watershed to show their support for clean water. The event was supported by 100 volunteers and raised more than \$396,708 to support the Coalition's education, conservation, research and advocacy work.

On June 26, 2021, the Coalition held its 28th annual Swim for Buzzards Bay fundraising event. A 1.2-mile open water swim across Outer New Bedford Harbor, the Swim is the Coalition's signature outdoor event. Due to COVID concerns the number of swimmers was limited to 50. Those who participated raised \$122,251 to support the Coalition's work to protect clean water, conserve land and educate youth and adults across the Buzzards Bay region.

The Coalition also produces brochures, fact sheets, press releases, and other events about citizen action to protect and restore Buzzards Bay. Some information on upcoming events is at

<http://www.savebuzzardsbay.org/events/>. Information on past events may be found at <https://www.savebuzzardsbay.org/news/>.

During 2021, the NEP continued to update and streamline the navigation of its website buzzardsbay.org and subdomains, climate.buzzardsbay.org and Stormwater.BuzzardsBay.org. New pages and information related to stormwater pollution, nitrogen loading, habitat protection, and climate ready adaptation efforts in the Buzzards Bay watershed were added. The stormwater website was updated to include results of the Stormwater Collaborative program. Most notably, the [Interactive Map](#) page was updated so that the monitoring program data for each site is displayed when monitoring sites are clicked upon (sites with data appear as red dots on the map).

The BBAC continues to be a strong partner with the NEP in guiding the Buzzards Bay municipal grant program and in holding monthly meetings on special topics. Information about meetings can be found on the BBAC's website buzzardsbayaction.org, which is managed and maintained by the NEP.

Since 1989, the NEP has been training Conservation Commission members on how to delineate wetlands in cooperation with the Massachusetts Association of Conservation Commissions ([MACC](#)). Retired NEP Wetlands Specialist John Rockwell has continued to provide these training sessions with support of the NEP. The support consists of printing and distributing various wetland training guides and brochures developed by Rockwell during his tenure at the NEP (go to our [wetland delineation training](#) web page to view them; Rockwell continues to volunteer to maintain and update the documents on this page). Unfortunately, due to the COVID-19 pandemic all the workshops had to be canceled in 2021.

FFY21 Work Plan Task 8 - Other Specialized Technical Assistance

Summary of activity July 1, 2021 - June 30, 2022

The NEP continued to provide technical guidance and training on the use of surveying equipment by Coalition staff and interns, and GPS support on the various salt marsh studies and the NEP continues to distribute various specialized GIS datasets through its website. The NEP is also a partner with the Coalition on their 5-year targeted watershed grant from SNEP to support water quality improvements in Apponagansett Bay from pollution reduction efforts along Buttonwood Brook. Support included map preparation, stormwater data, and historical aerial interpretation (Fig. 11).



Fig. 11 A portion of the Buttonwood Brook watershed, 1938 (left) vs 2022 (right).

FFY21 Work Plan Task 9 - Technology Transfer to Other Estuaries

Summary of activity July 1, 2021 - June 30, 2022

Between the fall of 2021, and the spring of 2022, national meetings could only be attended online because of the COVID-19 pandemic. The Commonwealth of Massachusetts did not allow interstate travel where meetings were available online. The NEP Director participated in various NEP meetings sponsored by the Association of National Estuary Programs (ANEP). The Executive Director attended the fall NEP and spring headquarters EPA meetings. The NEP Director continued to work with EPA and RAE to guide the Southeast New England Program for Coastal Watershed Restoration (SNEP). The NEP Director is a member of the SNEP Steering Committee and Policy Committee, and on the Steering Committee of the newly formed SNEP technical assistance group. The NEP Executive Director continued to guide partners to participate and secure funds from SNEP.

The NEP Executive Director and Regional Planner help maintain grant award information on the [Massachusetts Coastal Zone Management Grant Viewer](#). The CZM Grant Viewer is an interactive map of grants awarded by CZM, the NEP, and the Massachusetts Bays National Estuary Program (MassBays). It includes grants awarded throughout the CZM Coastal Watershed, representing a strong investment in clean estuaries, resilient coasts, and healthy habitats.

FFY21 Work Plan Task 10 - Website Maintenance and Innovation

Summary of activity July 1, 2021 - June 30, 2022

The NEP continued to maintain an independent website to promote new approaches, receive feedback, communicate successes, track trends in water quality, monitor performance of government in implementing the CCMP, express the views and concerns of the NEP Steering Committee, create a forum for new initiatives and ideas of our partners, and support other obligations and tasks identified in this work plan. The website is also used to post results of the bay indicators and documents relating to the oil spill, and post procurement notices and grant announcements. The NEP has also been systematically scanning all old NEP reports and gray literature related to Buzzards Bay and posting it on our website.

The NEP Director continued to maintain and update the program's WordPress website (buzzardsbay.org). In addition, as noted in the outreach and education task in more detail, the NEP continues to maintain two subdomain websites. The first was the climate.buzzardsbay.org, launched in June 2013 to consolidate the NEP's climate related initiatives on one website. The second, <http://stormwater.buzzardsbay.org/>, is the subdomain for the Stormwater Collaborative that was launched in 2016. In May 2022, the NEP updated the stormwater interactive map database, where information about pipes, catch basins, and stormwater discharges, including water quality data can be downloaded by town officials and the public.

Besides the NEP websites, the NEP continues to maintain the BBAC's website, buzzardsbayaction.org. Their page is updated with stories, photos, videos, and presentations to meet the needs of that organization as requested by the BBAC Executive Director.

FFY21 Work Plan Task 11 – Scientific collaboration on nitrogen TMDLs, climate impacts, and water quality impacts on natural resources.

Summary of activity July 1, 2021 - June 30, 2022

The NEP collaborated with area scientists to publish results from the previous year's climate tasks and long-term trends including assessing impacts of climate change on water quality. As part of this task, the NEP conducted GIS analyses of watershed land use, including several onsite systems, occupancy rates, land use types, estimates of impervious area, lawn area, extent of sewerage, and agriculture. Specific accomplishments included:

- Provided assistance evaluating the Coalition's water quality data set.
- Updated the stormwater monitoring guide in support of the Stormwater Collaborative.
- Refined the shellfish bed closure history in Buzzards Bay embayments, including calculation of acre days closed based on the duration of seasonal closures.
- The NEP continued support to the Stormwater Collaborative and MMA to continue the stormwater network mapping and discharge monitoring program with Buzzards Bay municipalities.

The NEP is a partner on a 604(b)(3) grant to the Town of Bourne to undertake a TMDL analysis for the Pocasset Harbor Estuary Complex (Fig 12). The work commenced in March 2021, but the Coalition requested an extension of the project to December 2022. In the spring of 2021, the NEP completed a draft of the watershed loading analysis for the Pocasset Harbor estuary complex. All NEP work will be completed by December 2022

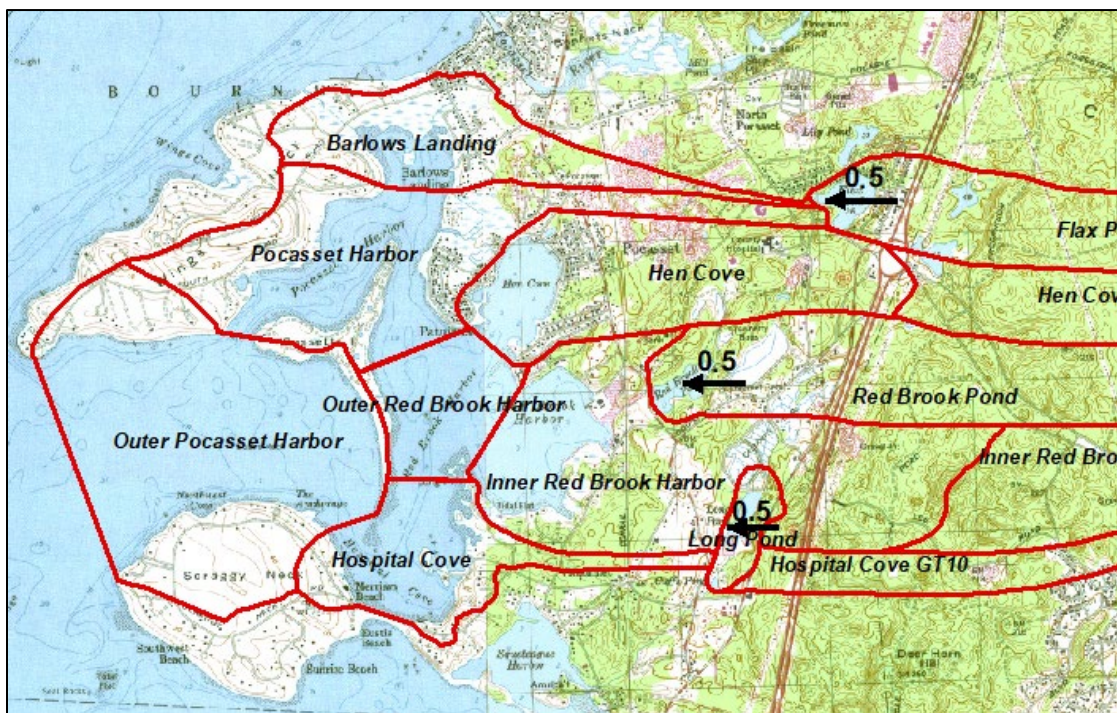


Fig. 12 Pocasset Harbor Estuary Complex subwatersheds adopted by the NEP in support of the TMDL study.

FFY21 Work Plan Task 12 – Salt Marsh Loss Assessment Collaboration with Coalition and Runnel Study with Coalition and Woodwell Climate Center

Summary of activity July 1, 2021 - June 30, 2022

The NEP and our non-profit partner organization, the Coalition, continued to study salt marsh die-off and runnel studies in Buzzards Bay. In the summer of 2021, the NEP Director helped train new seasonal Coalition interns and staff on the use of a Leica Laser Leveler for the precise measurement of elevations within the salt marsh and converted GPS data to generate marsh vegetation-elevation profiles. Throughout the fall of 2021 to 2022, the NEP Director collected new GPS data of transect markers and benchmarks and updated the GIS database of features for the salt marsh study, including new midpoint parkers and other features not previously surveyed.

During this period, the NEP director helped the Coalition and a post-doc scientist with the Woodwell Climate Center complete tasks associated with an ongoing two-year \$400,000 SNEP grant awarded in 2019 to study the use of runnels (shallow channels to drain standing water) as a sea level rise management tool (Fig 13). The NEP director also worked with this research team to develop another research grant application related to salt marsh loss. The NEP provided GIS and other support for all these efforts. The NEP maintained and updated an [interactive map web-site](#) of marsh sites, and created datasets that meet EPA, NEP, Coalition, and collaborating researcher goals. The preparation of a report on the history of salt marsh boundary changes at the selected sites is an ongoing task. The NEP participated in several online meetings of salt marsh investigators sponsored by CZM.



Fig. 13 Coalition staff conducting a vegetation survey in the summer of 2021 along a salt marsh transect.

This task supported several Clean Water Act (CWA) core programs indirectly including elements: 2) improving water quality monitoring, 4) controlling non-point source pollution on a wa-

tershed basis, 6) supporting sustainable wastewater infrastructure and CWA and state wetland protection efforts, and climate adaptation related priorities.

FFY21 Work Plan Task 13 – Technical Assistance to Support Coastal Resiliency and Municipal Vulnerability Preparedness.

Summary of activity July 1, 2021 - June 30, 2022

The NEP provided maps of guidance to Buzzards Bay municipalities seeking Coastal Resiliency and Municipal Vulnerability Preparedness grants and provides support to the CZM South Coast Regional Coordinator in promoting the program. In the summer of 2021, the State of Massachusetts announced these grants to Buzzards Bay municipalities:

Dartmouth (\$107,255) Assessment, Design and Permitting to Improve the Coastal Resiliency and Function of Apponagansett Park/Arthur Dias Town Landing

The Town of Dartmouth will assess alternatives and develop resilient nature-based and structural design strategies for addressing the failing seawall around the perimeter of Apponagansett Park and Arthur Dias Town Landing, which regularly experience flooding during spring tides and coastal storms.

Gosnold (\$212,000) Gosnold Fuel Resilience Project

The Town of Gosnold will evaluate, design, permit and install a preferred alternative for an above-ground fuel storage facility on Cuttyhunk Island. The project will incorporate coastal storm and sea level rise considerations when replacing the recently removed underground tanks.

Marion (\$148,500) Front Street Pump Station Resiliency Improvements and Force Main Evaluation

The Town of Marion will conduct preliminary design work of additional flood protection measures at the Front Street Pump Station, evaluate the sewer force main pipe that carries flow from the pump station to the Marion Water Pollution Control Facility, and design, bid and construct a bypass connection in the event of a pump station failure.

Mattapoisett (\$29,400) Reopening Old Slough Road for Vehicle Travel in Emergencies

The Town of Mattapoisett and the Mattapoisett Land Trust will complete engineering design and survey work to reopen Old Slough Road as an emergency access route for vehicles traveling to and from the Point Connett and Angelica Point communities, which are currently accessed by a low-lying roadway that is vulnerable to coastal storm and sea level rise impacts. The NEP provided maps that were used in the grant application.

Mattapoisett (\$158,765) Eel Pond Sewer Force Main Replacement - Permitting and Final Design

The Town of Mattapoisett will complete final design and permitting necessary to implement the Eel Pond Sewer Force Main Replacement Project along the barrier beach and under the West Channel. The preferred approach for the new force main route is to use horizontal directional drilling to install the force main deeper and farther from the ocean than the existing force main to protect the main from flooding, erosion and beach migration over the design life. This project was another outcome of the [Weather Ready Mattapoisett](#) project undertaken by the U.S. EPA in which the NEP participated.

Wareham (\$127,000) Elevated Generator Platform at Salt Works Road Pump Station

The Town of Wareham will construct an elevated platform that incorporates coastal storm and sea level rise projections to protect an emergency generator at the Salt Works Road Pump Station. The pump station is located 100 feet from the shoreline and is part of a critical infrastructure sys-

tem that protects public health and the environment. This pump station was identified as a concern by the NEP in this [2013 Sea Level Rise Vulnerability Report](#).

FFY21 Work Plan Task 14 - Targeted Grant Sub-awards (Carryover Tasks)

Summary of activity July 1, 2021 - June 30, 2022

These subaward tasks were identified in the FFY20 work plan. Tasks were continued over 18 months, with at least one element or sub-task carried over between July 1, 2021 and June 30, 2022.

1. Collaboration with the Ecosystem Center to evaluate Permeable Reactive Barriers (PRB) Technology for remediation of treated wastewater (\$27,375 sub-award to the Marine Biological Laboratory Ecosystem Center).

In 2019, the NEP collaborated with the Ecosystem Center at the Marine Biological Laboratory to conduct a study with SNEP funding to evaluate the feasibility of applying PRB technology at the Wareham Wastewater Treatment Facility (Fig 14). Using wood chips as a carbon source, the goal was to reduce nitrogen inputs from an advanced wastewater effluent under different controlled flow conditions. PRBs are a proven technology that have been demonstrated to passively reduce groundwater nitrate concentrations from several mg/L to less than 0.1 mg/L. This project was renewed for a second year with reduced funding so that springtime conditions could be evaluated. This work began in 2021, was delayed, then recommenced and completed April 30, 2022. The Town of Wareham is interested in scaling up the technology to a large existing unused lined bed on the property.

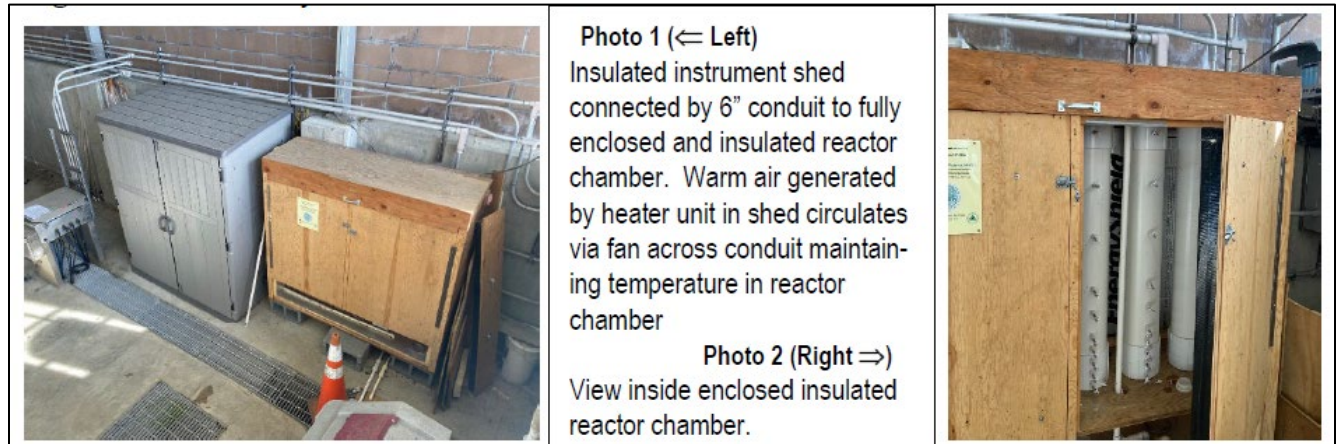


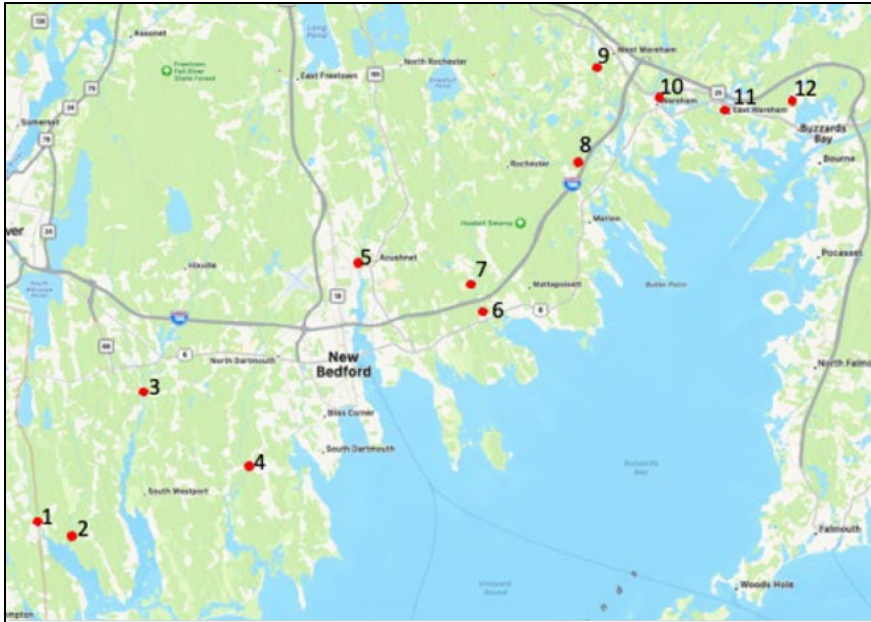
Fig. 14 PRB test columns at the Wareham Wastewater Treatment Facility as modified in 2021.

2. Determining Nitrogen Inputs to Buzzards Bay from Coastal Rivers (Woodwell Climate Research Center, \$56,746)

In this project, the Woodwell Climate Research Center (WCRC) initiated discharge and concentration sampling on six Buzzards Bay rivers: East Branch Westport River, Slocums River (Paskamansett River), Acushnet River, Mattapoisett River, Sippican River, and Wankinco River. During the course of the effort, they expanded to six additional sites (Fig. 15). The investigators planned to sample for one water year (1 October to 30 September) starting October 1, 2020. Together with the sampling of the Weweantic and Agawam Rivers by United States Department of Agriculture (USDA), these data will provide nitrogen load estimates for ten total rivers. The in-

investigators will develop a database of river discharge and concentrations to be made available by the WCRC.

The specific activities conducted under this project will include: (1) establishing staff gages and recording staff level loggers at selected river gaging points; (2) periodic measurements of river discharge across a range of river flows to create a rating curve to translate staff measurements into river discharge; (3) regular biweekly sampling of river water; (4) analysis of ammonium,



nitrate, dissolved organic nitrogen, particulate organic nitrogen, phosphate and total phosphorus in river water; and (5) calculation of annual watershed nitrogen loads from discharge and concentrations.

Due to COVID related delays, the project did not commence until late in 2020, and was extended to June 30, 2022. All monitoring staff gauges were established, and water samples are being collected.

Fig. 15 River monitoring sites in the Woodwell Climate Research Center study.

3) CCMP Climate Vulnerability Assessment Support (Coalition, \$10,000)

The NEP set aside \$10,000 for this task, made available by EPA headquarters Climate Ready Estuaries program, to support Coalition staff to host meetings and workshops with key stakeholders, synthesize responses, and prepare graphics associated with climate and pollutant trends in Buzzards Bay. Because of COVID-19, the NEP deferred this project until the fall 2021. While the NEP will be the lead in developing the CCMP climate vulnerability assessment in partnership with and technical support of U.S. EPA Region 1, the Coalition held online workshop forums to assess needs of each stakeholder group to gauge their particular interests or concerns about climate change risks and the adaptation planning process. The stakeholders consulted in this assessment included municipal, state, and federal government, a county government agency, a regional planning agency, the Buzzards Bay Steering Committee, environmental non-profits and lands trusts within the watershed, and area scientists, including those participating on the Coalition's SAC. The project will end after holding five online workshops. The outcome of the climate assessment is contained in the Buzzards Bay Climate Vulnerability assessment dated June 30, 2022

FFY21 Work Plan Task 14 - Targeted Grant Sub-awards

Summary of activity July 1, 2021 - June 30, 2022

1. Monitoring Program Support for Baywatchers (Coalition, \$40,000)

The Baywatchers program completed another successful year, and their activities are summarized in FFY21 Task 5.

2. Continued Collaboration with UMass Dartmouth on the development of Stormwater Designs and Innovative Environmental Monitoring and Assessment Approaches for SNEP Priorities (\$44,006)

This task was to include students working on stormwater designs and to provide Salt Marsh Unmanned Aircraft System (UAS) Surveys of salt marshes. However, because the NEP did not proceed with targeted stormwater design support to Buzzards Bay municipalities, this project was delayed and was reconfigured exclusively to a UAS study. An ISA was enacted with UMass Dartmouth in March 2022. The scope, which will include work of both a graduate student and undergraduate is summarized as:

The University of Massachusetts Dartmouth (UMD) is working with the Buzzards Bay National Estuary Program (BBNEP) to conduct salt marsh surveys in Buzzards Bay for the evaluation of vegetation, edge loss and elevation. UMD will perform the surveys utilizing Unmanned Aircraft Systems (UAS) having had experience with the operation and video footage processing of DJI Phantom 4 Pro quadcopters. They will process raw footage using 3D photogrammetry software to generate Digital Surface Models (DSM) and georectified true color imagery. UMD will use existing NGS rod benchmarks on each side along with BBNEP owned surveying equipment to set control points prior to each UAS survey. BBNEP will provide training on the use of their surveying equipment for setting control points. The UAS survey will be overseen by a FAA licensed operator, and UMD will be responsible for obtaining any additional licenses when operating in the vicinity of any airport. Under this agreement UMD will deliver DSM and georectified true

color imagery for ten (10) salt marsh sites twice a year, totaling twenty (20) surveys. Timing of the surveys will be decided jointly by BBNEP and UMD.

3. MMA-NEP Partnership to Support the Stormwater Collaborative (MMA, \$25,000)

This funding supported the MMA coordinator and a GPS software upgrade for the GPS survey tablet. The work under this subaward is summarized in FFY21 Task 2.

2021 Leveraged Funding (Federal FFY21 Work Plan funds)

Each September, the NEP submits to EPA, as part of our Government Performance Reporting Act requirements, a summary of state, federal and local dollars and in-kind services leveraged by the NEP or leveraged by our partners with technical support by the NEP, in support of the implementation of the CCMP. Some funds are leveraged through the municipal grant program; other funds are leveraged through other grant programs with our partners. For the period October 1, 2020, to September 30, 2021, the NEP's leveraged funds in the primary, significant, or support category totaled \$1,182,564, \$9,028,381, and \$0 respectively (Table 1).

Table 1. Summary of NEP role in leveraged funds, GPRA September 2021

NEP Role	Total
Primary	\$1,182,564
Significant	\$9,028,381
Support	\$0
Grand Total	\$10,210,945

We will report our FFY21 2021-2022 leveraged estimates to EPA in the fall of 2022.

Section 3: FFY22 Funds: Proposed Work Plan Activities July 1, 2022 - June 30, 2023.

In the sections below, we provide details of the specific tasks and actions expected in the coming year. Highlights of these activities include 1) closing out past grants and reissuing any residual grant funds, 2) continuing technical support for the Stormwater Collaborative, 3) technical assistance to municipalities on MS4 and other issues, and 4) continued collaboration with area scientists, the Coalition, and other partners on land use and water quality data sets to guide management action. This year's funding utilizes \$750,000 in NEP base funding, and \$250,000 in a Region I SNEP add-on for targeted projects, for a total of \$1,000,000. Expenditures utilizing SNEP funds are summarized in Table 2

Table 2. Use of SNEP funds

Task	Amount
Municipal Grant Program (Task 3)	\$171,773
Sea Lab Support	\$22,604
UMass Dartmouth UAS imagery salt marsh loss study (Task 12)*	\$46,708
Portion of River Monitoring Task	\$5,463
State Chargeback fees	\$3,452
Total	\$250,000

We have organized the work plan narrative summary using our past work plan structures for the most part and EPA's recommended logic model to the greatest extent possible. In this effort, we have conformed to EPA's terminology defined as follows:

- Activities: NEP work plan projects.
- Partnerships: involvement of local community partner agencies, organizations and/or individuals.
- Outputs: products and services resulting from the work plan (i.e., deliverables).
- Short-term outcomes: changes in knowledge, learning, attitude, and skills; raising awareness amongst targeted NEP partners and stakeholder groups.
- Intermediate outcomes: changes in behavior, practice, decisions, and involvement among targeted NEP partners and stakeholder groups.
- Pressures: changes, positive and/or negative, related to specific quantitative targets (e.g., percent of nitrogen reduction); and
- Long-term outcomes: changes in condition of the state, when possible.

Besides these characterizations, we identify the specific CCMP Action Plans are supported by the task. We also identify which Clean Water Act core programs the task supports. The core Clean Water Act programs are defined here as: 1) strengthening water quality standards, 2) improving water quality monitoring, 3) developing total maximum daily loads, 4) controlling non-point source pollution, 5) strengthening NPDES permits (including MS4), and 6) supporting sustainable wastewater infrastructure, 7) supporting CWA and state wetland protection efforts, and 8) protecting coastal waters and large aquatic ecosystems through the National Estuary Program.

FFY22 Work Plan Task 1 - Wetland Restoration and Open Space Protection and Restoration

Planned Project/Activity Purpose and Description (July 1, 2022 - June 30, 2023): (Status: ongoing)

As we have done in the past, the NEP will continue to work and collaborate with the Coalition, area land trusts, and municipalities, in our ongoing effort to protect and restore valuable wetlands and upland wildlife habitat throughout the Buzzards Bay watershed. Through this effort, the NEP will continue to provide maps, help develop state and federal grant applications, and conduct land use analyses. Work related to this task will be principally generated through meeting requests for technical assistance by area lands trusts, municipalities, and the Coalition in their efforts to receive grant funds from other sources.

Responsible Partners and Their Role(s):

The Coalition, municipalities, and area land trusts are key partners in our combined efforts. These land trusts are vitally important in the development of grant applications, and in building local financial and political support for new initiatives. These non-profits also work with private landowners to become partners in these protection efforts.

NEP Staff:

Principal Staff involved in these tasks: Regional Planner will provide technical support to the Coalition, municipalities, and area land trusts. Additional support will be provided from other NEP staff, with guidance from the Executive Director, as well as with input from the Coalition Executive Director, municipalities, and area land trusts. The Executive Director and Regional Planner complete the GPRA report.

How the Project Supports the CCMP and Work Plan Goals:

Wetlands and habitat protection and restoration in the wetland action plans and the land use management action plans principally. (Sub-element: Habitat, Water Quality, Living Resources, Healthy Communities. Program goal: Ecosystem Restoration & Protection)

How the Project Supports the CWA

This task supports Clean Water Act core programs 7) supporting CWA and state wetland protection efforts, and 8) protecting coastal waters and large aquatic ecosystems through the National Estuary Program.

Outputs, Products, or Deliverables:

1. Grant applications to state and federal grant programs by us or our partners with our support.
2. The NEP may provide support to towns to produce materials for updating local open space plans (which expire every seven years).
3. The permanent protection of new open space with wetlands and other important habitat in the Buzzards Bay watershed through conservation restriction or purchase in fee.
4. Annual GPRA reports on wetland and habitat protected or restored will be submitted through the NEPORT website.

Milestones:

1. Report to EPA each September via GPRA report on the NEPORT website. Other projects and activities as financial or local interest opportunities arise. Projects undertaken with tech-

nical support from the NEP. Maps or analyses prepared for area land trusts or other partners as needed and upon request.

Estimated Budget:

Staff time to meet requests for technical assistance. Roughly, \$900 in office supplies and paper, and printer ink are projected to be expended on the production of maps, brochures, and outreach information.

Leveraged Funding and Support:

Municipal land protection and restoration projects leverage considerable resources. The Coalition has successfully leveraged considerable state, federal, municipal funds and resources, as well as private donations, in their efforts to protect and restore habitat and wetlands. Only a fraction of those leveraged funds are attributed as match to these NEP's Cooperative Agreement with EPA

Outcomes:

Short-term:

Increased number of habitat acres protected and restored, including geographic information systems location data.

Intermediate:

Increased number of wetland and habitat related actions in the CCMP that have been completed. Increased leveraging of resources committed to NEP activities or towards implementation of CCMP goals and recommended actions. Increased number of acres of protected open land through purchase or easement.

Long-term:

CCMP Goal: Long-term increase of high-quality wetlands and coastal habitat in the Buzzards Bay watershed.

FFY22 Work Plan Task 2 - Stormwater Remediation and Technical Assistance

Planned Project/Activity Purpose and Description (July 1, 2022 - June 30, 2023): (Status: on-going)

Stormwater continues to be a special focus area for the NEP. Stormwater is contributing to nutrient and pathogen impairments in Buzzards Bay. There are roughly 5,500 acres of shellfish growing areas closed year-round. These closures are the result of bacterial contamination related to stormwater discharges. Because of these concerns, a large portion of the NEP's focus will remain on continuing the efforts of the Stormwater Collaborative. Previous SNEP funding terminates September 2021. The NEP will provide some support to the MMA to perform certain Stormwater Collaborative tasks during the winter months. During last year's work plan cycle the NEP helped MMA secure a \$71,000 DEP MS4 grant conduct field IDDE investigations in five towns, and conduct IDDE training sessions. This grant will terminate June 30, 2022. The Stormwater Collaborative will seek a fourth year of DEP MS4 funding, but continued funding is uncertain. The NEP staff will continue to support and train municipal officials and MMA staff on effective use of the IDDE trailer in both 2022 and 2023, irrespective of DEP funding.

During the upcoming work plan period, the NEP staff will provide other routine stormwater management technical support ranging from MS4 Notice of Intent development, MS4 reporting products, including the stormwater mapping through ArcGIS Online (MMA is providing the li-

cense) and Stormwater Management Plan guidance, and project review of designs in complex local permit applications upon request.

Besides the Stormwater Collaborative program support, the NEP aids towns on stormwater issues in several ways. First, we review stormwater designs proposed by towns for remediation projects, or at the request of a town board as part of local permitting or site plan review. Second, we help towns prepare grant applications for state and federal monies to help fund remediation of priority sites. Third, we assist towns to develop and implement stormwater management plans, like the Phase II MS4 NPDES municipal plans. Finally, we work with town boards to adopt local stormwater regulations and LID strategies.

Under this task, we will also continue to manage and guide the efforts of the Stormwater Collaborative, and to guide towns in their efforts to comply with MS4 permit requirements. The NEP stormwater specialists will continue to manage this complex regional initiative, collect stormwater samples, inspect stormwater facilities, and map stormwater networks, and provide guidance to MMA and the towns to implement these tasks.

The NEP's stormwater technical assistance program has clear measurable benefits including identification of potential illicit stormwater discharges, the creation of catchment and drainage system maps, and a water quality data management system to assist in municipal storm drain maintenance and tracking of stormwater problems. This information will be used for the creation of online data reports (see the [stormwater interactive map](#)) for each discharge that will establish priorities for the treatment of stormwater discharges conveying non-point sources of pollution. NEP reports and data will assist funding agencies and towns to target limited available dollars to treat stormwater discharges to improve water quality and open shellfish beds. This prioritization will aid municipalities in securing grants for remediation, such as CZM's Coastal Pollution Remediation fund. Another measure of the program's success will be the participation of additional municipalities in future years.

How the Project Supports the CCMP and Work Plan Goals:

Principally Stormwater Management, Shellfish Management, and Wetlands and Habitat action plans, secondarily Land Use, On-Site Septic System management plans.

How the Project Supports the CWA

This task supports these Clean Water Act core programs: 1) improving water quality monitoring, 2) developing strategies to meet Buzzards Bay total maximum daily loads (for bacteria), 3) controlling non-point source pollution on a watershed basis, 4) strengthening NPDES permits, and 5) supporting sustainable wastewater infrastructure, 8) protecting coastal waters and large aquatic ecosystems through the National Estuary Program.

Responsible Partners and Their Role(s):

On the Stormwater Collaborative Initiative, our principal partners on these projects are the Buzzards Bay watershed municipalities and their public works departments and the MMA. For on-site specific projects, DPWs will be the principal collaborator in developing the site-specific stormwater designs, as will municipal boards, districts, and environmental groups. Other partners may arise during project revisions, collaborations related to Massachusetts Environmental Policy Act (MEPA) permit submissions, or projects commencing that are of regional significance.

NEP Staff:

As described above, about 80% of the full-time and part-time Stormwater Specialists' time will be dedicated to tasks associated with the Stormwater Collaborative, with the balance of time re-

lated to broader stormwater management goals and services to municipalities not yet participating in the Stormwater Collaborative.

The part-time Stormwater Specialist will conduct the stormwater design reviews and will assist in the implementation of stormwater regulations. The Stormwater Specialists and Executive Director will develop state and federal grant applications and attend meetings as needed. The NEP Director also oversees staff in implementing the program.

Outputs, Products, or Deliverables:

1. Oversee and guide the Stormwater Collaborative stormwater network mapping and discharge monitoring program.
2. Maintenance of the Stormwater Collaborative water quality database.
3. Maintenance of the Stormwater Collaborative GIS database.
4. Coordination of Stormwater Collaborative activities.
5. General local stormwater initiative products include stormwater plan updates, review and analysis of stormwater calculations.
6. Develop engineering designs for three or four priority sites in the Buzzards Bay watershed.
7. Provide stormwater grants or provide technical assistance to municipalities in their efforts to secure funding for stormwater designs.
8. Work with towns to adopt improved stormwater regulations and policies, and compliance with MS4 permits.

Milestones:

In fall of 2022, assist MMA to complete reports and data submission requirements under their grant. The NEP will assist municipalities upon request to prepare documents and information to help them meet MS4 submission requirements and program deadlines. Project-specific timelines will be defined by meetings with the towns relating to best treatment strategies, the diagnosis of potential illicit connections, or MS4-specific submission deadlines.

For the general stormwater technical and financial assistance program, most products and activities in this technical assistance program are developed and are completed as needed on an ad hoc basis, and as permit applications are submitted, or as towns express interest and have match available to apply for federal and state grants. Some activities are defined by stormwater grants in the Buzzards Bay municipal grant program. Other specific milestones arise from projects already initiated.

Estimated Budget:

The costs for these tasks in terms of NEP staff time are estimated at more than \$315,000 (salary + fringe + indirect), or 60% of personnel costs. The MMA work will continue with nearly half funded through municipal contracts. Other expenditures in this task include about \$1,500 of the program's Supplies budget.

Outcomes:

Short-term:

Stormwater Collaborative Initiative: maintain database structures to meet needs, collect samples, implement management oversight, and program control measures.

General stormwater technical and financial assistance program: Increased citizen and government actions to protect and restore water quality and living resources in Buzzards Bay and its surrounding watershed through the implementation of the CCMP.

Intermediate:

Stormwater Collaborative Initiative: With the continued funding of the program, we hope to add additional towns as participants and work to include more municipal staff in the program, to make them more self-sufficient in implementing monitoring and mapping programs. This outcome will require local training to expand municipal self-reliance. Continue to transfer more management of the program responsibilities to municipalities.

General stormwater technical and financial assistance program: Increased leveraging of resources committed to NEP activities or towards implementation of CCMP goals and recommended actions.

Long-term:

Stormwater Collaborative Initiative: Eventual independence of Buzzards Bay municipalities from NEP management and oversight or stormwater monitoring and mapping obligations.

General stormwater technical and financial assistance program: Actions taken to protect and restore water quality and living resources in Buzzards Bay and its surrounding watershed through the implementation of the CCMP.

Pressures affecting outcomes:

Stormwater Collaborative Initiative: Sufficient funding from municipalities remains the greatest obstacle for completing tasks and meeting deadlines.

Stormwater Design Development: The NEP can handle requests for technical assistance depending upon workload and ongoing projects.

General stormwater technical and financial assistance: These efforts are also dependent on local interest and local match availability on site specific projects. The NEP can handle requests for technical assistance depending upon workload and ongoing projects.

FFY22 Work Plan Task 3 - Municipal Grant Program

Planned Project/Activity Purpose and Description (July 1, 2022 - June 30, 2023): (Status: on-going)

The NEP has set aside \$171,773 of the \$250,000 add-on SNEP funds to support the Buzzards Bay Municipal Mini-grant Program, up from \$110,000 from the previous year. With carryover of unspent funds from the FFY21 budget, the NEP will release a request for proposals for approximately \$200,000 in September 2022.

How the Project Supports the CCMP and Work Plan Goals:

Depending upon the specific municipal projects funded, this task has the potential to address numerous CCMP goals, an particularly Action Plan 1: Managing Nitrogen Sensitive Embayments, Action Plan 2: Protecting and Enhancing Shellfish Resources, Action Plan 3: Managing Stormwater Runoff and Promoting LID, Action Plan 4: Improving Land Use Management and Promoting Smart Growth, Action Plan 5: Managing Onsite Wastewater Disposal Systems, Action Plan 6: Managing Impacts from Boating, Marinas, and Moorings, 8: Restoring Migratory Fish Passage and Populations, Action Plan 15: Managing Coastal Watersheets and the Waterfront, Action Plan 16: Reducing Toxic Pollution, Action Plan 17: Preventing Oil Pollution, and Action Plan 18: Planning for a Shifting Shoreline and Coastal Storms, Action Plan 19: Protecting Public Health at Swimming Beaches.

How the Project Supports the CWA

Depending upon the specific municipal project funded, this task has the potential to address several Clean Water Act core programs directly or indirectly, including 1) strengthening water quality standards, 2) improving water quality monitoring, 3) developing total maximum daily loads, 4) controlling non-point source pollution, 5) strengthening NPDES permits (including MS4), 6) supporting sustainable wastewater infrastructure, 7) supporting CWA and state wetland protection efforts, and 8) protecting coastal waters and large aquatic ecosystems through the National Estuary Program.

Responsible Partners and Their Role(s):

Buzzards Bay municipalities are the applicants to the municipal grant program and the lead for implementing this task. Other partners, like the Buzzards Bay Coalition and Land Trusts often assist municipalities with their applications. The CZM South Coast Regional Coordinator, housed in the NEP offices, will also support project development by Buzzards Bay municipalities, and to encourage participation in the Buzzards Bay Municipal Grant Program and other state programs. The NEP staff do this when the grant application is not active.

NEP Staff:

Principal Staff involved in these tasks includes the Regional Planner who oversees grants and contracts, Executive Director, CZM, and the stormwater specialists, who help guide the stormwater engineering services contract.

Outputs, Products, or Deliverables:

Scopes developed, contracts awarded, press releases prepared, website updated with projects, projects overseen, projects completed, match documents received, and contracts closed.

Milestones:

1. RFR announced in September, grants awarded in November, grants terminate by March 2024.

Estimated Budget:

The municipal grant program has been allotted \$182,542. Any unexpanded funding from previous grant rounds will be rolled into this solicitation (currently estimated at \$43,000).

Outcomes:

Short-term:

Award of grants and the completion of work by March 2024 at the latest.

Intermediate:

Continued collaborations and partnerships sustained to ensure the development of new projects and designs for future funds including those funded by other state and federal grant programs and local sources.

Long-term:

Sustained local and state commitment to continued implementation of projects that will protect and restore water quality and living resources in Buzzards Bay and its surrounding watershed through the implementation of the CCMP and serving all populations within municipalities.

Pressures affecting outcomes:

There are two additional principal issues that can delay this effort. First, the state may delay the award or release of funds for various reasons. Second, municipalities may have problems meeting grant schedules for various reasons and request extensions in their grant agreements. Grants are generally set for 9-month completion, with extensions to 18 months if needed.

FFY22 Work Plan Task 4 - Program Oversight and Administration

Planned Project/Activity Purpose and Description (July 1, 2022 - June 30, 2024): (Status: on-going)

The NEP Executive Director and CZM Fiscal Officer ensure administration of the EPA and other grants and ISAs awarded to the NEP.

The NEP will submit complete GPRA report information to EPA as specified in the EPA Funding Guidance. The GPRA report for NEPs includes annual estimates of habitat and wetlands protected or restored, and annual estimates of funds leveraged in some way by the NEP. As a requirement of this agreement, the NEP will provide information on the GPRA performance measures to EPA by their required date.

How the Project Supports the CCMP and Work Plan Goals:

Supports all program activities.

How the Project Supports the CWA

This task supports core program 8) protecting coastal waters and large aquatic ecosystems through the National Estuary Program.

Responsible Partners and Their Role(s):

The NEP parent agencies of CZM and EEA are responsible for the fiduciary and financial reporting requirements of the NEP.

NEP Staff:

Principal Staff involved in these tasks: NEP Executive Director and Regional Planner (for municipal grants), with additional support from the CZM financial officer and CZM.

Outputs, Products, or Deliverables:

1. Financial reports to EPA.
2. Preparation of work plans, cooperative agreements, grant amendments.
3. Steering Committee meetings needed to review the work plan.
4. Performance reports to EPA.

Milestones:

1. Account draw downs and reports as needed and required.
2. GPRA and leveraging reports due to EPA annually in September 2022.
3. Draft FFY23 work plan sent to Steering Committee in April/May 2023.
4. Approved Cooperative Agreement sent to EPA in June 2023.
5. EPA finalize award by 30 July 2023.

6. Close out of previous work plan by September 2023.

Estimated Budget:

The only costs are NEP staff time.

Outcomes:

Short-term:

Meet all reporting and programmatic deadlines.

Intermediate:

Increase and improve upon the information that the Buzzards Bay community leaders, environmental managers, scientific and education community, Commonwealth of Massachusetts, federal officials, and the general public has for making management actions related to the restoration, protection, and sustainable use and enjoyment of Buzzards Bay and its watershed.

Long-term:

Increased citizen and government actions to protect and restore water quality and living resources in Buzzards Bay and its surrounding watershed through the implementation of the CCMP.

Pressures affecting outcomes:

Few pressures will affect this task, but delays in completion of grant awards may result in a request to EPA to extend a Cooperative Agreement.

FFY22 Work Plan Task 5 - Buzzards Bay Citizens' Water Quality Monitoring

***Planned Project/Activity Purpose and Description (January 1, 2022 - December 31, 2023):
(Status: ongoing)***

With its support from the NEP, the Commonwealth of Massachusetts, citizens, Coalition dues, and other sources, the Coalition will continue its nationally recognized water quality monitoring program which costs roughly \$250,000 annually. The NEP is providing \$40,000 in this year's budget for that task (Task 1 of the sub-award to the Buzzards Bay Coalition). The NEP will continue to provide technical support to Coalition staff in implementing the Monitoring Program. The NEP and the Coalition will continue to use data to advocate for nitrogen management in Buzzards Bay Watershed communities and to evaluate trends in Buzzards Bay. The data is also used by DEP's Massachusetts Estuaries Project in the development of TMDLs. The Commonwealth of Massachusetts for several years has provided between \$50,000 and \$150,000 annually towards this program that was used as match to our program.

The NEP director will continue to participate in the Coalition SAC workgroup, which continues to work on several tasks, including a recommended monitoring and modeling requirements for any potential new wastewater outfalls that would be allowed under a changed state law that would enable such new outfalls.

How the Project Supports the CCMP and Work Plan Goals:

This task principally supports Action Plan 1: Managing Nitrogen Sensitive Embayments, Action Plan 2: Protecting and Enhancing Shellfish Resources, Action Plan 4: Improving Land Use Management and Promoting Smart Growth, Action Plan 5: Managing Onsite Wastewater Disposal Systems, Action Plan 19: Protecting Public Health at Swimming Beaches, Action Plan 20: Moni-

toring Management Action, Status, and Trends, Action Plan 21: Enhancing Public Education and Participation.

How the Project Supports the CWA

This task supports these core programs: 1) strengthening water quality standards, 2) improving water quality monitoring, 3) developing total maximum daily loads, and 4) controlling non-point source pollution on a watershed basis and CWA and state wetland protection efforts.

Responsible Partners and Their Role(s):

The Coalition is the lead for the water quality program and is responsible for meeting state and federal QAPP requirements. They are also the lead on the SAC, but the NEP Director is also a member of that committee and can provide technical and material support for some of their activities. The NEP Regional Planner provides GIS products in support of the water quality monitoring program. The NEP Executive Director coordinates with the Coalition Executive Director, and the Coalition's newly established SAC, on needed program support, and provides technical assistance and guidance on biannual water quality and related State of the Bay products.

NEP Staff:

Principal Staff involved will be the NEP Executive Director, Regional Planner, and other NEP staff as required.

Outputs, Products, or Deliverables:

1. Annual data disks provided to the NEP.
2. Updates posted to Coalition and NEP website.
3. Electronic rainfall database maintained for evaluating impacts to water quality.

Milestones:

1. Though not required under a grant, the Coalition will share the water quality data for the summer of 2021 monitoring in September of 2022.

Estimated Budget:

The only costs of Section 320 funds under this Cooperative Agreement with EPA are the NEP staff time (principally the NEP Director) working with Coalition staff. The Coalition's budget for the monitoring program is approximately \$250,000, much of which is used as match. The NEP will also work with Coalition staff to secure additional sources of funding, including through EPA targeted grants to the NEPs

Outcomes:

Short-term:

Increased information availability for use by Buzzards Bay community leaders, environmental managers, scientific and education community, Commonwealth of Massachusetts, federal officials, and the public to make better management decisions and actions related to the restoration, protection, and sustainable use and enjoyment of Buzzards Bay and its watershed. Increase involvement of citizens to protect the natural resources of Buzzards Bay by actively empowering people to get involved and make a difference in the sound management and restoration of the Bay's resources.

Intermediate:

Improved public and governmental understanding of Buzzards Bay environmental issues, increased productivity of partners needing information or Buzzards Bay documents, and increased public and financial support for action to protect and restore Buzzards Bay. The advancement in knowledge on the effects of nitrogen pollution and documentation of the condition of localized water quality throughout Buzzards Bay harbors in relation to nutrient loads from the watersheds. Provide external water quality data for the DEP to assess water body health and develop cleanup plans for impaired waters.

Long-term:

Maintain, and ideally increase, the number of acres of eelgrass habitat in Buzzards Bay through reduced nitrogen loading. Meet nitrogen action plan goals: 1. Ensure that beneficial water uses will not be lost, nor will ecosystems be adversely affected by excessive contributions of nitrogen to any embayment within Buzzards Bay; 2. Restore any beneficial water uses and ecosystems lost or impacted by the excessive contribution of nitrogen to any embayment within Buzzards Bay.

Pressures affecting outcomes:

The Coalition is considering implementing a program to freeze certain samples for certain analyses as allowed for under the existing QAPP, if social distancing procedures or other policies cannot be implemented during the July-August sampling period. This may affect turnaround time in receiving data and data analysis from the Coalition's analytical laboratory.

FFY22 Work Plan Task 6 - Environmental Indicators and Outcomes Tracking

Planned Project/Activity Purpose and Description (July 1, 2022 - June 30, 2023): (Status: on-going)

The U.S. EPA requires an assessment of environmental “outputs” and “outcomes,” and a method to measure achievement of outputs and outcomes in our efforts to implement the CCMP, and to meet our overarching goal to protect and restore water quality, wetlands, and habitat in Buzzards Bay and its surrounding watershed. The NEP defines environmental outcomes and preliminary indicators through its annual GPRA submissions.

The NEP submitted its first GPRA report to EPA in October 2003 and continues to submit this information annually. To a large degree, the NEP will measure this work plan's outputs and outcomes based on annual reporting of work plan tasks completed, CCMP recommendations implemented, remediation projects completed, and our GPRA/environmental indicators reporting. Each work plan will contain a summary of tasks and measurable outcomes accomplished over the previous year, and tasks ongoing through program extensions.

Because a new Coalition *State of the Bay* report is not due until January 2027, the NEP will continue to internally track certain indicators like shellfish closure statistics and eelgrass cover summaries under this work plan. Even when a state of the Bay report is not completed in a particular year, the Buzzards Bay Coalition continues to update its website with bay health index data. Other data tracked by the NEP include stormwater discharges, tracking of CCMP accomplishments, and the ongoing tracking of protected open space and new land acquisitions (GPRA data).

How the Project Supports the CCMP and Work Plan Goals:

All Action Plans to a degree, but particularly Action Plan 20: Monitoring Management Action, Status, and Trends, and Action Plan 21: Enhancing Public Education and Participation.

How the Project Supports the CWA

This task may indirectly support any of these CWA core program: 1) strengthening water quality standards, 2) improving water quality monitoring, 3) developing total maximum daily loads, 4) controlling non-point source pollution on a watershed basis, 5) strengthening NPDES permits, 6) supporting sustainable wastewater infrastructure and CWA and state wetland protection efforts.

Responsible Partners and Their Role(s): (Status: ongoing)

The Coalition is a key partner in this effort and is the lead in the collection and tracking of several data sets. The Massachusetts Division of Marine Fisheries is the lead agency in collecting and assessing shellfish closures, and provides this data to the NEP. The NEP coordinates closely with DMF in creating Buzzards Bay GIS shellfish bed closures.

NEP Staff:

Executive Director.

Outputs, Products, or Deliverables:

1. Annually updated shellfish bed closure maps for Buzzards Bay posted at the program's annual summary shellfish closure web page.
2. The Coalition updates in online health index data each winter.
3. GPRA reports submitted to EPA
4. Stormwater monitoring data published online at least annually.

NEP Milestones:

1. Shellfish bed closure map through 2022 updated by January 2023.
2. GPRA submitted September 2022 for the previous work plan period,

Estimated Budget:

For NEP tasks, the only section 320 funds are NEP staff time. Because the state of the Bay report was completed in 2022, little effort is required under this task.

Outcomes:

Short-term:

Increased information availability for use by Buzzards Bay community leaders, environmental managers, scientific and education community, Commonwealth of Massachusetts, federal officials, and the general public to make better management decisions and actions related to the restoration, protection, and sustainable use and enjoyment of Buzzards Bay and its watershed.

Intermediate:

Improved public and governmental understanding of Buzzards Bay environmental issues, increased productivity of partners needing information or Buzzards Bay documents, and increased public and financial support for action to protect and restore Buzzards Bay. The advancement in knowledge on the effects of nitrogen pollution and documentation of the condition of localized water quality throughout Buzzards Bay harbors in relation to nutrient loads from the watersheds.

Long-term:

Increased citizen and government actions to protect and restore water quality and living resources in Buzzards Bay and its surrounding watershed through the implementation of the CCMP.

Pressures affecting outcomes:

Unanticipated demands on staff time, particularly those of the NEP director, will have the greatest impact on this task.

The NEP continues to track various environmental indicators on its website including shellfish bed closures ([shellfish closure web page](#) and Fig. 9 and Fig. 10) and eelgrass abundance. The Buzzards Bay eelgrass estimates are based on DEP databases, and our own interpretation of aerial photographs in areas not covered by DEP's analysis. These data will be used during the Coalition's quadrennial *State of the Bay* report, likely next issued January 2027.

FFY22 Work Plan Task 7 - Outreach and Education

Planned Project/Activity Purpose and Description (July 1, 2022 - June 30, 2023) (ongoing):

Most of the activities under this task are met by the Coalition, but an important element is the Buzzards Bay NEPs partnership. With respect to the NEP, our outreach and education efforts principally focus on reaching out to the public thorough the program's website, or through more directed efforts in support of municipalities through training workshops, participation in public meetings, and preparation of brochures, meeting with residents on site specific projects, and handouts as requested by towns. Some of these specific actions are included in other tasks of this work plan.

The NEP will resume its support for the two annual Wetlands Delineation Workshops and special request workshops (as needed) conducted by the Massachusetts Association of Conservation Commissions ([MACC](#)). The workshops were suspended in 2021 because of the COVID Pandemic. These workshops are conducted by retired NEP wetlands specialist, John Rockwell, who does the workshops on a pro bono basis.

Since the 1990s, to avoid redundancy of public outreach efforts in the face of diminishing funds and staff resources, the NEP relies on the general public outreach of the Coalition². The Coalition will continue to undertake outreach and education activities highlighting the condition and state of Buzzards Bay, progress toward restoration and protection goals, and collaboration with the NEP in their activities. These activities include the July Swim Buzzards Bay event, the October Buzzards Bay Watershed Ride, their annual meeting, press events, and various publications, including the annual report to their members.

The Coalition will continue to maintain their website. The Coalition will also continue its advocacy efforts through their various programs.

The BBAC continues to hold monthly meetings inviting relevant speakers and hosting workshops for MCZM and the NEP as needed. They have also expanded their website to include recent actions and accomplishments such as their Earth Day activities.

² This strategy was formalized in a 2005 Memorandum of Understanding between the NEP, Coalition, and the Buzzards Bay Action Committee.

How the Project Supports the CCMP and Work Plan Goals:

To a degree, this task supports many action plans, but especially meets Action Plan 21: Enhancing Public Education and Participation.

How the Project Supports the CWA

This task will principally support this CWA core program: 4) controlling non-point source pollution on a watershed basis but may also indirectly support 1) strengthening water quality standards, 2) improving water quality monitoring, 3) developing total maximum daily loads, 5) strengthening NPDES permits, 6) supporting sustainable wastewater infrastructure and CWA and state wetland protection efforts.

Responsible Partners and Their Role(s):

The Coalition and the BBAC are our principal partners, but we may collaborate with other organizations such as the Massachusetts Association of Conservation Commissions. The NEP may also periodically prepare articles and notes for CZMail, an e-newsletter hosted by Massachusetts Coastal Zone Management. The BBAC promotes increased awareness in their municipalities' intra-town networking.

NEP Staff:

Principal Staff involved will be the NEP Executive Director and other NEP staff as required.

Outputs, Products, or Deliverables:

Coalition and NEP websites. Coalition newsletter, flyers, posters, press releases, and reports to their members and residents about actions to protect and restore Buzzards Bay.

Improve NEP website information, brochures, and flyers. Help update the BBAC website. Provide wetlands delineation materials and [web page](#).

Milestones:

Both the Coalition and BBAC have established schedules to meet their own goals and guidelines and are not included in this work plan.

Estimated Budget:

The only section 320 fund costs are the NEP staff time, and occasional costs for light refreshments and/or meals served at meetings, conferences, training workshops and outreach activities (events), consistent with 41 CFR 301-74.7, and as approved by the Director.

Outcomes:

Short-term:

Increased information availability for use by Buzzards Bay community leaders, environmental managers, scientific and education community, Commonwealth of Massachusetts, federal officials, and the general public to make better management decisions and actions related to the restoration, protection, and sustainable use and enjoyment of Buzzards Bay and its watershed.

Intermediate:

Improved public and governmental understanding of Buzzards Bay environmental issues, increased productivity of partners needing information or Buzzards Bay documents, and increased public and financial support for action to protect and restore Buzzards Bay.

Long-term:

Increased citizen and government actions to protect and restore water quality and living resources in Buzzards Bay and its surrounding watershed through the implementation of the CCMP.

Pressures affecting outcomes:

However, many of the Coalition outreach efforts around specific projects may be canceled, such as the Buzzards Bay Swim. Like all other tasks, unanticipated demands on staff time can also affect which outcomes are met.

FFY22 Work Plan Task 8 - Specialized Technical Assistance

CCMP/Work Plan Goals:

Various action plans including nitrogen management, stormwater management, land use planning, and open space protection.

How the Project Supports the CWA

This task may directly or indirectly support any of these CWA core program: 1) strengthening water quality standards, 2) improving water quality monitoring, 3) developing total maximum daily loads, 4) controlling non-point source pollution on a watershed basis, 5) strengthening NPDES permits, 6) supporting sustainable wastewater infrastructure and CWA and state wetland protection efforts.

Planned Project/Activity Purpose and Description (July 1, 2022 - June 30, 2023) (ongoing):

This task includes technical assistance of NEP staff to municipalities, non-profits, other agencies, and the public to meet the goals of the CCMP. Because the CCMP is a non-regulatory document, most recommendations are directed toward municipalities because they have the greatest authority. Whether certain activities are initiated depends upon our partners' capacity to address specific growth-related and non-point source pollution problems facing the bay and watershed. Consequently, the NEP provides this assistance on an ad hoc. This technical assistance primarily focuses on specific initiatives funded or managed by the NEP but can include a wide range of CCMP issues and management topics. Work under this task is provided based on the availability of staff, and at the direction of the NEP director to ensure that technical assistance efforts continue to meet the needs and goals of the NEP.

Responsible Partners and Their Role(s):

Key partners in this effort include the Coalition, the BBAC, Buzzards Bay municipalities, CZM, and other state and federal agencies.

NEP Staff:

All NEP staff work on these projects as needed or required.

Outputs, Products, or Deliverables:

1. Provide specialized technical assistance to municipalities to promote low impact development, remediate stormwater discharges, and adopt stormwater management strategies, promote better management of on-site septic systems and innovative wastewater systems; improve local wetlands and habitat protection, manage nitrogen loadings, prepare and adopt open space plans.
2. Identify new local actions needed to support the development of the updated CCMP.

3. Encourage towns to take actions that support the updated CCMP.
4. Promote LID and Smart Growth strategies and stormwater management in Buzzards Bay communities.
5. Help towns develop concepts, remediation strategies and help prepare grant applications to implement programs and projects to implement CCMP recommendations.
6. Promote better management of on-site wastewater systems and use of innovative technologies.
7. Help municipalities improve local wetlands and habitat protection through regulatory and non-regulatory approaches.

Milestones:

Depends on future projects that cannot be anticipated at this time.

Estimated Budget:

The only costs are NEP staff time.

Outcomes:

Short-term:

Increased information availability for use by Buzzards Bay community leaders, environmental managers, scientific and education community, Commonwealth of Massachusetts, federal officials, and the public to make better management decisions and actions related to the restoration, protection, and sustainable use and enjoyment of Buzzards Bay and its watershed.

Intermediate:

The advancement in knowledge on the effects of nitrogen pollution and documentation of the condition of localized water quality throughout Buzzards Bay harbors in relation to nutrient loads from the watersheds.

Long-term:

Increased citizen and government actions to protect and restore water quality and living resources in Buzzards Bay and its surrounding watershed through the implementation of the CCMP.

Pressures affecting outcomes:

We provide technical assistance on a first come first serve basis and as allowed by available staff time.

FFY22 Work Plan Task 9 - Technology Transfer to Other Estuaries

Planned Project/Activity Purpose and Description (July 1, 2022 - June 30, 2023): (Status: ongoing)

The NEP Director anticipates attending both the spring and fall NEP national meetings. The U.S. EPA requires NEP attendance at out-of-state conferences, particularly the spring and fall National Estuary Program meetings. Because of financial limitations, only the NEP Director will attend these meetings. The NEP Director also participates in the Coalition's SAC. Additionally, the NEP Director participates in the SNEP. The NEP Director will also, from time to time, provide technical assistance to other NEP directors, the Association of National Estuary Programs, and

other national programs in efforts to communicate the benefits of protecting and restoring national estuaries.

How the Project Supports the CCMP and Work Plan Goals:

All CCMP actions to some degree.

How the Project Supports the CWA

This task principally supports CWA core program 8) protecting coastal waters and large aquatic ecosystems through the National Estuary Program.

Responsible Partners and Their Role(s):

The Coalition and the NEP send the appropriate staff to these meetings, or participate in collaborative NEP conference calls, webinars, training events, and meetings.

NEP Staff:

The NEP Executive Director or his designee will attend the fall 2022 (remotely) and spring 2023 NEP meetings and participate in conference calls, web meetings, and communication efforts. Other NEP staff may attend meetings as required by the Executive Director.

Outputs, Products, or Deliverables:

1. Attendance at NEP meetings.
2. Presentations at out of state meetings.
3. Information transfer to Buzzards Bay communities.
4. Informational materials to area legislators.

Milestones:

Attendance of fall 2022 (remotely) and spring 2023 EPA-NEP meeting (in Washington DC) at a minimum. Staff may also attend other national conventions (on planning, wetlands, and storm-water as budget, availability, and staff time allows, and as allowed by state policy.)

Estimated Budget:

The travel budget (\$3,600) covers the expenses of one out-of-state meeting, as well as all in-state travel of staff.

Outcomes:

Short-term:

Information and lessons from Buzzards Bay transferred to other entities.

Intermediate:

Increased involvement of citizens to protect the natural resources of Buzzards Bay by actively empowering people to get involved and make a difference in the sound management and restoration of the Bay's resources.

Long-term:

Increased citizen and government actions to protect and restore water quality and living resources in Buzzards Bay and its surrounding watershed through the implementation of the CCMP.

Pressures affecting outcomes:

Unanticipated budget shortfalls can require elimination of out-of-state travel.

FFY22 Work Plan Task 10 - Website Maintenance and Innovation

Planned Project/Activity Purpose and Description (July 1, 2022 - June 30, 2023): (Status: on-going)

The NEP shall continue to maintain an independent website (Buzzardsbay.org) to assist the NEP to promote new approaches, receive feedback, communicate successes, track trends in water quality, performance of government in implementing the CCMP, express the views and concerns of the NEP Steering Committee, create a forum for new initiatives and ideas of our partners, and support other obligations and tasks identified in this work plan. The website is also used to post results of the bay indicators and documents relating to the oil spill, data in support of the Coalition's *State of the Bay* reports, and post procurement notices and grant announcements. The NEP has also been systematically scanning all old NEP reports and gray literature related to Buzzards Bay and posting it on our website main website buzzardsbay.org and the subdomains climate.buzzardsbay.org, and stormwater.buzzardsbay.org.

In addition to our own website, the NEP designed and continues to maintain the BBAC's website, buzzardsbayaction.org. Their page is updated with stories, photos, videos, and presentations at the request of the BBAC.

How the Project Supports the CCMP and Work Plan Goals:

Supports all activities, in particular Trends, Action Plan 21: Enhancing Public Education and Participation.

How the Project Supports the CWA

This task does not directly support any CWA core programs but may indirectly support 2) improving water quality monitoring, 4) controlling non-point source pollution on a watershed basis, 6) supporting sustainable wastewater infrastructure and CWA and state wetland protection efforts, and 8) protecting coastal waters and large aquatic ecosystems through the National Estuary Program.

Principal Staff involved in these tasks:

Executive Director.

Responsible Partners and Their Role(s):

The NEP coordinates with the Coalition to ensure that each of our indicator and tracking pages are consistent where we provide overlapping information.

NEP Staff:

The NEP Executive Director is the web master and principal author of the website. Other NEP staff contribute to the site with specific documents and materials, and review.

Outputs, Products, or Deliverables:

1. Posting of new web pages and documents.
2. Update of existing web pages.
3. Modify all pages and documents to meet state and federal requirements for accessibility of the site for those with disabilities including W3C, WAI, and Section 508 compliance.

Milestones:

Updates and postings as need or required.

Estimated Budget:

The only costs are NEP staff time.

Outcomes:

Short-term:

Improved public and governmental understanding of Buzzards Bay environmental issues, increased productivity of partners needing information or Buzzards Bay documents, and increased public and financial support for action to protect and restore Buzzards Bay.

Intermediate:

Increased citizen and government actions to protect and restore water quality and living resources in Buzzards Bay and its surrounding watershed through the implementation of the CCMP.

Long-term:

Assists in advancing all CCMP goals

Pressures affecting outcomes:

Creation of new pages limited by time availability of the Executive Director (webmaster) to add new information and links.

FFY22 Work Plan Task 11 - Scientific collaboration on nitrogen TMDLs, climate impacts, and water quality impacts on natural resources

Planned Project/Activity Purpose and Description (July 1, 2022 - June 30, 2023):

The NEP will continue to work with the Coalition and area scientists to complete and publish findings related to the Coalition's water quality data set and land use changes in Buzzards Bay and other collaborations involving area scientists. In 2021, the NEP partnered with the Coalition and the Town of Bourne to receive 604(b) funding from MassDEP to conduct a TMDL assessment for Red Brook Harbor Phinneys Harbor Complex in the town of Bourne. The NEP has agreed to complete several tasks for this assessment (at no cost), including conducting GIS analyses of watershed land use, including the number of onsite systems, determining occupancy rates for census data, determining land use types including estimates of impervious area, lawn area, extent of sewerage, and agriculture.

Under this task, the NEP may undertake these additional tasks to support partners, including:

- Conduct a similar analysis for the catchment area of each stormwater discharge monitored in the study.
- Aid in evaluating the Coalition's water quality data set.
- Provide guidance on the preparation of QAPPs in support of these studies, and if appropriate, amend the Stormwater Collaborative QAPP to include analyses by a laboratory.
- Define sewer history in Buzzards Bay embayments, including the enumeration of septic systems over time based on municipal assessors' records of the year of construction of each property in the assessed watersheds.
- The NEP will work with the MMA to ensure the collection of stormwater samples and sample splits to be analyzed by a laboratory.

How the Project Supports the CCMP and Work Plan Goals:

This task principally supports Action Plan 1: Managing Nitrogen Sensitive Embayments, but also Action Plan 7: Protecting and Restoring Wetlands, and Action Plan 2: Protecting and Enhancing Shellfish Resources.

How the Project Supports the CWA

This task supports several Clean Water Act core programs directly or indirectly including elements: 2) improving water quality monitoring, 4) controlling non-point source pollution on a watershed basis, 6) supporting sustainable wastewater infrastructure and CWA and state wetland protection efforts, and climate adaptation related priorities, 8) protecting coastal waters and large aquatic ecosystems through the National Estuary Program.

Principal Staff involved in these tasks:

Executive Director.

Responsible Partners and Their Role(s):

The NEP coordinates with the Coalition, and the SAC to ensure that the findings derived from the water quality datasets and precipitation and climate records are sound.

NEP Staff:

The NEP Executive Director is the lead on this effort. Other NEP staff contributes to the effort with specific documents, data entry, and review.

Outputs, Products, or Deliverables:

1. Posting of new web pages and documents in support of the effort.
2. Production of data set that meets EPA, NEP, and Coalition and collaborating researcher goals and needs.
3. Issuance of a report on the history of wastewater loading to Buzzards Bay.

Milestones:

Updates and postings as need or required.

Estimated Budget:

The only costs are NEP staff time.

Outcomes:

Short-term:

Improved Coalition water quality data set that can be imported into other applications, and incorporates necessary QA records, information, and metadata.

Intermediate:

Increased utility of the data set for more expedited development of water quality health index scores and facilitated joining to GIS data.

Long-term:

Increased utility and use of the dataset by independent researchers.

Pressures affecting outcomes:

Work on the data set limited by time availability of the Executive Director.

FFY22 Work Plan Task 12 - Salt Marsh Loss Assessment and Runnel Study Collaboration with Coalition

Planned Project/Activity Purpose and Description (July 1, 2022 - June 30, 2023): (Status: on-going)

The NEP and our non-profit partner organization, the Coalition will continue to study salt marsh die-off in Buzzards Bay. The NEP has installed the needed elevation benchmarks and will continue to document transect elevations and tidal elevations and interpret changes in marsh boundaries in historical photographs during 2022 and 2023. The data will be used to verify the remote sensing data and collect additional water quality data and document specific damage associated with crab grazing, storm damage and several other marsh indicators. The NEP continues to be the lead on the GIS analysis. This effort will follow and refine draft marsh monitoring protocols developed by DEP and CZM under an EPA Wetlands Program Development grant awarded last year. The NEP will support the studies also through Light Detection and Ranging (LiDAR) analysis³

To support this task, the NEP has set aside \$44,006 for an ISA with UMass Dartmouth for a second season of monitoring to support the salt marsh loss study (see subawards section). The imagery will be processed to provide both ortho rectified imagery and photogrammetric processing to generate a digital elevation model to be used in ArcGIS. Pixel size for both products will be less than 0.1 meters.

This task supports several Clean Water Act core programs indirectly including elements: 2) improving water quality monitoring, 4) controlling non-point source pollution on a watershed basis, 6) supporting sustainable wastewater infrastructure and CWA and state wetland protection efforts, and climate adaptation related priorities.

How the Project Supports the CCMP and Work Plan Goals:

Principally supports Action Plan 18: Planning for a Shifting Shoreline and Coastal Storms, and Action Plan 7: Protecting and Restoring Wetlands.

How the Project Supports the CWA

This task supports several Clean Water Act core programs indirectly including elements: 2) improving water quality monitoring, 4) controlling non-point source pollution on a watershed basis, 6) supporting sustainable wastewater infrastructure and CWA and state wetland protection efforts, and climate adaptation related priorities, and 8) protecting coastal waters and large aquatic ecosystems through the National Estuary Program.

Principal Staff involved in these tasks:

Executive Director, Coalition Staff, Coalition SAC subgroup (Anne Giblin, Chris Neill, Linda Deegan are among the principals).

Responsible Partners and Their Role(s):

The NEP coordinates with the Coalition, and the SAC to ensure that the findings derived from analysis are sound.

³ See <http://climate.buzzardsbay.org/marsh-migration-methods.html>

NEP Staff:

The NEP Executive Director is the lead on this GIS component of the effort. Other NEP staff may contribute to the effort with specific documents, data entry, and review.

Outputs, Products, or Deliverables:

1. Posting of new web pages and documents in support of the effort.
2. UMass Dartmouth unmanned aerial system salt marsh surveys in the Fall of 2022 or summer of 2023.
2. Production of GIS data sets that meets EPA, NEP, Coalition, and collaborating researcher goals and needs.
3. Issuance of a report on the history of salt marsh boundary changes at the selected sites and like causes prepared by the Coalition and Science Advisory principals.
6. Incorporation of marsh loss into future Buzzards Bay *State of the Bay* reports (as a narrative element). The Coalition prepares these reports with NEP support, and changes in salt marsh area or condition are not currently reported. In future reports the Coalition will report findings from periodic aerial surveys of marsh condition (narrative element).

Milestones:

The summer monitoring season is expected to be complete by October 1, 2022. GIS coverage of key historical aerial surveys will be completed by December 30, 2023. Other updates and web postings as need or required.

Estimated Budget:

NEP staff time, principally the Director.

Outcomes:

Short-term:

Baseline vegetation and elevation data at a minimum of 10 reference sites. Improved GIS data set of existing and historical marsh boundaries. Data set that can be imported into other applications, and incorporates necessary QA records, information, and metadata.

Intermediate:

Increased utility of the data set for more expedited analysis of saltmarsh loss. A report on the potential or likely cause of marsh loss in each of the 10 sites.

Long-term:

Increased utility of salt marsh change dataset that can be used by independent researchers.

Pressures affecting outcomes:

For the NEP task, limited by time availability of the Executive Director. At the Coalition, the efficacy and efficiency of the salt marsh field monitoring and sampling protocols.

FFY22 Work Plan Task 13 - Technical Assistance to Support Coastal Resiliency and Municipal Vulnerability Preparedness

Planned Project/Activity Purpose and Description (July 1, 2022 - June 30, 2023):

In September 2021, the Commonwealth of Massachusetts announced the availability of \$3.0 million in Coastal Resiliency Program (CRP) grant funds, and in March 2022, the availability of

\$11.1 million in Municipal Vulnerability Preparedness (MVP) grant funds were announced. The NEP has been providing technical support to Buzzards Bay municipalities and CZM on priority needs in the Buzzards Bay watershed based on past sea level rise studies and technical analyses conducted previously by NEP or other entities. This technical assistance included developing maps, analyses, and information that can be used to support Buzzards Bay municipal applications.

How the Project Supports the CCMP and Work Plan Goals:

Principally supports Action Plan 18: Planning for a Shifting Shoreline and Coastal Storms.

How the Project Supports the CWA

This task supports several Clean Water Act core programs directly or indirectly, including 6) supporting sustainable wastewater infrastructure, 7) supporting CWA and state wetland protection efforts, and 8) protecting coastal waters and large aquatic ecosystems through the National Estuary Program.

Principal Staff involved in these tasks:

NEP Executive Director and Regional Planner; and collaboration with the CZM South Coast regional coordinator.

Responsible Partners and Their Role(s):

As has been done in the past, the NEP director will coordinate with the CZM South Coast Regional Coordinator to provide technical support for the development of proposal concepts for future state grant reports. Technical support will include LiDAR data, watershed, and land use GIS analysis in support of applications, guidance on the development of tasks and project budgets, and other activities that would support Buzzards Bay municipality participation in these grant programs.

Outputs, Products, or Deliverables:

Production of maps, data, and information that will support municipal applications to the CRP and MVP grant programs.

Milestones:

Work on this project would be performed upon request on an ad hoc basis. At the start of the Cooperative Agreement, an announcement would be sent from the NEP to all applicable boards about the availability of NEP technical support for municipal applications to the CRP and MVP grant programs. The announcement will include back links to the NEP website with existing interactive maps and datasets relevant to municipalities that support this task.

Estimated Budget:

NEP staff time. A minimum of \$182,542 in grants are estimated to be awarded to Buzzards Bay municipalities from the CRP and MVP programs during this work plan period, and they are expected to be used as cash match to this Cooperative Agreement. Both programs are state funded.

Outcomes:

Short-term:

Increased number of municipal applications to the CRP and MVP grant programs.

Intermediate:

Increased number of awards from the CRP and MVP grant programs from Buzzards Bay municipalities.

Long-term:

Increased coastal resiliency and municipal vulnerability preparedness within the Buzzards Bay watershed.

Pressures affecting outcomes:

For the NEP, limited by time availability of the Executive Director, and programmatically, local commitment of staff to support and application, and the level of competition for state grant funds.

FFY22 Work Plan Task 14 - Targeted Grant Sub-awards

Planned Project/Activity Purpose and Description (July 1, 2022 - June 30, 2023):

This work plan has four targeted subawards. The Coalition water quality monitoring effort is also described in Task 5. The other two subawards are described here. For discretionary subawards utilizing U.S. EPA Southeast New England Program (SNEP) funds, the NEP has adopted a policy with a goal to limit indirect costs for discretionary subawards by encouraging recipients to waive costs above program goals. This policy is established to maximize the cost-effectiveness of federal funds and to help justify the subaward process. For discretionary subawards, the following policies will apply pursuant to the federal cooperative agreement for this workplan.

- **Entities without a federally-negotiated indirect cost rate agreement:** Indirect costs of sub-awardee recipients are limited to 10% of the total direct costs. Any unreimbursed indirect expenditures, if from a non-federal source, may be reported by the sub-awardee as match in their close-out report to the Buzzards Bay National Estuary Program.
- **Entities with a federally-negotiated indirect cost rate agreement:** Under 2 CFR 200.306(c), sub-awardee recipients with approved federally negotiated indirect cost rates may use unrecovered, unreimbursed, or waived indirect costs that exceed the NEP's goal of limiting indirect costs to 26% of Modified Total Direct Costs, as defined by 2 CFR 200.68, as match in their close-out report to the Buzzards Bay National Estuary Program.

1) Continued Collaboration with UMass Dartmouth Salt Marsh Unmanned Aircraft System Surveys (\$46,708)

Under this initiative, the NEP will continue its partnership with UMass Dartmouth to continue both a senior studies project and a graduate student research project to using Unmanned Aircraft System Surveys to map changes in salt marsh boundaries, vegetation, and elevations. The elevation monitoring will involve sophisticated photogrammetry software and field elevation surveys of control points. Data will be collected under an EPA approved QAPP.

How the Project Supports the CCMP and Work Plan Goals:

This subaward principally supports Action Plan 7: Protecting and Restoring Wetlands, Action Plan 9: Protecting Biodiversity and Rare and Endangered Species Habitat, and Action Plan 18: Planning for a Shifting Shoreline and Coastal Storms.

How the Project Supports the CWA

This task supports several Clean Water Act core programs including CWA and state wetland protection efforts, and climate adaptation related priorities.

2) Continued Monitoring Nitrogen Inputs to Buzzards Bay from Coastal Rivers (Woodwell Climate Research Center, \$44,616)

With support from the Buzzards Bay National Estuary Program, with Federal FY20 funding, in late 2021 and early 2022, the Woodwell Climate Research Center established stage gauges on ten Buzzards Bay Rivers (Table 1). Two additional rivers are gauged by the U.S. Geological Survey as part of the Waters Resources of the United States (USGS 2022) network (Table 1). These gauges (Fig. 1) now provide stage measurements every 30 minutes. The data from the Woodwell gauges are downloaded, and quality checked monthly. The data from the USGS gauges are downloaded and combined into the same Buzzards Bay Rivers database. In March 2021, in the same 12 rivers, in the Woodwell Center began sampling water chemistry twice monthly during May to October and monthly during November to April.

In this follow-up study, Woodwell proposes to continue monitoring these rivers to better understand the factors that drive these patterns. Specifically, the Woodwell Center will: (1) continue stage recordings from this river network for one year from July 1, 2022 to June 30, 2023; (2) improve stage-discharge curves for each river by making field measurements of discharge six times in each river across a range of high and low flows; (3) sample concentrations of different dissolved and particulate nitrogen and phosphorus forms twice monthly during May through October and monthly during November through April for one year from July 1, 2022 to June 30, 2023. Chemical analyses will include ammonium, nitrate, dissolved organic nitrogen, particulate organic nitrogen, phosphate, and total phosphorus in river water. Rating curves will be developed by measuring discharge monthly with a SonTek FlowTracker2 hand-held flow meter in smaller rivers or a tow-across StreamPro acoustic doppler current profiler in larger rivers. Stage recorders are Onset Hobo MX-2001 dataloggers. We will use the combination of flow and concentrations to estimate total nitrogen and phosphorus loads in river discharge for the 12 rivers. Annual loads will be calculated from discharge and concentrations using LOADEST and other similar data and modeling approaches⁴. All methods will follow those described in the Quality Assurance Project Plan developed for this project.

How the Project Supports the CCMP and Work Plan Goals:

This subaward principally supports Action Plan 1: Managing Nitrogen Sensitive Embayments, but also Action Plan 7: Protecting and Restoring Wetlands, Action Plan 9: Protecting Biodiversity and Rare and Endangered Species Habitat, and Action Plan 13: Protecting and Restoring Ponds and Streams.

How the Project Supports the CWA

This task supports several Clean Water Act core programs including CWA and state wetland protection efforts, and climate adaptation related priorities.

3. Buzzards Bay Coalition Baywatchers Support (\$60,000)

This proposal would fund continuation of the Baywatchers program in Buzzards Bay during January 1, 2022 - December 31, 2023, using NEP federal fiscal year 2022 funds. The Baywatchers program is largely funded by membership donations, Coalition fundraising events, like the Buzzards Bay Swim, and in the past has received direct state funding. The funds requested will help ensure core elements of the Baywatchers program continue. These funds will be used to support Baywatchers long-term monitoring program. This amount will support a portion of salary for the Coalition's Director of Monitoring Programs who runs the program - training volunteers, handling equipment repair and calibration, coordinating with the analytical laboratory, performing

quality assurance, etc. – or the BBC’s Science Director acting in that role. The funding will enable the collection of water quality monitoring data principally during the 2022 calendar year to continue the existing Bay-wide long-term record. All samples will be collected and analyzed in accordance with a QAPP that has already been approved by DEP and EPA. Additional details provided in Appendix B.

4. New Bedford Sea Lab Buzzards Bay NEP Partnership, Marine Education Support to Environmental Justice Communities, Year 2 (\$22,604)

The Commonwealth of Massachusetts, through the Executive Office of Energy and Environmental Affairs, maintains a policy of Environmental Justice to better serve the environmental needs of the Commonwealth's most vulnerable residents. Similarly, as noted by the U.S. EPA's Environmental Justice Office, EPA's goal is to provide an environment where all people enjoy the same degree of protection from environmental and health hazards and equal access to the decision-making process to maintain a healthy environment in which to live, learn, and work. An important pathway toward both these state and federal goals is the participation and education of vulnerable youth populations. These individuals will become tomorrow's stewards of the environment, and a strong foundation in science and natural ecosystems is essential for them to make informed decisions about the environment as adults, and to be the caretakers of our future.

While the New Bedford School Department has made great strides in bringing in minority, language isolated, and financially disadvantaged students into the program, the greatest single need identified by Sea Lab Facilitator Simone Bourgeois is the need to provide tuition waivers to families who cannot pay for the tuition. Beyond this dire need are specific unmet program expenses and initiatives that will broaden the programs. This New Bedford Sea Lab Buzzards Bay NEP Partnership is designed to meet these needs. The intent of this proposed work plan is two-fold. 1) to match privately funded school tuition waivers to Sea Lab (and thereby leverage future private donations) and 2) fund specific equipment, curricula expansion and program needs.

FFY22 Work Plan Task 15 - CCMP update

Planned Project/Activity Purpose and Description (July 1, 2022 - June 30, 2023):

The Buzzards Bay CCMP was last updated November 26, 2013. According to the U.S. EPA *National Estuary Program Comprehensive Conservation and Management Plan Revision and Update Guidelines* issued May 3, 2016:

Revisions involve a significant change. For example, a CCMP Revision could be driven by: 1) new CCMP goals, as directed by the Management Conference, 2) new information obtained through monitoring that would require revisiting and changing the actions in a CCMP; or 3) an expansion of the study area. A Revision would also be necessary in cases where original CCMPs have not yet been revised. Minor changes to action plans or insertion of a few new actions would be considered an Update. Reformatting, streamlining or reorganizing core actions to reflect new ways of accomplishing original CCMP goals would also be considered an Update.

By this 2016 guidance definition, although the 2013 update largely represented minor updates to the 1992 CCMP, it also included some expansion of new goals and focus areas, and an increased focus on climate impacts. In this respect the 2013 update can be considered a revision by the guidance and met the necessary submission and checklist requirements according to the 2016 guidance.

Although the 2013 update included considerable additional discussion of climate vulnerabilities, the NEP undertook a climate change vulnerability assessment in 2021 and 2022, with a \$10,000 Climate Ready Estuary grant from EPA headquarters, and through a partnership with the Buzzards Bay Coalition. The effort involved workshops for various stakeholder groups (scientists, state and federal agencies, municipal officials, and the public and non-profits). One of the goals of this effort was to inform the planned update of the CCMP in 2023.

According to the 2016 guidance, "an Updated CCMP can take the form of: 1) an Addendum to the Current CCMP, 2) a Strategic Plan or updated Implementation Plan that serves as a companion piece to the CCMP, or 3) changes to select Action Plans in the current CCMP." Over the course of this workplan, the NEP will assess the best format in which to update the CCMP in 2023.

How the Project Supports the CCMP and Work Plan Goals:

Supports all CCMP action plans and workplan goals.

How the Project Supports the CWA

The CCMP supports directly or indirectly all Clean Water Act core programs.

Principal Staff involved in these tasks:

NEP Executive Director is the lead, with all NEP staff contributing, with additional collaboration with the CZM South Coast regional coordinator.

Responsible Partners and Their Role(s):

The NEP will reach out to partners in a similar way as was conducted through the Climate Change Vulnerability Assessment, through online workshops, and online feedback forms. The update will also be a topic for the Buzzards Bay Coalition's Science Advisory Committee, and the Buzzards Bay Action Committee.

Outputs, Products, or Deliverables:

Production of maps, data, and information to support the effort. At least four meetings will be held with project partners. The NEP will use Google Forms to obtain online feedback.

Milestones:

In the fall of 2022, the NEP will incorporate recommendations from the Climate Vulnerability Assessment in the chosen CCMP update format. This document will be circulated to key agency partners in the winter, and in the spring, online feedback and input forms will be posted. During the summer of 2023, online workshops will be held to obtain further guidance. The CCMP update with endorsement from the NEP Steering Committee will be submitted to EPA by the end of 2023.

Estimated Budget:

Existing NEP staff time.

Outcomes:

Short-term:

Completion of the 2023 CCMP update. Incorporation of the Climate Change Vulnerability Assessment recommendations. Meeting CCMP update requirements

Intermediate:

Increased involvement and participation of the public.

Long-term:

Improvements to the CCMP that meet the long-term goals of the program to protect and restore water quality and living resources in Buzzards Bay and its surrounding watershed through the implementation of the CCMP.

Pressures affecting outcomes:

Demands from other projects and overcommitments of NEP staff.

Section 4: Budget Summary and Explanation

This work plan is a new Cooperative Agreement. The new budget is summarized in Table 3 and the pie chart in Fig. 16, according to EPA grant categories. Supplemental details of the budget are contained in Table 4. Beginning with this work plan, EEA has assumed the costs of phone and data/internet services to the NEP.

Table 3. Federal FFY22 BUDGET DETAIL
(Award = \$1,000,000 (\$750,000 base funding + \$250,000 SNEP add-on))

Personnel*:	\$379,512
(Personnel costs are based on the following staffing levels)	
Joe Costa, Executive Director	\$117,872
Sarah Williams, Regional Planner	\$99,792
Kevin Bartsch, Stormwater Specialist	\$109,148
Bernadette, Taber Stormwater Specialist 20/h week	\$52,700
Contractual*:	\$0
Travel:	\$3,600
Travel estimate is based on the actual in-state and out-of-state expenditure from other years and new projections, and uncertainties in allowance to attend the fall NEP meeting cancellation, but inclusion of the Spring 2023 meeting in Washington DC. Most of the travel is done within the Buzzards Bay watershed (site visits or partner meetings), with additional agency partner meetings in Massachusetts, Rhode Island (mostly for SNEP meetings), and tech transfer meetings in New England and include the following:	
<ul style="list-style-type: none"> • Executive Director: 1 national meeting, 2 NE tech transfer meetings, 7 in-state and watershed partner meetings, 30 in-state site visits. • Regional Planner: 2 state and watershed partner meetings, 2 site visits. • Stormwater Specialist (Full-Time Employee): 1 NE tech transfer meeting, 5 state and watershed partner meetings, 40 site visits. • Stormwater Specialist (Half-Time Employee): 2 state/watershed partner meetings, 15 site visits. 	
Fringe:	\$158,977
41.89% pf personnel (inc. Medicaid, etc. charge on all personnel)	
Supplies:	\$3,825
Postage, printing, paper, office and field supplies	
Other:	\$398,648
Program Operations	\$52,947
Municipal Grants	\$171,773
Buzzards Bay Coalition Monitoring	\$60,000
Sea Lab Support	\$22,604
UMass Salt Marsh UAV study	\$46,708
Woodwell CRC River Monitoring Program	\$44,616

Program Operations includes 12 months' rent (\$30,940 after \$5,000 offset from CZM for space for the South Coast Regional Coordinator), and utilities, cleaning, disposal, state audit, computer leases, repairs, telephone and internet charges, other chargebacks. State Audit, MMARS, and IT services total \$12,793. Cleaning, disposal, and repairs and maintenance (copy machine, printers, etc.) are not contractual purchases by the NEP. The vendors for these items are selected from state blanket contracts.

Indirect costs: **\$55,437**

* There is an 14.04% charge on "Personnel," "Contractual," plus selected expenditures in the "Other" category (detail in Table 5).

Table 4. Supplemental budget details

"OTHER Program Operations detail	
rent (includes \$5,000 offset from CZM)	\$30,940
cleaning	\$3,380
utility electric	\$960
utility gas	\$600
water/sewer	\$630
alarm system	\$360
repairs, maintenance (copy/printer, etc.)	\$365
Phone, internet	\$0
Core technology, single audit, etc. chargebacks	\$13,820
Printer/Copier/Scanner lease	\$1,892
Other Total	\$52,947

Table 5. Indirect Costs Table

PERSONEL	\$379,512
CONTRACTUAL	\$0
OTHER Program Operations sub elements	
cleaning	\$3,380
alarm system	\$360
Selected chargebacks (MMARS IT & Core Tech)	\$11,600
Indirect Base total	\$394,852
Indirect rate 14.04% (0.1404)	
Federal Indirect share	\$55,437

BBP FFY22 Budget for Workplan, Total Award = \$1,000,000 (incl. \$250,000 SNEP)

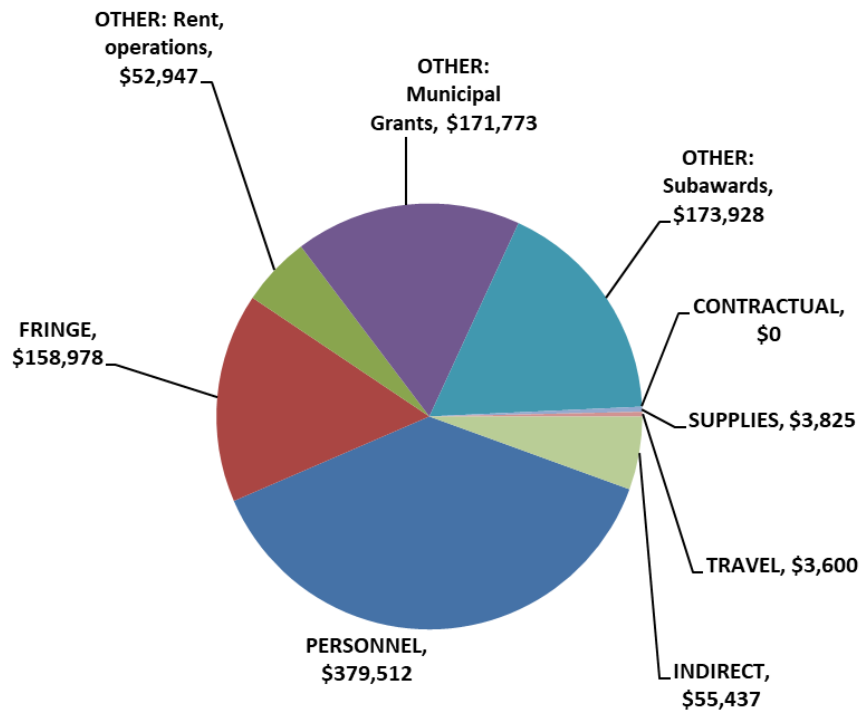


Fig. 16 Pie chart showing FFY21 budget by EPA budget categories and tasks.

Section 5: Match to the Cooperative Agreement

Below is a summary of the \$1,000,000 match that is being provided to meet the match requirement under this Cooperative Agreement to the Commonwealth. The largest portion of the match is provided by the Coalition programs followed by the municipal grant program. The Coalition, which last year had an operational budget of over \$3.5 million, works in a close partnership with the NEP on several tasks, including application of the water quality testing program, and work in support of wetland and habitat protection and restoration. The Coalition also provides a vital role in assisting communities to develop applications to the Buzzards Bay municipal grant program. Another important contributor to the match total is the cash and in-kind contributions from the member communities of the BBAC. These collaborations have led to a very high rate of leveraging in our municipal grant program and continue to represent one of the cores of the match to our cooperative agreement. The match is characterized in different ways in Table 6, Table 7, and Table 8.

1) Coalition Water Quality Monitoring Program (\$186,740)

For the past decade, the Coalition secured nonfederal funds through grants, members' dues, state earmarks, and donations to support its water quality monitoring program and related outreach. The cost of the core elements of this monitoring program, excluding citizen volunteer time, exceeds \$250,000 per year, and includes staff time, contractual laboratory testing services, publications, web services, and supplies. We have limited the match to this Cooperative Agreement to just the estimated volunteer time of \$186,740 based on 2021 participation of 196 volunteers contributing 5340 volunteer hours x \$34.97 (BBC correspondence for volunteer time hours, value of volunteer time for Massachusetts rates at independentsector.org/value-volunteer-time-methodology/ for the 2020). In this category, we are including the value of the time volunteers contribute to the Coalition's Water Quality Monitoring Program.

2) Municipal support to BBAC (\$25,000)

The municipalities of Buzzards Bay pay \$25,000 per year in dues assessments to the BBAC to support projects to implement the CCMP. These funds pay the costs of a part-time Executive Director, defray organization costs, helped fund a school education pilot program, and pay for meeting and workshop expenses.

3) In kind participation of BBAC meetings and workshops (\$21,038)

Municipal official participation in BBAC and NEP meetings (assume 11 meetings; average 15 people per meeting, 1.5 hours meeting time, and an \$85/h loaded rate. Some of these meetings are expected to remain as webinars until all COVID-19 health emergency restrictions are eliminated.

4) Other Coalition support: education and land conservation programs (\$234,200).

The Coalition's annual operational budget exceeds \$1.4 million and includes a wide range of activities that compliment this work plan. These activities include public education and outreach initiatives and publications, water quality data management updates for their website, in-stream monitoring program, oil spill area contingency plan updates with municipal officials, newsletters and events that include the cost of director, outreach staff, and communication costs. The Coalition also has a vigorous land protection program to encourage bay-focused watershed land protection, empower local land trusts, and educate private landowners about land conservation options. These efforts are supported by foundation and donor-supported programs, include several staff members, and has outreach costs. Expenditures under this program by the Coalition, espe-

cially land acquisition, continue to represent a large portion of this non-profit's expenditures. The activities support a key goal of the CCMP - the protection of wetlands, habitat, and open space to protect water quality, and living resources. Publicly accessible open space also helps build support for other environmental initiatives of both our programs. The applicable matching amounts support and coincide with the NEP tasks identified in this work plan and represents portions of Coalition staff salaries working on these tasks.

The NEP is a key partner with the Coalition in these efforts, and each year, we prepare hundreds of maps and other products, and conducting GIS land use evaluations for targeted acquisitions. Our support is integral in the Coalition's outreach for their program and has helped the passage of municipal town meeting legislative articles in support of conservation land acquisitions.

5) CZM Coastal Resiliency and Municipal Vulnerability Grant programs (\$86,022)

Grants awarded by CZM for projects in the Buzzards Bay watershed.

6) Match to the municipal grant program (\$350,000)

Based on past multipliers, the NEP expects to receive \$350,000 in match toward the \$182,542 in municipal grants awarded. Match to any roll over grant funds will only apply to the previous Co-operative Agreement.

7) Municipal funds provided to the Stormwater Collaborative (\$97,000)

Based on last year's support, MMA will receive \$97,000 from Buzzards Bay municipalities to fund co-op students participating in the effort to map stormwater networks and monitor storm-water discharges.

Table 6. Match Overview by EPA Category

EPA Grant Category	Federal	Non-Federal	Total
PERSONNEL	\$379,512	\$253,538	\$633,050
FRINGE	\$158,978	\$0	\$158,978
TRAVEL	\$3,600	\$1,700	\$5,300
SUPPLIES	\$3,825	\$0	\$3,825
CONTRACTUAL	\$0	\$308,740	\$308,740
OTHER	\$398,648	\$436,022	\$834,670
TOTAL DIRECT	\$944,563	\$1,000,000	\$1,944,563
INDIRECT	\$55,437	\$0	\$55,437
TOTAL	\$1,000,000	\$1,000,000	\$2,000,000

Table 7. Summary of proposed match.

Proposed MATCH (non-state)	Personnel	Fringe	Contractual	Other	Supplies	Travel	Indirect	TOTAL
1. Coalition WQ Monitoring Program (1)			\$186,740					\$186,740
2. BBAC dues			\$25,000					\$25,000
3. BBAC, other municipal meetings, workshops (5)	\$21,038							\$21,038
4. Other Coalition Support (2)	\$232,500					\$1,700		\$234,200
5. CZM Coastal Resiliency and Water Quality grant programs (4)				\$86,022				\$86,022
6. Municipal match to Buzzards Bay NEP grants (3)				\$350,000				\$350,000
7. Municipal cash to storm-water collaborative contracts, MS4 grants			\$97,000					\$97,000
Summary	\$253,538	\$0	\$308,740	\$436,022	\$0	\$1,700	\$0	\$1,000,000

(1): In this category, we are including the value of the time volunteers contribute to the Buzzards Bay Coalition's Water Quality Monitoring Program. This contribution is based on 165 volunteers contributing 4524 volunteer hours x \$34.97 (BBC correspondence for volunteer time hours, value of volunteer time from Massachusetts data at www.independentsector.org/programs/research/volunteer_time.html). Added to this total (\$158,204) is the \$40,000 match to monitoring subaward, which is derived from private foundations and donations that is used to purchase test kits, supplies, and monitoring equipment to support the monitoring effort, and related costs.

(2): Portions of Buzzards Bay Coalition Staff in these positions: VP Education & Public Engagement (\$55,000) VP Watershed Protection (\$50,000), Director of Land Protection (\$40,000), Communications Specialist (\$40,000), Director of Land Protection (\$49,000), and Restoration Specialist (\$45,000). Travel includes both in-state and out-of-state estimated reimbursements.

(3): Based on typical overmatch match typical for land acquisition grants.

(4): The actual amount of match in this category will depend on how much overmatch match is provided by the grant recipients.

(5): BBAC municipal official time is 11 meetings, avg 15 people per meeting, 1.5 hours, \$80/h fringe + indirect loaded rate.

Table 8. Summary of Match by Source

	State	Other (non-profit)	Local (munis)	Total
PERSONNEL	0	\$232,500	\$21,038	\$253,538
FRINGE	0	\$0	\$0	\$0
TRAVEL	0	\$1,700		\$1,700
SUPPLIES	0	\$0		\$0
CONTRACTUAL	0	\$186,740	\$122,000	\$308,740
OTHER	\$86,022		\$350,000	\$436,022
INDIRECT	0	\$0	\$0	\$0
TOTAL	\$86,022	\$420,940	\$493,038	\$1,000,000

Section 6: Reprogramming of FFY21 Funds

The FFY21 two-year work plan was submitted in May 2021 and approved by EPA in June 2021. After the work plan commenced, several tasks needed revision. First, the planned solicitation for contractual engineering services set to commence last fall was abandoned (funding was in the "Contractual" grant category, \$75,000). During the summer of 2021, stormwater designs the NEP developed at three sites under an earlier Cooperative Agreement were not funded with state or local funding, and Stormwater Collaborative towns were not ready to commence development of new designs. Consequently, this funding was deferred to March 2022 as a municipal minigrant program for stormwater and wastewater engineering services and MS4 support (funding moved to the "Other" grant category; see this [web page](#)).

Because of this decision, funding for the first task for the UMass Dartmouth subaward, which was dependent upon the development of new stormwater designs (the focus of the first task in the UMass proposal), was reconfigured to wholly fund the second task in the UMass Dartmouth subaward, that of innovative monitoring approaches using Unmanned Aerial Systems to document salt marsh loss from climate change and other factors. The budget also increased from \$43,719 to \$49,411, utilizing funds created by reductions of indirect from moving funds from Contractual to Other.

Finally, the March 2022 stormwater and engineering municipal grant request for proposals received only one response. Rather than wait to re-release all the funds in some later municipal grant RFR, the NEP initiated a new subaward with the New Bedford Public School Systems to strengthen our work with Environmental Justice communities. A portion of these funds (\$27,496) funded the *New Bedford Sea Lab Buzzards Bay NEP Partnership Marine Education Support to Environmental Justice Communities* that commenced July 1, and which is renewed for a second year in this workplan.

Given that Cooperative Agreement CE-00A00860-0 totaled \$1.9 million, this programming did not require a formal grant amendment.

Section 7: NEP Staff

Dr. Joe Costa is Executive Director of the NEP. Besides overseeing and administering the Program, he provides technical assistance on nitrogen loading assessment and management, water quality analysis, watershed planning, build-out analysis, data analysis, and software support. His research in marine ecology, particularly nitrogen loading effects on eelgrass beds and coastal ecosystems has been put to use in the Coalition's citizen monitoring program and the NEP's nitrogen management approach. The director is also the program's webmaster.

Kevin Bartsch is one of the NEP's Stormwater Specialists (full-time). He has a master's degree in Watershed Science and over 20 years of experience in GIS data development and modeling. Kevin has a wealth of knowledge in utility (water, wastewater, electric) infrastructure, asset management, soil erosion, natural resource management, and open space protection. At the NEP, Kevin works with municipalities and the MMA to create a comprehensive stormwater GIS and management program. Kevin also volunteers as a board member and is former Director and President of the Wareham Land Trust.

Bernadette Taber is one of the NEP's Stormwater Specialists (part-time, 0.64 FTE). A long-time former employee of the USDA Natural Resource Conservation Service detailed to the NEP office since 1991, Bernie re-joined the NEP after leaving federal service in 2015. Bernie evaluates and develops engineering solutions for stormwater remediation in both agricultural and urban

environments. Bernie has reviewed many engineering plans at the request of Buzzards Bay municipalities and has developed the preliminary stormwater and habitat restoration designs identified in collaboration with Buzzards Bay municipalities and their contractors.

Sarah Williams is the NEP's Regional Planner (full time). She aids municipalities on land use and watershed planning, land conservation, buildout analysis, habitat restoration, and mapping as well as some of the administrative functions of the Project. She is a coordinator between the towns and the NEP on our Municipal Grant Program and prepared the NEP's regional open space plan. Sarah was also a former member of the Fairhaven-Acushnet Land Preservation Trust and Fairhaven Conservation Commission and brings this valuable experience to bear on her activities.

Appendix B. Subaward Proposals

1. Monitoring Program Support for Baywatchers and Salt Marsh Monitoring Program (Coalition, \$60,000)
2. Nutrient Inputs to Buzzards Bay from Coastal Rivers Woodwell Climate Research Center Scope of Work (MMA, \$44,616)
3. Collaboration with UMass Dartmouth Use of Unmanned Aerial Systems to Monitor Salt Marsh Loss from Climate Change and Other Factors, Year 2, (\$46,708)
4. New Bedford Sea Lab Buzzards Bay NEP Partnership, Marine Education Support to Environmental Justice Communities, Year 2 (\$22,604)



Buzzards Bay Water Quality Monitoring

Rachel Wisniewski Jakuba, PhD, Vice President for Bay Science

114 Front Street, New Bedford, MA 02740

Tel – 508-999-6363 x229 – jakuba@savebuzzardsbay.org

Project Description

This proposal would fund continuation of the Baywatchers program in Buzzards Bay during January 1, 2023 - December 31, 2023, using NEP federal fiscal year 2022 funds. The Baywatchers program is largely funded by membership donations, Coalition fundraising events, like the Buzzards Bay Swim, and in the past has received direct state funding. The funds requested will help ensure core elements of the Baywatchers program continue.

Description of Environmental Impairment/Project Need

Nitrogen pollution is a critical threat to Buzzard Bay's ecological health, as described in the CCMP. Nitrogen pollution causes increased algae growth that reduces water clarity and oxygen levels, reduces shellfish and other biodiversity, can degrade salt marsh habitat, and degrades the recreational value of the Bay. Because of nitrogen pollution, eelgrass coverage in Buzzards Bay has declined by about 50% since the 1970s, and iconic bay scallops are now extremely rare. According to the Massachusetts Year 2016 Integrated List of Waters, over 40 water body segments around Buzzards Bay are impaired because of excess nitrogen. Restoring and preserving water quality will require effective management based on accurate information. The Coalition's Baywatchers monitoring program was designed to assess nutrient-related Bay health, documenting the impact of nitrogen pollution on the Bay's harbors and coves.

For 30 years, Baywatchers has collected basic water quality, nutrient, and algal pigment information around Buzzards Bay during the summer months and educated the public on their local water quality. Since 1992, this effort has directly engaged over 1,000 citizen scientists and has resulted in an impressive dataset of long-term trends of the ecological health of over 200 locations around the Bay.

Proposed Activities

Task 1: The \$60,000 requested for this task would be used to support Baywatchers long-term monitoring program. This amount will support a portion of salary for the Coalition's Director of Monitoring Programs who runs the program - training volunteers, handling equipment repair and calibration, coordinating with the analytical laboratory, performing quality assurance, etc. – or the BBC's Science Director acting in that role. The funding will enable the collection of water quality monitoring data principally during the 2023 calendar year to continue the existing Bay-wide long-term record. With the help of trained volunteers, basic water quality measurements of dissolved oxygen, temperature, salinity, and water clarity will be made about every five days beginning in late May through mid-September. Samples may also be collected on four dates in July and August for analysis of the full suite of nutrients as well as algal pigments. All samples will be collected and analyzed in accordance with a QAPP that has already been approved by DEP and EPA.

Expected Environmental Benefits of Proposed Work

Task 1: One of the first actions to be implemented from the original CCMP was the initiation of water quality monitoring. This underscores the importance of monitoring as the foundation for actions that improve environmental health. For 30 years, Baywatchers water quality data has been critical for preserving and restoring coastal waters around Buzzards Bay. The data has been used repeatedly since 2002 in the development of the MassDEP's Integrated List of Waters. A water body's inclusion on the Integrated List of Waters as an impaired water body is the first step to restoration because it compels DEP to develop a nutrient reduction plan known as a TMDL. Baywatchers data has been used in the development of all the nitrogen TMDLs for impaired embayments around Buzzards Bay. DEP and EPA have used the data when setting nitrogen limits for municipal and private wastewater treatment plants through the NPDES and Massachusetts Groundwater Discharge permit processes. For example, Baywatchers data led to EPA establishing a total nitrogen permit limit for the Wareham Wastewater Treatment Facility, which resulted in an over 50% decrease in the annual total nitrogen concentrations in the Agawam River where the Wareham Wastewater Treatment Facility discharges. The data has been also used by municipal government to justify new regulations, bylaws, or reduction of nutrients loads.

Budget

Salaries	\$42,639
Fringe (18.51%)	\$7,893
Indirect (18.74%)	\$9,468
Total	\$60,000

Match

The Coalition will provide an in-kind match of \$60,000 from private foundations and donations that is used to support additional salaries and to purchase test kits, supplies, and monitoring equipment to support the monitoring effort. We recognize also that the Buzzards Bay NEP credits Baywatchers volunteer time toward their federal match requirement.

Determining Nutrient Inputs to Buzzards Bay from Coastal Rivers

Woodwell Climate Research Center Scope of Work

Background

Nitrogen and phosphorus arriving in the water discharged through coastal rivers is one of the major sources of these nutrients to Buzzards Bay¹. Although the water quality in the estuarine embayments into which these rivers flow has been monitored for 30 years as part of the Buzzards Bay Coalition's *Baywatchers* program², the amount of nutrients contributed by rivers remains poorly understood. Quantifying nutrient flows from rivers is important for validating watershed models and for understanding how residential and commercial development, land and agricultural management, and ecological restoration activities will influence nutrient delivery to Buzzards Bay. Because climate change will bring increasingly variable precipitation to the Northeast U.S.³, understanding the controls on river-borne sources of nutrients to Buzzards Bay will also be critical to understanding nutrient loads to the Bay in the future.

Quantifying nitrogen and phosphorus loads through rivers requires continuous measurement of river discharge and regular sampling of river water to determine concentrations of different nitrogen and phosphorus forms. Discharge is quantified by establishing a recording staff gage to log river stage (typically hourly) and building a discharge-stage relationship (rating curve) to estimate discharge based on field-measured discharges at different river stages. Concentrations are measured by periodic grab sampling of river water.

With support from the Buzzards Bay National Estuary Program, with Federal FY20 funding, in late 2021 and early 2022, the Woodwell Climate Research Center established stage gauges on ten Buzzards Bay Rivers (Table 1). Two additional rivers are gauged by the U.S. Geological Survey as part of the Waters Resources of the United States (USGS 2022) network (Table 1). These gauges (Fig. 1) now provide stage measurements every 30 minutes. The data from the Woodwell gauges are downloaded, and quality checked monthly. The data from the USGS gauges are downloaded and combined into the same Buzzards Bay Rivers database. In March 2021, in the same 12 rivers, in the Woodwell Center began sampling water chemistry twice monthly during May to October and monthly during November to April.

The results to date have been intriguing. Figure 2 shows the concentration of nitrate (NO_3^-) in several rivers. Although concentrations varied among rivers, there was both a high degree of synchrony of NO_3^- concentrations among rivers over time, and a relationship between NO_3^- concentration and flow. Concentrations were lowest when discharge was very high following high rainfall in late October 2021. Another unexpected observation were the contrasting patterns observed in different streams, as shown in Figure 3, comparing concentrations of nitrate in the Weweantic River and Angeline Brook in Westport. TAs shown, the concentrations of NO_3^- in Angeline were unexpectedly high given the high forest cover in the Angeline Brook watershed. The source of this high NO_3^- is not known. Like in other rivers, the NO_3^- concentration was much lower at high flow.

Proposed work

In this follow-up study, we propose continue monitoring these rivers to better understand the factors that drive these patterns. Specifically, the Woodwell Center will: (1) continue stage recordings from this river network for one year from July 1, 2022 to June 30, 2023; (2) improve

stage-discharge curves for each river by making field measurements of discharge six times in each river across a range of high and low flows; (3) sample concentrations of different dissolved and particulate nitrogen and phosphorus forms twice monthly during May through October and monthly during November through April for one year from July 1, 2022 to June 30, 2023.

Methods

Chemical analyses will include ammonium, nitrate, dissolved organic nitrogen, particulate organic nitrogen, phosphate, and total phosphorus in river water. Rating curves will be developed by measuring discharge monthly with a SonTek FlowTracker2 hand-held flow meter in smaller rivers or a tow-across StreamPro acoustic doppler current profiler in larger rivers. Stage recorders are Onset Hobo MX-2001 dataloggers. We will use the combination of flow and concentrations to estimate total nitrogen and phosphorus loads in river discharge for the 12 rivers. Annual loads will be calculated from discharge and concentrations using LOADEST and other similar data and modeling approaches⁴. All methods will follow those described in the Quality Assurance Project Plan developed for this project⁵.

Budget

Salaries and wages		
Chris Neill	0.50 months for project direction	\$7,126
Research Assistant I	4 months for field, data, and laboratory work	\$13,394
Fringe benefits		\$11,594
Travel	Local travel to field sites in personal vehicles	\$1,421
Materials and supplies		
Laboratory supplies	Includes sample bottles, reagents for analyses	\$2,158
Indirect costs	Calculated at 25% of total direct costs	\$8,923
Total		\$44,616

Reference Cited

1. Williamson, S. G., J. E. Rheuban, J. E. Costa, D. M. Glover and S. C. Doney. 2017. Assessing the impact of local and regional influences on nitrogen loads to Buzzards Bay. *Frontiers in Marine Science* 3, article 279.
2. Jakuba, R., T. Williams, C. Neill, R. McHorney, L. Scott, B. L. Howes, J. Costa, H. Ducklow, M. Erickson, and M. Rasmussen. 2021. A long-term citizen-assisted dataset of estuarine water quality in Buzzards Bay. *Scientific Data* 8, Article 76.
3. Horton, R., G. Yohe, W. Easterling, R. Kates, M. Ruth, E. Sussman, A. Whelchel, D. Wolfe, and F. Lipschultz. 2014. Chapter 16: Northeast. Pages 371 to 395 in *Climate Change Impacts in the United States: The Third National Climate Assessment*, J. M. Melillo, T. C. Richmond, and G. W. Yohe (Eds), U.S. Global Change Research Program, 371-395. doi:10.7930/J0SF2T3P.
4. Runkel, R. L., C. G. Crawford and T. A. Cohn. Load Estimator (LOADEST): A FORTRAN program for estimating constituent loads in streams and rivers. Techniques and Methods Book 4, Chapter A5. USGS, Reston, VA.
5. Neill, C. 2022. *Quality Assurance Project Plan for Monitoring Flow and Chemistry of Streams and Rivers Draining to Buzzards Bay*. Quality Assurance Project Plan. Grant Number EPA 00A00623, QA Tracking Number 22049.

Table 2. Location of stream and river stage measurements and water quality sample collection.

Number	Stream or River	Site Description	Latitude	Longitude	Watershed Area (ha)*	Activity
1	West Westport River	On wooden footbridge on Sakonnet Preservation Association Sakonnet Preserve in Little Compton, RI adjacent to Gray's Mill Pond parking lot on Adamsville Rd., Westport, MA,	41.55687	-71.12770	2,334	Stage and water chemistry
2	Angeline Brook	On Barnett property about 60 m south of Cornell Road, Westport, MA	41.54974	-71.10526	864	Stage and water chemistry
3	East Branch Westport River	On Westport Conservation Trust Mill Pond Preserve off Reed Rd., Westport, MA.	41.62538	-71.05985	10,433	Stage and water chemistry
4	Paskamansett River	River crossing of Russells Mill Rd., Dartmouth, MA. USGS gauge.	41.58528	-70.99083	6,639	Water chemistry only
5	Acushnet River	Adjacent to wooden footbridge in Buzzards Bay Coalition Sawmill Preserve, Acushnet, MA, off Mill Rd., New Bedford, MA	41.68400	-70.91891	4,408	Stage and water chemistry
6	Mattapoissett River	River crossing of River Rd. at stone bridge, Mattapoissett, MA. USGS gauge.	41.65989	-70.83677	6,346	Water chemistry only
7	Tripps Mill Brook	On Mattapoissett town land, stream crossing of Acushnet Rd., Mattapoissett, MA,	41.67926	-70.84685	988	Stage and water chemistry
8	Sippican River	On Rockwell property, Marion, MA, river crossing of County Rd., Marion MA,	41.73424	-70.77491	7,199	Stage and water chemistry
9	Weweantic River	On Town of Wareham Westgate Conservation Area, river crossing of Papermill Rd., Wareham, MA,	41.77980	-70.76339	12,597	Stage and water chemistry
10	Wankinco River	On Town of Wareham property at former Tremont Nail Factory, river crossing of Elm Rd., Wareham, MA,	41.76715	-70.72201	4,031	Stage and water chemistry
11	Agawam River	On Wareham Land Trust property, river crossing of eastbound Cranberry Highway, Wareham, MA,	41.76240	-70.67644	4,151	Stage and water chemistry
12	Red Brook	On Trustees Lyman Reserve, upstream of stream crossing of Head of the Bay Rd., Plymouth, MA,	41.76556	-70.63444	1,060	Stage and water chemistry

* Watershed areas provided by Sarah Williams, Buzzards Bay National Estuary Program.



Figure 1. Image of staff gauge setup in the West Westport River on the border of Westport, MA and Little Compton, RI. Data are downloaded with a Bluetooth connection to a tablet.

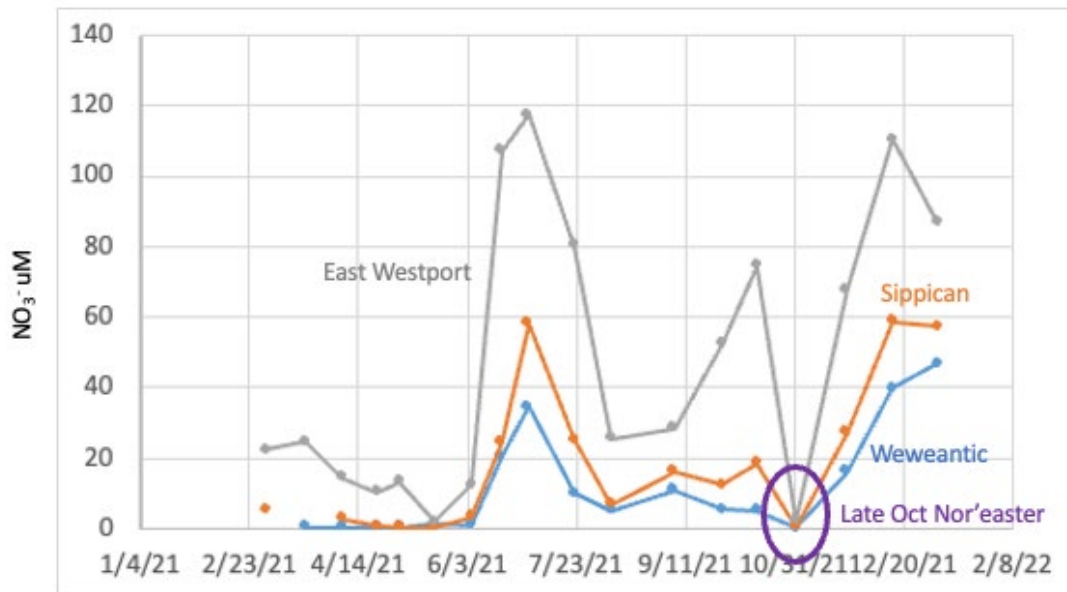


Figure 2. Concentration of nitrate (NO_3^-) measured during one year in the Weweantic, Sippican and West Westport Rivers.

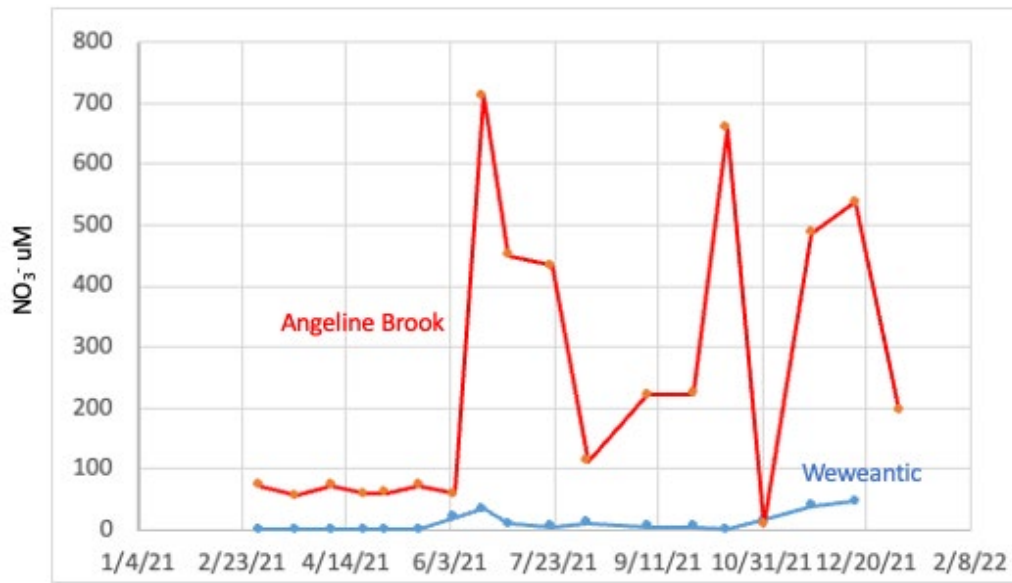


Figure 3. Concentrations of NO₃⁻ in the Weweantic River and Angeline Brook in Westport.

Collaboration with UMass Dartmouth Use of Unmanned Aerial Systems to Monitor Salt Marsh Loss from Climate Change and Other Factors, Year 2

Proposed Work

The University of Massachusetts Dartmouth (UMD) will work with the Buzzards Bay National Estuary Program (BBNEP) for a second year to conduct salt marsh surveys in Buzzards Bay for the evaluation of vegetation, edge loss and elevation. UMD will perform the surveys utilizing Unmanned Aircraft Systems (UAS) having had experience with the operation and video footage processing of DJI Phantom 4 Pro quadcopters. They will process raw footage using 3D photogrammetry software to generate Digital Surface Models (DSM) and georectified true color imagery. UMD will use existing NGS rod benchmarks on each side along with BBNEP owned surveying equipment to set control points prior to each UAS survey. BBNEP will provide training on the use of their surveying equipment for setting control points. The UAS survey will be overseen by a FAA licensed operator, and UMD will be responsible for obtaining any additional licenses when operating in the vicinity of any airport.

Under this agreement UMD will deliver DSM and georectified true color imagery for eleven salt marsh sites twice a year, totaling twenty (20) surveys. Timing of the surveys will be decided jointly by BBNEP and UMD. The eleven site names and locations are as follows:

1. Little Bay North/Little Bay South, Fairhaven
2. Mattapoissett Neck, Mattapoissett
3. Hammett Cove, Marion
4. Little Harbor Beach, Wareham
5. Wings Neck, Bourne
6. Patuisset Marsh, Bourne
7. Herring Brook, Falmouth
8. Sippewissett Marsh, Falmouth
9. Ocean View Farm, Dartmouth,
10. Westport Town Farm, Westport
11. Demarest Lloyd State Park Dartmouth

Budget

The total budget for this project is \$46,708 as per the table below. The University will waive a portion of its 59% overhead for this project, which will be used toward match.

1.0 Itemized Budget

1.0 Itemized Budget

		<i>9-month Salaries</i>	<i>months per year</i>	Year 1	TOTAL
A. SALARIES & WAGES (Senior Personnel)					
1. Dan MacDonald		147,880	0.12	\$1,955	\$1,955
Total Senior Personnel				\$1,955	\$1,955
B. SALARIES & WAGES (Other Personnel)					
	Base				
4. Graduate Student (Annual Rate - Units = Month)		22,000	9	\$16,500	\$16,500
3. Technician (Annual Rate - Units = Month)		60,000	0.5	\$2,500	\$2,500
5. Undergraduate Students (per student semester)	2100	2,100	2	\$4,200	\$4,200
Total Other Personnel				\$23,200	\$23,200
Total Salaries & Wages				\$25,155	\$25,155
FRINGE BENEFITS					
Payroll Taxes (Faculty Summer)	1.94%			\$38	\$38
Summer Payroll (Grad Students)	1.94% Summer			\$80	\$80
Total fringe				\$888	\$888
Total Salaries, Wages, & Fringe Benefits				\$26,043	\$26,043
D. PERMANENT EQUIPMENT				\$0	\$0
Total Equipment				\$0	\$0
E. TRAVEL			<i>Trips per year (Faculty/Grad Student)</i>		
Field Work Travel			0	\$720	\$720
Total Travel				\$720	\$720
G. Other Direct Costs					
1. Materials and Supplies					
Hardware				\$2,000	\$2,000
Computational Resources				\$1,000	\$1,000
2. Publication Costs/Page Charges				\$0	\$0
5. Subawards (Summer)				\$0	\$0
a. Tuition (in-state) *		\$9,504		\$9,504	\$9,504
b. Other Fees				\$0	\$0
Total Other				\$9,504	\$9,504
Total Other Direct Costs				\$12,504	\$12,504
H. Total Direct Cost				\$39,267	\$39,267
INDIRECT EXEMPTIONS				\$9,504	\$9,504
SUBCONTRACT ALLOWANCE				\$0	\$0
MODIFIED TOTAL DIRECT COST (MTDC)				\$29,763	\$29,763
I. Total Indirect Costs(59% MTDC)			17,560	\$7,441	\$17,560
Allowed Indirect Costs(25% MTDC)				\$7,441	\$7,441
Unmet Indirect Costs provided as match			\$10,119		
K. Total Amount of This request				\$46,708	\$46,708

Collaboration with UMass Dartmouth Use of Unmanned Aerial Systems to Monitor Salt Marsh Loss from Climate Change and Other Factors, Year 2

Proposed Work

The University of Massachusetts Dartmouth (UMD) will work with the Buzzards Bay National Estuary Program (BBNEP) for a second year to conduct salt marsh surveys in Buzzards Bay for the evaluation of vegetation, edge loss and elevation. UMD will perform the surveys utilizing Unmanned Aircraft Systems (UAS) having had experience with the operation and video footage processing of DJI Phantom 4 Pro quadcopters. They will process raw footage using 3D photogrammetry software to generate Digital Surface Models (DSM) and georectified true color imagery. UMD will use existing NGS rod benchmarks on each side along with BBNEP owned surveying equipment to set control points prior to each UAS survey. BBNEP will provide training on the use of their surveying equipment for setting control points. The UAS survey will be overseen by a FAA licensed operator, and UMD will be responsible for obtaining any additional licenses when operating in the vicinity of any airport.

Under this agreement UMD will deliver DSM and georectified true color imagery for eleven salt marsh sites twice a year, totaling twenty (20) surveys. Timing of the surveys will be decided jointly by BBNEP and UMD. The eleven site names and locations are as follows:

12. Little Bay North/Little Bay South, Fairhaven
13. Mattapoissett Neck, Mattapoissett
14. Hammett Cove, Marion
15. Little Harbor Beach, Wareham
16. Wings Neck, Bourne
17. Patuisset Marsh, Bourne
18. Herring Brook, Falmouth
19. Sippewissett Marsh, Falmouth
20. Ocean View Farm, Dartmouth,
21. Westport Town Farm, Westport
22. Demarest Lloyd State Park Dartmouth

Budget

The total budget for this project is \$46,708 as per the table below. The University will waive a portion of its 59% overhead for this project, which will be used toward match.

1.0 Itemized Budget

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		<i>9-month Salaries</i>	<i>months per year</i>	Year 1	TOTAL
A. SALARIES & WAGES (Senior Personnel)					
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Total Senior Personnel				\$1,955	\$1,955
B. SALARIES & WAGES (Other Personnel)					
	Base				
4. Graduate Student (Annual Rate - Units = Month)		22,000	9	\$16,500	\$16,500
3. Technician (Annual Rate - Units = Month)		60,000	0.5	\$2,500	\$2,500
5. Undergraduate Students (per student semester)	2100	2,100	2	\$4,200	\$4,200
Total Other Personnel				\$23,200	\$23,200
Total Salaries & Wages				\$25,155	\$25,155
FRINGE BENEFITS					
Payroll Taxes (Faculty Summer)	1.94%			\$38	\$38
Summer Payroll (Grad Students)	1.94% Summer			\$80	\$80
Total fringe				\$888	\$888
Total Salaries, Wages, & Fringe Benefits				\$26,043	\$26,043
D. PERMANENT EQUIPMENT				\$0	\$0
Total Equipment				\$0	\$0
E. TRAVEL			<i>Trips per year (Faculty/Grad Student)</i>		
Field Work Travel			0	\$720	\$720
Total Travel				\$720	\$720
G. Other Direct Costs					
1. Materials and Supplies					
Hardware				\$2,000	\$2,000
Computational Resources				\$1,000	\$1,000
2. Publication Costs/Page Charges				\$0	\$0
5. Subawards (Summer)				\$0	\$0
a. Tuition (in-state) *		\$9,504		\$9,504	\$9,504
b. Other Fees				\$0	\$0
Total Other				\$9,504	\$9,504
Total Other Direct Costs				\$12,504	\$12,504
H. Total Direct Cost				\$39,267	\$39,267
INDIRECT EXEMPTIONS				\$9,504	\$9,504
SUBCONTRACT ALLOWANCE				\$0	\$0
MODIFIED TOTAL DIRECT COST (MTDC)				\$29,763	\$29,763
I. Total Indirect Costs(59% MTDC)			17,560	\$7,441	\$17,560
Allowed Indirect Costs(25% MTDC)				\$7,441	\$7,441
Unmet Indirect Costs provided as match			10,119		
K. Total Amount of This request				\$46,708	\$46,708



**New Bedford Sea Lab Buzzards Bay NEP Partnership
Marine Education Support to Environmental Justice Communities
Year 2, Federal FY22 funds**

Background

The Sea Lab Marine Science Education Center is New Bedford Public Schools' (NBPS) marine and aquatic educational summer- school program supported through tuition and the Local Education Agency. Sea Lab is located on the Fort Rodman Peninsula, New Bedford, MA, close to the City's public beaches. Since 1968, third grade students through sophomores in high school, who present with an interest in the ocean sciences, have attended Sea Lab's six-week program. The curricula are cumulative from Level One - through Level Seven. Science curricula developed covers oceanography, limnology, meteorology, geology, marine biology, and chemistry as they relate to the marine environment. Course work includes laboratory work and field studies along the Massachusetts and Rhode Island coastlines. As noted on the program's website⁴, teaching materials are developed to achieve a balance between the introduction of basic scientific concepts and the discussion of observable phenomena with a focus on high interest, hands-on, intensive study designed to appeal to the serious student. Simone Bourgeois, Sea Lab Facilitator, has noted the program's emphasis is on experiential learning, with science content classes complemented by field studies and hands-on activities, focusing on scientific inquiry and observation⁵. The Program has been nationally recognized with past support from National Oceanic and Atmospheric Administration and the Naval Research Center. The curricula include collaboration with area universities, and Sea Lab students have had the opportunity to participate in ongoing scientific research.



Sixth graders are exposed to sailing experiences. Additionally, they are exposed to the utilization of sextants, marlinspike seamanship, along with the historical significance of sailing vessels.

One of the most fundamental elements of the Sea Lab

⁴ <https://sealab.newbedfordschools.org/>

⁵ <https://www.newbedfordguide.com/sea-lab-marine-science-program-new-bedford-students-sea/2021/10/26>



Eight graders participate in field trips to study different types of ecosystems.

program is its focus to provide educational equity for all NBPS students. Scholarship funding helps to introduce minorities and economically disadvantaged youth of New Bedford with environmental studies, looking at ecosystems from a scientific perspective, experiencing their first time visiting the ocean, and learning the historical significance of environmental stewardship of the city in which they live.

As noted in the Buzzards Bay Coalition's 2019 B-Wet initiative⁶, outdoor recreation has long suffered from an "adventure gap"⁷ that excludes minorities and the economically disadvantaged from these programs. As noted in the New Bedford Public School's 2021 budget, 66.1 percent of New Bedford students are economically disadvantaged, 40.4 percent do not have English as the first language, and 60.2 percent are minorities⁸.

In 2021, 325 students participated in the Sea Lab program. To participate in this voluntary summer program, the families of resident children must pay \$400 tuition plus certain field trip fees. This tuition covers the costs of teacher salaries, some supplies, and some field trip costs. Sea Lab is also supported by a parent/teacher organization, the Sea Lab Keel, which raises money to buy and repair equipment, defray the costs of field trips, provide snacks for the children, purchase trophies and awards, and award scholarships to Sea Lab alumni as they go off to college. Several other individuals and organizations provide support to keep the Sea Lab program viable.

Project Goals

The Commonwealth of Massachusetts, through the Executive Office of Energy and Environmental Affairs, maintains a policy of Environmental Justice to better serve the environmental needs of the Com-

⁶ <https://www.savebuzzardsbay.org/news/three-year-b-wet-grant-will-fund-outdoor-exploration-for-new-bedford-students/>

⁷

https://www.earthisland.org/journal/index.php/articles/entry/closing_the_adventure_gap_by_getting_inner_city_kids_outdoors/

⁸ [FY21 Preliminary Budget Book 7.06.20.pdf \(sharpschool.com\)](#).

monwealth's most vulnerable residents. Similarly, as noted by the U.S. EPA's Environmental Justice Office, EPA's goal is to provide an environment where all people enjoy the same degree of protection from environmental and health hazards and equal access to the decision-making process to maintain a healthy environment in which to live, learn, and work. An important pathway toward both these state and federal goals is the participation and education of vulnerable youth populations. These individuals will become tomorrow's stewards of the environment, and a strong foundation in science and natural ecosystems is essential for them to make informed decisions about the environment as adults, and to be the caretakers of our future.



Fifth graders learn to marine ecosystems through classroom and laboratory exercise.

While the New Bedford School Department has made great strides in bringing in minority, language isolated, and financially disadvantaged students into the program⁹, the greatest single need identified by Sea Lab Facilitator Simone Bourgeois is the need to provide tuition waivers to families who cannot pay for the tuition. Beyond this dire need are specific unmet program expenses and initiatives that will broaden the programs. This New Bedford Sea Lab Buzzards Bay NEP Partnership is designed to meet these needs. The intent of this proposed work plan is three-fold. 1) to match privately funded school tuition waivers to Sea Lab (and thereby leverage future private donations) and 3) fund specific equipment, curriculum expansion, and program needs.

Project Scope

In this second year of the program, the Buzzards Bay NEP will continue its collaboration with New Bedford Public School System for a second year. The work described in this proposal will be funded as a Cooperative Agreement sub-award in the form of a reimbursement contract between the Commonwealth of Massachusetts and the City of New Bedford Public Schools with the following tasks.

Task 1. Tuition Waivers. The core task under this agreement is to bring disadvantaged students into the program. The cost of tuition to participate in the program equals the cost of one month's food budget for many families. The NEP will match privately funded tuition to disadvantaged students from the previous year, up to \$16,000. The value of this task will equal forty \$400 tuition waivers or some equivalent value of partial tuition awards.

⁹ Applications are available in Spanish and Portuguese.

Task 2. Material and Supplies for Curriculum Expansion. In this task, \$6,604 is set aside to implement curriculum expansion with new technologies and help fund two fieldtrips. Items include ten waterproof Onset HOBO Bluetooth pendant light and temperature data logger (\$80 each) to continuously log temperature in different habitats and microenvironments, handheld pH meters, LEGO kits for technology STEM Kit (4 @\$500), preserved specimens, dissection equipment, field study to Cuttyhunk (eight grade), and a Whale Watch (9th Grade). Additional details are in the budget table.

Project Benefit

Goals of the Sea Lab tuition Scholarship program includes providing educational equity, develop environmental caretakes, develop and preserve Earth’s marine and aquatic water systems, and help students develop an understanding of how marine/aquatic system affect Earth and Space Sciences, Physical Science, Technology & Engineering, and Life Science. This project meets state and federal Environmental Justice goals and helps the NEP meet Justice40 goals, by directly expanding the pool of disadvantaged students that can participate in the program. The project also directly meets goals in the Buzzards Bay Comprehensive Conservation and Management Plan Action Plan 21: Enhancing Public Education and Participation¹⁰. Specifically, this project meets Goal 21.1. To expand the public’s knowledge of the natural resources and water quality of Buzzards Bay and surrounding watershed and the threats they face¹¹. As noted in this Action Plan, "contributing to the problem, people, first as children, then as adults, may not have been educated about concepts like groundwater flow, pollution pathways in local watersheds, how wastewater is treated and disposed, or the connection between ground and surface waters."

Budget

Task	Amount
Task 1: Waiver of Fees for Disadvantaged students, not to exceed	\$16,000
Task 2: Curriculum Support and Expansion	
ten waterproof Onset HOBO Bluetooth Pendant Light and Temperature Data Logger (\$80 each)	\$800
LEGO kits for technology STEM Kit (4 @\$500)	\$2,000
3 In 1 Digital PH TDS TEMP Waterproof Water Quality Meter Tester (5 @\$65 each)	\$325
dissection supplies and specimens	\$879
Cuttyhunk field trip (eighth grade), partial support	\$1,300
Whale Watch field trip (ninth grade), partial support	\$1,300
TOTAL	\$22,604

¹⁰ <https://buzzardsbay.org/newccmp/newccmp-education.pdf>

¹¹ Objective 21.1. To better convey concepts of watersheds and the flow of water from precipitation along the land surface and in the ground. Objective 21.2. To better convey an understanding of pollution sources and pathways in the environment. Objective 21.3. To improve the public understanding of human and natural effects on plant and animal populations and ecosystems.