

# *Buzzards Bay National Estuary Program*

## Implementation Activities

### Federal FFY20 Funds Work Plan and Budget

Pursuant to Section 320 funding under  
A Cooperative Agreement with the U.S. EPA

For work beginning July 1, 2020, to June 30, 2022  
June 24, 2019



Installation of an elevation benchmark

**Table of Contents**

Table of Contents.....2  
Section 1: Introduction and Overview.....3  
Section 2: FFY19 Outcomes: Highlights and Accomplishments July 1, 2019 to June 30, 2020 .4  
Section 3: FFY20 Funds: Proposed Work Plan Activities July 1, 2019 to June 30, 2021. ....18  
Section 4: Budget Summary and Explanation.....43  
Section 5: Match to the Cooperative Agreement.....45  
Section 6: Reprogramming of FFY20 Funds.....47  
Section 7: Buzzards Bay NEP Staff.....48  
Appendix 1. Index of Tasks.....49  
Appendix 2. Sub-award Proposals.....50

## 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 this CCMP. This mission was affirmed when the NEP Steering Committee approved the *CCMP 2013 Update* on November 26, 2013.

The U.S. Environmental Protection Agency (EPA) has made available to the NEP \$662,500 in 2020 federal fiscal year (FFY) Clean Water Act (CWA) Section 320 funds. In addition, EPA headquarters has provided a \$10,000 add-on for a CCMP climate vulnerability assessment, and EPA 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 \$922,500 in spending.

A summary of NEP funding since 2005 is shown in Fig. 1. Section 3 of this work plan describes activities planned with the use federal FFY20 funds to meet NEP goals. In the FFY14 and FFY 15 funding cycle, the NEP administered \$728,000 and \$1,000,000 in SNEP grant funds at the request of the EPA, and in FFY18, the NEP administered \$500,000 in more targeted initiatives, and with a similar targeted program in FFY20 (\$250,000).

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 FFY20 work plan, CZM is providing \$5,000 toward the NEP's rental agreement in support of the South Coast Regional Coordinator housed in the NEP office.

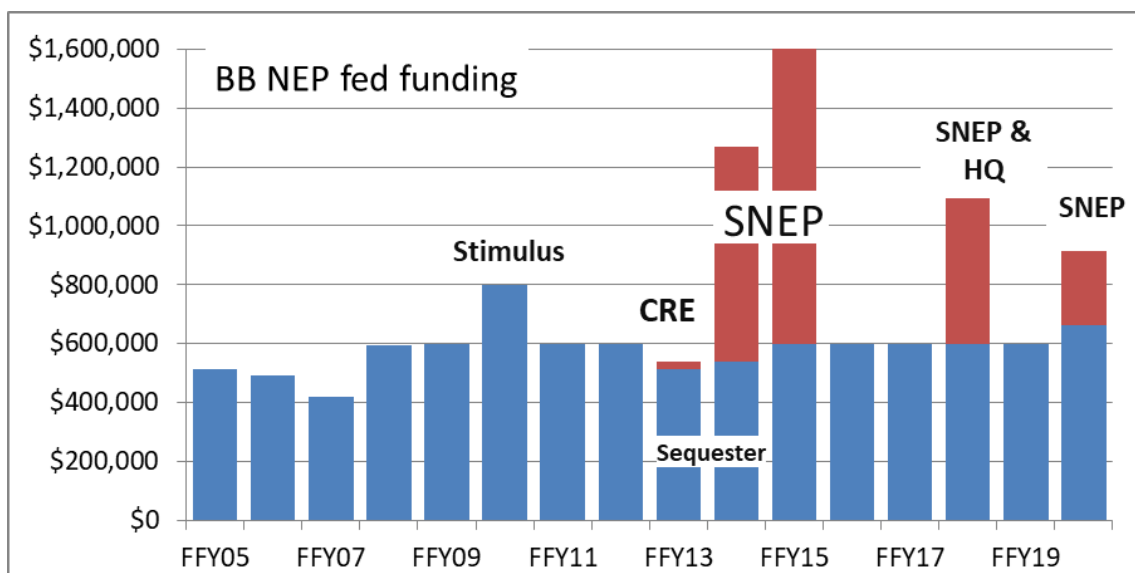


Fig. 1 Past NEP Section 320 base funding (blue) and various add-ons (red).

## Section 2: FFY19 Outcomes: Highlights and Accomplishments July 1, 2019, to June 30, 2020

### Status of FFY19 Work plan, July 1, 2019, to present

This work plan began immediately after the NEP completed its successful Triennial Review by EPA Headquarters.

This section summarizes the status of tasks in last year's work plan activities and describes key accomplishments by the NEP and our partners. The FFY19 work plan Cooperative Agreement is ongoing because the grants awarded under that work plan have not yet closed, like the commencement of the stormwater engineering design procurement, which began May 2020. This contract and some other projects were also 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.

### FFY19 Work Plan Task 1 - Wetland Restoration and Open Space Protection and Restoration

As we have done in the past, we 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 provided maps, helped develop state and federal grant applications, wrote letters of partnership and support to granting agencies, conducted land use analyses, and through the municipal grant program, provided mini-grant funds that help meet match requirements for leveraging grants from other programs. As required by EPA headquarters, the NEP reports on wetland and habitat

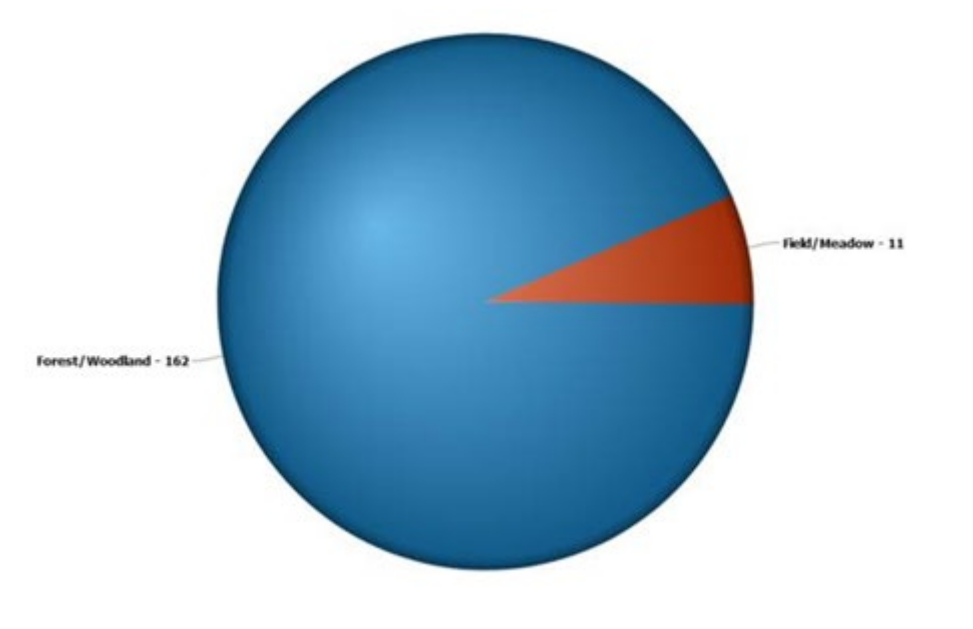


Fig. 2 Types of habitats protected or restored as reported in the 2019 GPRA report to EPA.

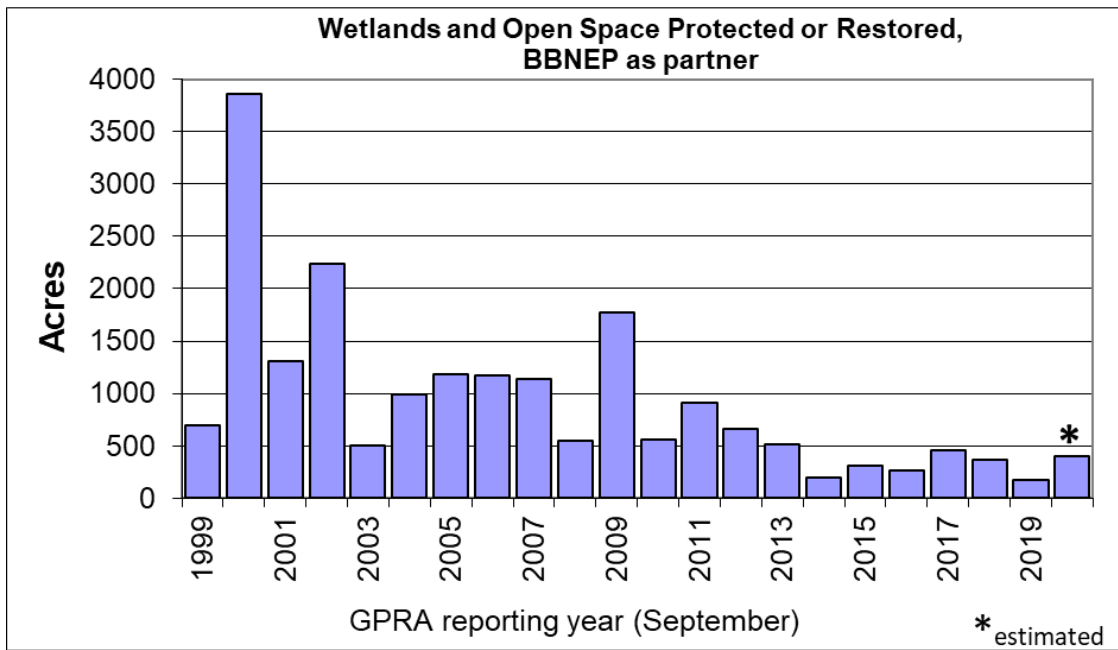


Fig. 3 Total wetlands and open space protected or restored.

protected or restored with support of the NEP in our annual Government Performance and 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 Fig. 3 shows the amount of land protected with NEP technical or financial support since 1999.

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, totaling \$95,418, and these are described in the summary of our municipal grants. However, a special call-out is warranted in the Coalition's efforts to coordinate funding and local legislation over several years as part of an effort to protect 300 acres of undeveloped land on the island of Cuttyhunk in the Town of Gosnold (Fig. 4, and see <https://www.savebuzzardsbay.org/news/10-reasons-why-2019-was-another-great-year-for-buzzards-bay/>). By June 30, the final property acquisitions and land protection easements are expected to be recorded in the county deeds office.

Another strength of the Coalition is that they are responsible stewards of the lands they protect and encourage the public use and enjoyment of these properties. They have a strong record of restoring impaired properties by removing trash, derelict buildings, abandoned vehicles, and restoring wetlands and habitat. In 2017, the Coalition had purchased the Carvalho Farm with municipal funds, private donations, and a supporting grant from the NEP. In November 2019, after restoring the site and adding boardwalks, the Coalition opened the property to the public (Fig. 5).

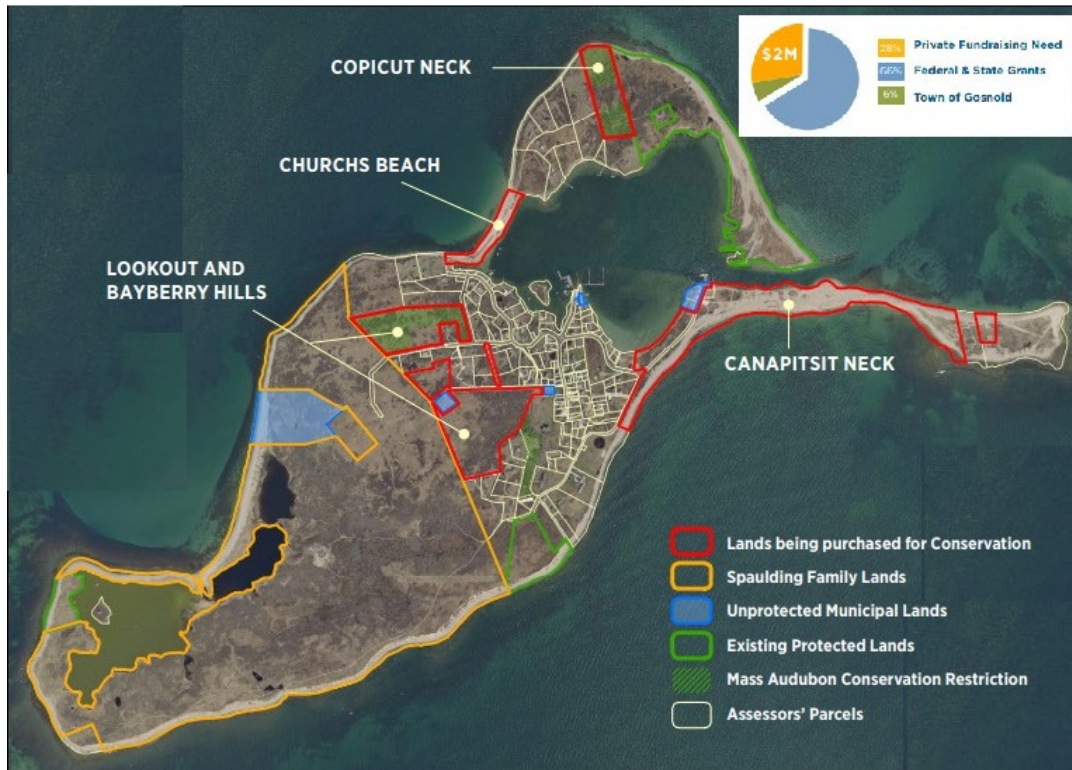


Fig. 4 Cuttyhunk Land Protection Project.

As summarized in Task 1, the NEP provides technical support to Buzzards Bay municipalities and our non-profit partners in their grant applications to state and federal grant programs to protect open space and restore wetlands. Only the Town of Rochester required technical assistance in the development of open space plans, in the form of updated maps, during the period of July 1, 2019, to June 30, 2020.

**FFY19 Work Plan Task 2 - Stormwater Remediation and Technical Assistance**

In the FFY2018 NEP work plan, EPA awarded Southeast New England Program (SNEP) funds to the NEP, a portion of which was used to move the Buzzards Bay Stormwater Collaborative (Stormwater Collaborative) effort to the MMA. This NEP funding terminated in December 2019. In January 2020, MMA continued the effort with a separate grant from SNEP, administered by Restore Americas Estuaries. This funding enabled the MMA to pro-



Fig. 5 Official opening of the Carvalho Farm.

vide staff and interns to work with municipalities and the NEP to collect stormwater samples, inspect stormwater facilities, and map stormwater networks under the guidance of the NEP staff.

This initiative represented 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 a Quality Assurance Project Plan (QAPP) update, training, 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, one NEP stormwater specialist maintains a Geographic Information System (GIS) database incorporating the field investigations and transferring of plan data into the GIS database. The other NEP stormwater specialist oversees the collection of water quality data and conducts QA checks of the data and prepares MS4 permit materials for Stormwater Collaborative participants.

Based on a proposal developed by NEP staff, in 2020, MMA also received a \$46,000 grant from the Massachusetts Department of Environmental Protection (DEP) to purchase and establish an illicit connection detection field investigation trailer that can be borrowed by Buzzards Bay municipalities for their own investigations. The MMA, with guidance from the NEP is currently outfitting the utility trailer, and the project will include training videos to be posted on YouTube and preparing written guidance for investigating illicit discharges. The trailer will be stationed at MMA and made



Fig. 6 Stormwater Collaborative IDDE trailer.

available to the municipalities.

In February 2020, the NEP sought to hire an engineering firm to create stamped engineered plans and supporting design calculations for a series of projects aimed at treating stormwater for bacteria contamination in participating towns in the Buzzards Bay watershed. A firm was selected to perform the work in April 2020. The goal is to develop permit-ready stormwater treatment designs for four to six stormwater networks. The sites will be selected from among those deemed as high priorities by the NEP based on monitoring data and stormwater network information gathered through the Stormwater Collaborative. Treatment strategies may include end of the pipe solutions and whole stormwater network solutions.

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 help towns prepare grant applications for 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 National Pollutant Detection Elimination System (NPDES) municipal plans. Finally, we work with town boards to adopt local stormwater regulations and Low Impact Development (LID) strategies.

### **FFY19 Work Plan Task 3 - NEP Technical Assistance and Municipal Grant Program**

Through our grant and technical assistance programs, the NEP helps municipalities, and our other partners achieve the goals and objectives of the CCMP. With respect to our grant program, there were no funds in the municipal grant program in last year's budget, but because of delayed and/or canceled prior SNEP grants, the NEP awarded a new round of grants totaling \$95,418 in the spring of 2019, and these projects commenced July 2019. The actual grants awarded were as follows:

- The Town of Rochester, and its partner the Rochester Land Trust, received \$45,000 to purchase and permanently protect 20.9 acres of undeveloped land in the Mattapoissett River aquifer, which provides drinking water to four communities in the Buzzards Bay watershed. The property, which is mostly wooded with a perennial stream, contains designated habitat for rare species. Now acquired and protected, the land is owned and managed by the Rochester Land Trust, which plans to provide access to the public for passive recreational activities.
- The Town of Mattapoissett, and its partner the Coalition, received \$30,000 to continue the Baywatchers monitoring program, which measures nutrient pollution in Buzzards Bay. For 27 years, this long-term monitoring program has collected basic water quality, nutrient, and algal pigment information at over 200 locations around Buzzards Bay during the summer months. The program also educates the public on their local water quality. The data collected is used by both state and local natural resource managers to make informed water quality related decisions.
- The Town of Gosnold, and its partner the Coalition, received \$20,418 toward the permanent protection of over 300 acres of undeveloped land on the island of Cuttyhunk. The funding will help match other state grants to acquire and protect 79 acres of privately owned, undeveloped land and secure a permanent conservation restriction on approximately 230 additional donated acres. The project area contains designated habitat for rare species. This pro-



ject will also protect more than 5 miles of coastal shoreline and the island's only drinking water supply.

As part of our technical assistance program, the NEP's Regional Planner also produced over 520 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 fund-raising maps and maps for their website, maps used by municipalities in open space reports and their grant applications, and for other purposes.

The NEP's grant and technical assistance programs continue to fund or advance progress on EPA's CWA core programs. In 2019, the NEP awarded \$30,000 to support the Coalition's Baywatchers citizen water quality monitoring program through a \$30,000 mini-grant through Mattapoisett. Baywatchers remains one of the most effective volunteer-based water quality monitoring programs in the country, 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 to treat problem stormwater discharges through technical assistance and grants, directly supports EPA goals to better control non-point source pollution on a watershed basis.

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

#### **FFY19 Work Plan Task 4 - Program Oversight and Administration**

After the retirement of the NEP Administrative Assistant on June 30, 2019, the Regional Planner position was changed from half time to full time, and the Administrative Assistant position went unfilled. 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.

During the fall and winter of 2019, the NEP director and staff worked with various state agencies and departments to secure new office space. The prior lease agreement had expired, and the procurement of new office space was required to go out to bid. The NEP secured a new office space in a newly constructed mixed-use development at 81B County Road in Mattapoisett. The NEP moved into the new facilities in January 2020. Since moving into the site, the Massachusetts Integrated Technology Department has been integrating NEP data and voice needs into the state network.

During the summer of 2019, the NEP and Boston finance staff worked together to close three outstanding cooperative agreements and submit all needed outstanding paperwork to EPA by the September 30 deadlines.

In September 2019, the NEP submitted 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.

### **FFY19 Work Plan Task 5 - Buzzards Bay Citizens' Water Quality Monitoring**

The Coalition continued its nationally recognized Baywatchers water quality monitoring program, which began in 1992. The Baywatchers program is supported by the Commonwealth of Massachusetts, the NEP, citizens, Coalition dues, and other sources. In 2019, the NEP provided \$30,000 as through a grant. The NEP continued providing technical support to the effort and collaborated with Coalition staff in data analysis and proposal development relating to the work for publications. The NEP and the Coalition used data collected by the Coalition's program to advocate for nitrogen management in Buzzards Bay watershed communities.

During the 2019 season, the 28th 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 177 individuals volunteered their time and energy for the 2019 water monitoring program. This totaled more than 4,920 volunteer hours to collect 3,610 points of basic water quality parameter data. During the 2019 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 762 coastal nutrient water samples and 100 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 (28 consecutive years) from more than 276 different sampling locations.

The NEP director continued to participate in the Coalition's Science Advisory Committee (SAC) that in 2019 focused on issues ranging from the proposed relocation of the Wareham wastewater facility outfall, salt marsh loss in Buzzards Bay, and toxic contaminants.

### **FFY19 Work Plan Task 6 - Environmental Indicators and Outcomes Tracking**

The NEP continued to track various environmental indicators on its website including shellfish bed closures ([buzzardsbay.org/enjoy-buzzards-bay/shellfish/shellfish\\_closures\\_buzzards\\_bay/](http://buzzardsbay.org/enjoy-buzzards-bay/shellfish/shellfish_closures_buzzards_bay/) and Fig. 7 and Fig. 8) 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 are also used during the Coalition's quadrennial *State of the Bay* reports (the last report was in 2018).

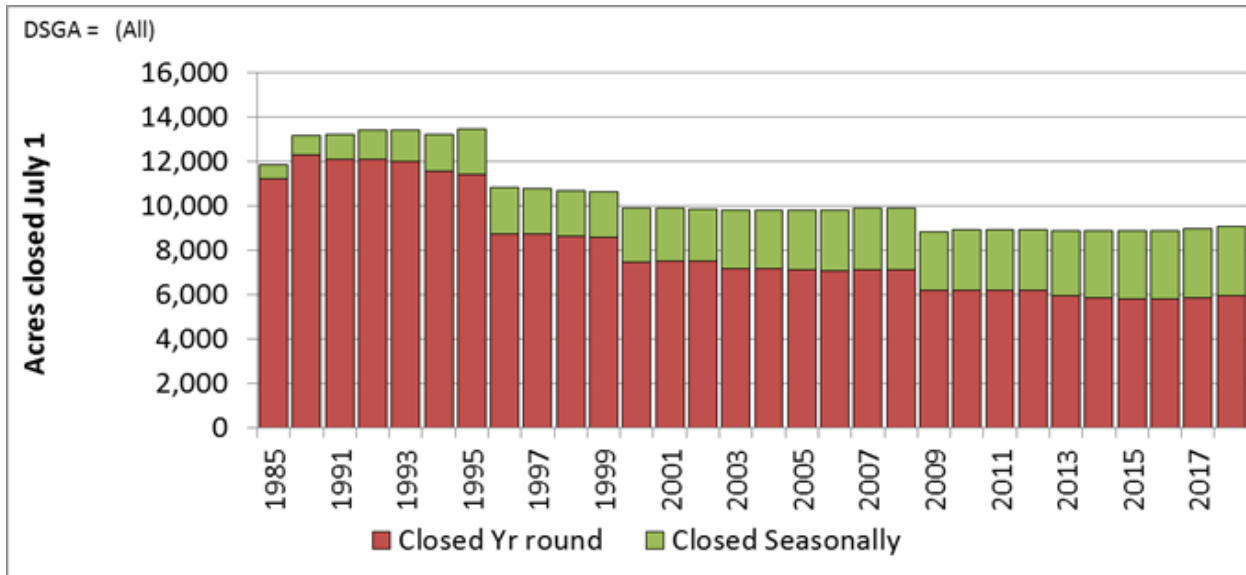


Fig. 7 Long-term shellfish bed closure trends.

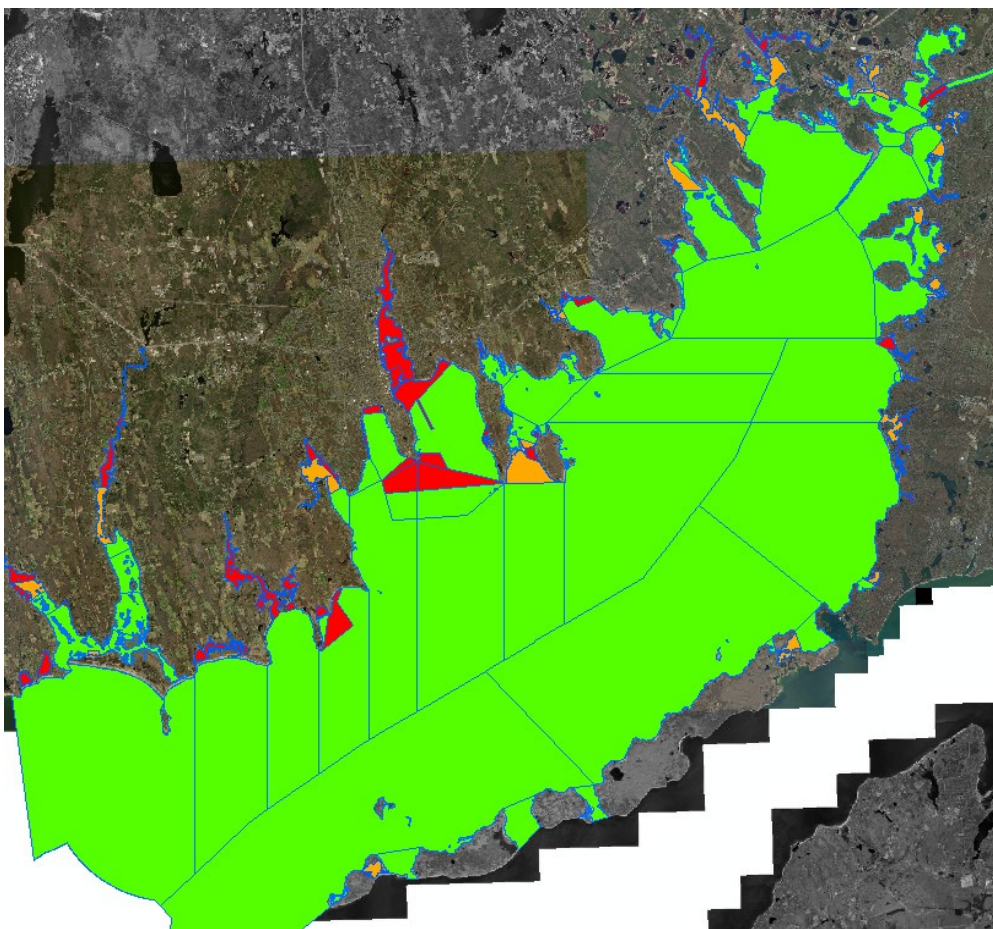


Fig. 8 Shellfish bed closure areas. Red shaded areas are closed year-round; orange shaded areas are seasonal closures.

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.

### **FFY19 Work Plan Task 7 - Outreach and Education**

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 undertook 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 included the June 2019 Swim Buzzards Bay event, their annual meeting, press events, and various publications including the annual report to their members.

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/>.

On June 22, 2019, the Coalition held their Swim Buzzards Bay event. Two hundred and seventy-eight swimmers participated in the 26<sup>th</sup> anniversary of the Swim. These dedicated swimmers raised over \$170,000 for clean water at this signature outdoor fundraising event. The Swim drew participants from 160 communities in 16 states, including as far as away as California, Texas, and Missouri (<https://www.savebuzzardsbay.org/news/2019-buzzards-bay-swim/>).

The Coalition held the 13<sup>th</sup> Annual Watershed Ride on October 6, 2019. A record 307 cyclists pedaled across Southeastern New England to show their support for clean water during the Coalition's largest-ever Buzzards Bay Watershed Ride (<https://www.savebuzzardsbay.org/news/2019-buzzards-bay-watershed-ride/>). The event, supported by 150 volunteers, raised \$215,000 to support the Coalition's education, conservation, research and advocacy work.

The Coalition continued to offer education programs throughout the year for all ages and abilities through the watershed. Examples include:

First Day Hike	January 1, 2019, Carver
Total Lunar Eclipse at the Bogs	January 20, 2019, Mattapoissett
Sunday Stroll: Eastover Reservation	February 3, 2019, Rochester
Science Kids Café: Sounds of the Ocean	February 22, 2019, New Bedford
Seal Walk	March 16, 2019, Dartmouth
Eyes on Owls: A Live Owl Show	March 30, 2019, Westport
Social Bike Ride	April 14, 2019, Falmouth
Open Water Swim	April 28, 2018, Mattapoissett
Barn Swallow Survey at Allens Pond	May 28, 2019, Westport
Trailpalooza!	June 1, 2019, Westport

Women in Waders: Seeking Shellfish	June 11, 2019, Fairhaven
Adult Intro to Sailing	July 11, 2019, Wareham
Learn to Quahog	July 13, 2019, Wareham
Saturday at the Sawmill: Outdoor Obstacles	August 3, 2019, Acushnet
Cuttyhunk Cruise & Exploration	August 5, 2019, New Bedford
Junior Bird Club: Monarch madness	September 24, 2019, Westport
Haunted Hike	October 18, 2019, Dartmouth
Itty Bit Explorers: Hide and Seek	October 29, 2019, New Bedford
Yoga Workshop	November 9, 2019, Plymouth
Geminid Meteor Shower	December 12, 2019, Mattapoisett

### **Learn to Quahog:**

Participants learned how to dig their own quahogs (hard clams) from Buzzards Bay. During this free event with the Coalition participants were taught the basics of local quahogging: what you need, how to do it, and where to go. This was a fun and educational activity for the whole family.

### **Sunday Stroll:**

A Sunday Stroll led by a Southcoast Health medical professional and a Coalition outdoor educator held one Sunday each month offered participants fresh air and exercise while learning how to maintain a healthy, active lifestyle and explore the outdoors.

### **Itty Bitty Bay Explorers:**

Little ones discovered the outdoors during Itty Bitty Bay Explorers, a series of outings with the Coalition. Through fun games and hands-on activities, families learned about Buzzards Bay's animals, plants, and habitats. Itty Bitty Bay Explorers is recommended for families with children five and younger.

During 2019, the NEP continued to update and streamline the navigation of its website [buzzardsbay.org](http://buzzardsbay.org) and subdomains, [climate.buzzardsbay.org](http://climate.buzzardsbay.org) and [Stormwater.BuzzardsBay.org](http://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. 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](http://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 continues 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). These two one-day workshops, focused on soils and vegetation. The Basic Wetland Delineation (BVW): Soils workshop had 24 attendees focusing on hydric soils,

indicators of wetland hydrology, and understanding the DEP BVW Delineation Field Data Form: Section II. Basic Wetland Delineation (BVW): Vegetation workshop had 15 attendees and focused on wetland vegetation and understanding the DEP BVW Delineation Field Data Form: Section I. Vegetation.

### **FFY19 Work Plan Task 8 - Other Specialized Technical Assistance**

The NEP continues to provide technical guidance on nitrogen management issues to the towns and the Coalition. Of note was the fact that the NEP continues to work with the Coalition on water quality monitoring database issues and the salt marsh runnel practice study. The NEP continues to distribute various specialized GIS datasets through its website to the municipalities and engineering firms, such as the sewer history coverage of Buzzards Bay

### **FFY19 Work Plan Task 9 - Technology Transfer to Other Estuaries**

The Executive Director was unable to attend the fall 2019 meeting in Delaware because of schedule conflicts but had planned to attend the spring Association of National Estuary Programs (ANEP) meeting in Washington, DC in March of 2020. However, the spring meeting was canceled due to the COVID-19 crisis.

The NEP Director continued to work with EPA and Restore America's Estuaries (RAE) to guide the 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 helps 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 Massachusetts Coastal Zone and Coastal Watershed, representing a strong investment in clean estuaries, resilient coasts, and healthy habitats.

### **FFY19 Work Plan Task 10 - Website Maintenance and Innovation**

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.

As noted in the outreach and education task in more detail, the NEP continues to maintain three subdomain websites. The first was the [climate.buzzardsbay.org](http://climate.buzzardsbay.org), launched in June 2013 to consolidate the NEP's climate related initiatives on one website. The second subdomain website was [restore.buzzardsbay.org](http://restore.buzzardsbay.org), launched in April 2014 in support of SNEP. The third, <http://stormwater.buzzardsbay.org/>, is the subdomain for the Stormwater Collaborative that was launched in 2016.

The NEP Director continued to maintain and update the program's WordPress website ([buzzardsbay.org](http://buzzardsbay.org)).

In addition to our own websites, the NEP continues to maintain the BBAC's website, [buzzardsbayaction.org](http://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.

### **FFY19 Work Plan Task 11 – Scientific collaboration on nitrogen TMDLs, climate impacts, and water quality impacts on natural resources.**

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 number of onsite systems, occupancy rates, land use types, estimates of impervious area, lawn area, extent of sewerage, and agriculture. Specific accomplishments included:

- Helped to evaluate the Coalition's water quality data set.
- Updated the stormwater Quality Assurance Project Plan (QAPP) and monitoring guide in support of the stormwater collaborative.
- Drafted a new QAPP in support of the salt marsh loss study in collaboration with the Coalition's SAC. Pursuant to that work, the NEP filed ten requests for determination with local conservation commissions to seek permission to undertake the salt marsh studies on what are mostly publicly owned property.
- Refined 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 worked to set up the new stormwater collaborative initiative with MMA. This effort ensured the continuation of the stormwater network mapping and discharge monitoring program with Buzzards Bay municipalities.

### **FFY19 Work Plan Task 12 – Salt Marsh Loss Assessment collaboration with Coalition.**

The NEP and our non-profit partner organization, the Coalition, continued to study salt marsh die-off in Buzzards Bay. In the spring of 2019, the NEP developed a QAPP to guide this effort, and the QAPP was approved by the EPA. During the summer and fall of 2019, NEP staff, with field support from MMA interns, installed elevation benchmarks at twelve sites, and conducted elevation surveys. During the same period, the Coalition, with some support from the NEP, funded MMA student-conducted vegetation and crab population surveys. During this period and continuing through June 2020, NEP staff continued to create a detailed GIS base map coverage of salt marshes in Buzzards Bay, as part of a long-term trend analysis of marsh loss. Planned spring and early summer fieldwork, including tidal studies, was canceled because of the COVID-19 crisis.

During the last work plan period, the NEP helped the Coalition and a scientist at the Woods Hole Research Center secure a \$400,000 SNEP grant to study the use of runnels (shallow channels to drain standing water) as a sea level rise management tool. The NEP director also worked with this research team to develop two other research grant applications related to salt marsh loss. The NEP provided GIS and other support for all these efforts. The NEP maintained and updated an [interactive map website](#) 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.

This task supported several CWA 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.

### **FFY19 Work Plan Task 13 – Technical assistance to support Coastal Resiliency and Municipal Vulnerability Preparedness.**

The NEP provided maps of guidance to Buzzards Bay municipalities seeking Coastal Resiliency Program (CRP) and Municipal Vulnerability Preparedness (MVP) grants. In the summer of 2019, the State of Massachusetts announced these grants to Buzzards Bay municipalities:

#### **Outputs/Products:**

**Mattapoissett** — Pine Island Pond Watershed Lands Project — \$960,000, which was used by the Mattapoissett Land Trust and Coalition to permanently protect 120 acres adjacent to Pine Island Pond in Mattapoissett.

**Westport** — Assess and Plan for Climate Threats to East Beach Corridor — \$75,000 for an engineering study to assess the East Beach corridor, which is at risk of flooding in many areas along and near East Beach, including residences and emergency access roads.

### **FFY19 Work Plan Task 14 – Collaboration with the Ecosystem Center to evaluate Permeable Reactive Barrier (PRB) technology for remediation of residential nitrate in treated wastewater (\$60,531 sub-award to the Marine Biological Laboratory Ecosystem Center).**

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. 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. Funding for this project was not finalized until the spring of 2019 because the study is undertaken outdoors and could not be completed during freezing weather. The PRB columns were built and installed at the Wareham Water Pollution Control Facility. Data was collected during the summer at fall using the test columns. The investigators evaluated how flows through the PRB media can be scaled, controlled, and optimized to further reduce nitrogen concentrations in the Wareham facility's discharge. The facility discharge currently averages less than 3 mg/L total nitrogen, mostly as nitrate, and most of this was refractory, so the experimental treatments included added nitrate. The investigators ran out of funds before the system could be retested in the spring of 2020 when the wastewater facility discharges an effluent higher in Dissolved Inorganic Nitrogen (DIN).

#### **Outputs/Products:**

Final report on the outcomes of the pilot study was completed March 2020.



## 2019 Leveraged Funding (Federal FFY19 Work Plan funds)

Each September, the NEP submits to EPA, as part of our GPRA 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, 2018, to September 30, 2019, the NEP's leveraged funds in the primary, significant, or support category totaled \$3,431,289, \$3,080,550, and \$0 respectively.

Table 1. Summary of NEP role in leveraged funds

NEP Role	Total
Primary	\$3,431,289
Significant	\$3,080,550
Support	\$0
<b>Grand Total</b>	<b>\$6,511,839</b>

We will report our FFY19 2019-2020 leveraged estimates to EPA in the fall of 2020.

### **Section 3: FFY20 Funds: Proposed Work Plan Activities July 1, 2020, to June 30, 2022.**

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 \$662,500 in NEP base funding, a \$10,000 headquarters add-on for a CCMP climate vulnerability assessment, and \$250,000 in a Region I SNEP add-on for targeted projects, for a total of \$922,500.

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.

#### **FFY20 Work Plan Task 1 - Wetland Restoration and Open Space Protection and Restoration**

##### **CCMP/Work Plan Goal(s):**

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)

##### **Project/Activity Purpose and Description:** (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.

### **Outputs/Products:**

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

### **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.

### **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.

Supports CWA core program: CWA and state wetland protection efforts.

## **FFY20 Work Plan Task 2 - Stormwater Remediation and Technical Assistance**

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. Because last year's SNEP funding continues throughout 2020, the NEP will continue to support the MMA efforts, conduct training exercises, and update the

training. During last year's work plan cycle the NEP helped MMA secure a \$46,000 DEP MS4 grant to purchase and outfit an Illicit Discharge Detection and Elimination (IDDE) investigation trailer. The NEP staff will continue to support and train municipal officials and MMA staff on effective use of the IDDE trailer.

In the FFY18 work plan, \$100,000 was included to hire an engineering firm to develop stormwater designs for three or four priority projects among the high priority discharges identified through the mapping and monitoring efforts of the Stormwater Collaborative. For various reasons, the commencement of this project was delayed until April of 2020. This project is scheduled to continue through December 31, 2020, with a possible extension to February 2021. Therefore, overseeing this task will be a major focus of the two NEP stormwater specialists in the coming year. An additional \$4,000 is set aside in the category for any needed professional survey work for stormwater designs (like bid specs), not included in the design contract.

Considering the COVID-19 crisis, the NEP staff has already adapted their approach to meet the needs of the NEP's stormwater assistance program. IDDE training courses will be largely replaced with a video series produced by the NEP. Meetings with the stormwater engineers will largely be undertaken via teleconference. Field work will be undertaken with appropriate social distancing protocols.

During the upcoming work plan period, the NEP staff will provide other routine stormwater management technical support ranging from MS4 NOI development and Stormwater Management Plan (SWMP) guidance, to project review of designs in complex local permit applications upon request.

**CCMP/Work Plan Goal(s): Ecosystem Restoration and Protection:**

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

**Project/Activity Purpose and Description: (ongoing)**

Besides the Stormwater Collaborative program support, the NEP helps 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. As noted above, the funding provided to the MMA is being carried forward into the current fiscal year through the end of December 2020, and the grant will likely be extended by RAE into 2021 because of delays from the COVID-19 crisis. 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.

In the coming fiscal year, the NEP is providing \$4,000 for laboratory testing services to test stormwater samples collected by the Stormwater Collaborative.

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 CPR fund. Another measure of the pilot program's success will be the participation of additional municipalities in future years.

### **Responsible Partners and Their Role(s):**

On the Stormwater Collaborative Initiative, our principal partners on these projects are the watershed municipalities and their public works departments and the MMA and Buzzards Bay municipalities. 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 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 related to broader stormwater management goals and services to municipalities not yet participating in the Stormwater Collaborative.

The part-time Stormwater Specialist, whose hours are being increased from 20 to 24 hours per week, 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:**

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:**

This year's work plan goal is to finalize engineering designs by the end of 2020 and 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 re-

quirements 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.

**Budget:**

The costs for these tasks in terms of NEP staff time are estimated at more than \$300,000 (salary + fringe + indirect), or 60% of personnel costs. The MMA work continues under a separate SNEP award. Included in this year's budget are about \$1,500 of the program's supplies budget, \$4,000 for additional engineering services, and \$3,000 for the laboratory testing in the contractual category.

**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:**

All activities under this task have medium to high potential of being affected by procedures implemented to deal with the COVID-19 crisis.

*Stormwater Collaborative Initiative:* Suspension of the summertime monitoring is a potential outcome of the COVID-19 crisis. It is expected that RAE, the EPA grant manager, would extend the grant well into 2021 to address this outcome. NEP staff would need to refocus its support through remote meetings, independent field work, remote GIS work, and data analysis.

*Stormwater Design Development:* Local participation may be affected by the COVID-19 crisis. Delays in contractual services can be met by extending the contract by two months. The NEP can handle requests for technical assistance depending upon workload and ongoing projects.

*General stormwater technical and financial assistance:* Local participation may be affected by the COVID-19 crisis. 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.

Supports CWA core program: 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.

### **FFY20 Work Plan Task 3 - Municipal Grant Program and Stormwater Collaborative Contractual Support**

#### **CCMP/Work Plan Goal(s):**

Implementation and capacity building needs of the CCMP including potential action in the Stormwater, Nitrogen, Shellfish, Wetlands and Habitat, Land Use, On-Site Septic Systems, and other action plans.

#### **Project/Activity Purpose and Description: (ongoing)**

The NEP has set aside \$125,606 of the \$250,000 add-on SNEP funds to support the Buzzards Bay Municipal Mini-grant Program.

Besides the ongoing support and oversight of the Stormwater Collaborative in Task 2, in terms of grant sub-award management, grant management is required for the engineering design services contract slated to continue through 2020, the \$4,000 in this year's budget to provide additional engineering services, and the \$4,000 to provide laboratory services to the Stormwater Collaborative. The additional engineering services contract is to complete tasks not included in the existing engineering services contract.

#### **Responsible Partners and Their Role(s):**

Buzzards Bay municipalities are the key partner in developing stormwater designs and guiding the MMA is also a key partner in ensuring continued interest and participation in both the municipal grant program, and in participation and support of the Stormwater Collaborative.

#### **NEP Staff:**

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

#### **Outputs/Products:**

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

#### **Milestones:**

1. Work with the Stormwater Collaborative municipalities and the NEP's contractor to develop stormwater designs for three or four high priority sites. Designs are slated for completion by December 2020.
2. Establish new engineering services contract and laboratory services contract.

**Budget:**

The ongoing contract is for \$100,000 from the FFY18 budget carried forward, and \$8,000 in FFY20 funds for the new engineering services and lab contracts, as well as staff time to manage and participate in these contracts.

**Outcomes:**

Short-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.

Intermediate: Increased leveraging of resources committed to NEP activities or towards implementation of CCMP goals and recommended actions.

Long-term: 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:**

All activities under this task have medium to high potential of being affected by procedures implemented to deal with the COVID-19 crisis. 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.

This task may support many of the CWA core programs including: 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.

**FFY20 Work Plan Task 4 - Program Oversight and Administration**

**CCMP/Work Plan Goal(s):**

Supports all program activities.

**Project/Activity Purpose and Description: (ongoing)**

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.

**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 with additional support from the CZM financial management assistant.



**Outputs/Products:**

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.
3. Draft 2020 work plan sent to Steering Committee in April/May 2020.
4. Approved Cooperative Agreement sent to EPA in June 2020.
5. EPA finalize award by 30 July 2020.

**Budget:**

The only costs are NEP staff time.

**Outcomes:**

**Short-term:** Increased leveraging of resources committed to NEP activities or towards implementation of CCMP goals and recommended actions.

**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:** Some activities under this task have low to medium potential of being affected by procedures implemented to deal with the COVID-19 crisis. In addition, various administrative delays are possible at levels in the hierarchy.

This task does not directly support any CWA core programs.

**FFY20 Work Plan Task 5 – Buzzards Bay Citizens’ Water Quality Monitoring****CCMP/Work Plan Goal(s):**

Principally Nitrogen Management, but also some assistance toward goals in Stormwater, Shellfish, Wetlands and Habitat, Land Use, On-Site Septic Systems, Sewage Treatment Facilities action plans.

**Project/Activity Purpose and Description: (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. 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 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.

**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:**

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 2019 monitoring in September of 2020.

**Budget:**

The only costs of Section 320 funds under this Cooperative Agreement with EPA are 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 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. 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 water-

sheds. 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: While the oxygen monitoring program under this task is not expected to be affected by the COVID-19 crisis, analysis of water sample by the research laboratory may be affected. 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.

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.

## **FFY20 Work Plan Task 6 - Environmental Indicators and Outcomes Tracking**

### **CCMP/Work Plan Goal(s):**

All Action Plans.

### **Project/Activity Purpose and Description: (ongoing)**

The 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.

The NEP will continue its work with the Coalition to analyze and publish results from the Citizens Water Quality Monitoring program database, including assessing climate change impacts. Specifically, the NEP continues to track and monitor key environmental indicators to document the success of the CCMP. Besides the ongoing water quality monitoring program of the Coalition, DEP eelgrass data, together with new historical eelgrass information collated by the NEP, are quantified for Buzzards Bay and reported every three years in the Coalition's *State of the Bay* reports.

Because a new Coalition *State of the Bay* report is expected in early 2021, the NEP will prepare shellfish closure statistics and eelgrass cover summaries under this work plan. Other data tracked by the NEP are shellfish bed permanent closures (also quantified for the Coalition's *State of the Bay* reports), percentage of stormwater discharges with some form of stormwater remediation imple-

mented, tracking of CCMP accomplishments, ongoing monitoring of two key Buzzards Bay herring runs, and the ongoing tracking of protected open space and new land acquisitions (GPRA data).

To more readily transmit information collected through the citizen water quality monitoring program (see Task 5), the Coalition plans to continue to enhance its website to include annual updates of its water quality testing program to show individual trends for Buzzards Bay embayments. The NEP believes this important endeavor enables citizens and managers to see clearly trends in embayments of interest.

### **Responsible Partners and Their Role(s): (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 (DMF) 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:**

1. Annually updated shellfish bed closure maps for Buzzards Bay posted at the program's annual summary shellfish closure web page.

### **Milestones:**

1. Shellfish bed closure map for the summer of 2019: To be initiated August 2020 and completed September 2020.
2. Eelgrass cover map for the summer of 2019: To be initiated August 2020 and completed September 2020.

### **Budget:**

The only section 320 funds are NEP staff time, with some supplies for map products. The Coalition's budget includes staff and outreach and publication costs.

### **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: Activities under this task are unlikely to be affected by the COVID-19 crisis. Unanticipated demands on staff time, particularly those of the NEP director, will have the greatest impact on this task.

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.

The NEP continues to track various environmental indicators on its website including shellfish bed closures ([buzzardsbay.org/enjoy-buzzards-bay/shellfish/shellfish\\_closures\\_buzzards\\_bay/](http://buzzardsbay.org/enjoy-buzzards-bay/shellfish/shellfish_closures_buzzards_bay/) and Fig. 7 and Fig. 8) 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 last report was in 2016).

### **FFY20 Work Plan Task 7 - Outreach and Education**

#### **CCMP/Work Plan Goal(s):**

CCMP Actions: Will address Stormwater, Nitrogen, Shellfish, Wetlands and Habitat, Land Use, On-Site Septic Systems, Sewage Treatment Facilities.

#### **Project/Activity Purpose and Description (ongoing):**

Most of the activities under this task are met by the Coalition. With respect to the NEP, the NEP's 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 continue its support for the two annual Wetlands Delineation Workshops and special request workshops (as needed) conducted by the [MACC](#). These workshops are conducted by retired NEP wetlands specialist, John Rockwell, who does the work on a pro bono basis.

Since the 1990s, in order 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 Coalition<sup>1</sup>. 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 annual swim consists of a 1.2-mile open water swim across outer New Bedford Harbor. It highlights the role a clean and healthy Buzzards Bay plays in the lives of watershed residents.

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

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<sup>1</sup> This strategy was formalized in a 2005 Memorandum of Understanding between the Buzzards Bay NEP, Coalition, and the BBAC.

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

**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 MACC. The NEP may also periodically prepare articles and notes for CZMail. 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:**

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. Wetlands delineation materials and [web page](#).

**Milestones:**

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

**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: NEP activities under this task are unlikely to be affected by the COVID-19 crisis. 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.

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.

## **FFY20 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.

### **Purpose and Description: (ongoing)**

This task includes technical assistance of Buzzards Bay 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, with most recommendations 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:**

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.

### **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 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:** 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.

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.

**FFY20 Work Plan Task 9 - Technology Transfer to Other Estuaries**

**CCMP/Work Plan Goal(s):**

All CCMP actions to some degree.

**Project/Activity Purpose and Description:** (ongoing)

The NEP Director anticipates attending both the spring and fall NEP national meeting. 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 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, Association of National Estuary Programs, other national programs in efforts to communicate the benefits of protecting and restoring national estuaries.

**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 spring and fall NEP meetings and participant in conference calls, web meetings, and communication efforts. Other NEP staff may attend meetings as required by the Executive Director.

**Outputs/Products:**

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 2020 and spring 2021 EPA-NEP meetings at a minimum. Staff may also attend other national conventions (on planning, wetlands, and stormwater as budget, availability, and staff time allows.)

**Budget:**

The travel budget (\$3,100) covers all out of state meeting expenses, as well as all in-state travel of staff. This represents a reduction from previous years because of expected travel restrictions due to the COVID-19 health emergency.

**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.

This task does not directly support any CWA core programs.

**FFY20 Work Plan Task 10 - Website Maintenance and Innovation**

**CCMP/Work Plan Goal(s):**

Supports all activities, in particular outreach and education components.

**Project/Activity Purpose and Description:**

The NEP will continue to maintain an independent website ([Buzzardsbay.org](http://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](http://buzzardsbay.org) and the subdomains [climate.buzzardsbay.org](http://climate.buzzardsbay.org), and [stormwater.buzzardsbay.org](http://stormwater.buzzardsbay.org).

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

**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:**

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.

### **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.

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.

### **FFY20 Work Plan Task 11 - Scientific collaboration on nitrogen TMDLs, climate impacts, and water quality impacts on natural resources**

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 areas scientists.

Conduct GIS analyses of watershed land use, including number of onsite systems, occupancy rates, land use types, estimates of impervious area, lawn area, extent of sewerage, and agriculture.

- 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 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.

**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:**

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.

**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: This task is not affected by the COVID-19 crisis. Work on the data set limited by time availability of the Executive Director.

This task supports several CWA 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.

## **FFY20 Work Plan Task 12 - Salt Marsh Loss Assessment and Runnel Study Collaboration with Coalition**

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 2020 and 2021. 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 MA 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) analysis<sup>2</sup>. The BBC will provide training to any citizen volunteers participating in the program. A QAPP developed in 2019 will guide this effort. The NEP is also a partner on a SNEP grant runnel study that will be ongoing in 2020 and 2021, and many of the same GIS services will be provided to that effort.

### **Principal Staff involved in these tasks:**

Executive Director, Coalition Staff, the Coalition's SAC subgroup (Giblin, Neill, Deegan will be 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.

### **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:**

1. Posting of new web pages and documents in support of the effort.
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 SAC principals.
6. Incorporation of marsh loss into future *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, 2020. GIS coverage of key historical aerial surveys will be completed by June 30, 2021. Other updates and web postings as need or required.

### **Budget:**

NEP staff time, principally the Director.

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<sup>2</sup> See <http://climate.buzzardsbay.org/marsh-migration-methods.html>

**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. Some tasks, particularly field work by NEP partners, will be affected by the COVID-19 crisis.

This task supports several CWA 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.

**FFY20 Work Plan Task 13 - Technical Assistance to Support Coastal Resiliency and Municipal Vulnerability Preparedness**

In September 2019, the Commonwealth of Massachusetts announced the awarding of \$2.4 million in Coastal Resiliency Program (CRP) grant funds, and in February 2020, \$11.6 million in Municipal Vulnerability Preparedness (MVP) grant funds were awarded. 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.

**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 landuse 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.

**NEP Staff:**

The NEP Executive Director is the lead on this task.

**Outputs/Products:**

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.

### **Budget:**

NEP staff time. A minimum of \$214,175 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: The COVID-19 crisis is not expected to adversely affect this task. 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.

This task supports several CWA core programs indirectly, including supporting sustainable wastewater infrastructure and CWA and state wetland protection efforts, and climate adaptation related priorities.

### **FFY20 Work Plan Task 14 - Targeted Grant Sub-awards**

This task includes all targeted grant sub-awards for FFY20 work plan funds, except for municipal grants, which are described in Task 3, and Coalition water quality monitoring, which is described in Task 5 and Appendix 2.

#### **1) Wareham Water Pollution Facility Permeable Reactive Barriers (PRB) Test Facility, Phase 2 (EC Marine Biological Laboratory \$27,375)**

In last year's work plan, using SNEP add-on funds, the NEP collaborated with the Ecosystem Center at the Marine Biological Laboratory to evaluate the feasibility of applying PRB technology, using wood chips as a carbon source, to reduce nitrogen inputs from advanced wastewater effluent under different controlled flow conditions. This work was undertaken in partnership with the Wareham Water Pollution Control Facility (WPCF) where the PRB test columns were installed (Fig. 9). This facility is under a permit limiting total nitrogen discharges to 3 mg/L total nitrogen for eight months of the year. 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. Because the project was principally a summer study, the work in last year's work plan was deferred until the summer of 2019. In the pilot project, the investigators constructed six replicate small-scale test reactors (6" diameter pipe x 4.5 foot long) and manipulated conditions within these to maximize denitrification and removal of the residual nitrate. Reactors were filled with either fresh wood or wood excavated from an existing 13-year-old PRB barrier (to evaluate longevity of the media). The investigators



Fig. 9 PRB test columns.

pumped treated effluent from the WPCF through these systems at varying flow rates to control residence time and also tested the capabilities of the system by adding nitrate to the inflow at levels up to 12 mg/l. Data collected included inflow, outflow, and interstitial water within the reactor to measure total dissolved N, NH<sub>3</sub>, NO<sub>3</sub>, PO<sub>4</sub>, DOC and Chromophoric Dissolved Organic Matter (CDOM) at different points along the flow path. This study was to evaluate the use of PRBs to further polish the effluent of advanced nitrogen reduction facilities like Wareham's.

During last year's investigation, it was determined that the facility often discharged far less than the permitted discharge limit of 3 mg/L total nitrogen, and most of this nitrogen was refractory (not the inorganic forms of nitrogen that would be easily treated by PRBs). Consequently, the experimental treatments required the addition of nitrate to the PRB influent. The systems were effective in removing all nitrate added up to levels of 12 mg/l. The funding in last year's study did not include monitoring for the spring of 2020 when the wastewater facility discharges an effluent higher in DIN, because the 3 mg/L total nitrogen limit is not required to be met. The processes involved in nitrate removal are affected by temperature and the reactor function should be evaluated throughout the seasons when both temperature and effluent quality change. The supplemental funds would allow the evaluation of the PRB during these cool water spring and fall conditions at the WPCF. The findings of this study will not only be useful in defining strategies to further reducing nitrogen loads from the Wareham facility but will be relevant to other wastewater facilities where stringent nitrogen controls are not required under an NPDES permit.

## 2) Determining Nitrogen Inputs to Buzzards Bay from Coastal Rivers (Woods Hole Research Center, \$56,746)

In this project, the Woods Hole Research Center (WHRC) will initiate discharge and concentration sampling on six additional Buzzards Bay rivers: East Branch Westport River, Slocums River (Paskamansett River), Acushnet River, Mattapoissett River, Sippican River, and Wankinco River. In

addition, the investigators will quantify discharge in Red Brook and the Pocasset River to combine with concentrations measured by the deployed monitoring equipment. The investigators will 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 investigators will develop a database of river discharge and concentrations to be made available by the WHRC.

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.

### **3) Stormwater Designs and Innovative Stormwater Monitoring Approaches (UMass Dartmouth, \$41,719)**

Under this initiative, the NEP will partner with UMass Dartmouth to fund both a senior studies project and a graduate student research project to develop stormwater treatment designs and conduct investigations of illicit connections and pollution sources in stormwater networks.

The senior student project will involve a team of students that will develop engineering designs to treat a stormwater discharge. This effort will complement an ongoing stormwater designs project by the Horsley Witten Group under contract with the NEP that began in May 2020. The senior student project will take a conceptual plan and develop engineering designs for that site in the spring of 2021.

The second project will involve a student in the BS-MS program. This student will be diagnosing pollution sources in a stormwater network containing elevated coliform concentrations. The student will help develop a monitoring approach to be undertaken by the Stormwater Collaborative to diagnose pollution sources in the selected stormwater network. The one-year student study will include a GIS evaluation of land use, stormwater networks, water quality data, and implementation of innovative monitoring approaches. The findings of the study will inform pollution source reduction efforts by the municipality, and the development of stormwater treatment designs.

### **4) CCMP Climate Vulnerability Assessment Support (Coalition, \$10,000)**

The \$10,000 for this task would be used to support BBC staff to host meetings and workshops with key stakeholders, synthesize responses, and prepare graphics associated with climate and pollutant trends in Buzzards Bay. 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 will facilitate the communication and consultation phases associated with the development of the CCMP climate vulnerability assessment. Specifically, the Coalition will use the forums to assess needs of each stakeholder group to gauge their interests or concerns about climate change risks and the adaptation planning process. The Coalition will hold a minimum of five workshops (webinars or in person meetings depending on the COVID-19 health emergency conditions) and develop a schedule for stakeholder involvement. 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. Included in this task are the devel-



opment of graphics to communicate environmental trends ranging from toxic contaminants to the mussel watch program to habitat change related to climate drivers.

**Principal Staff involved in these tasks:**

The NEP Executive Director will facilitate coordination with the principal investigator in all these grants and communicate activities and findings of the project on the NEP website. The NEP Regional Planner will administer the grants.

**Responsible Partners and Their Role(s):**

Dr. Ken Foreman, SES Director, is the project leader for MBL, and will oversee and manage the PRB pilot study. Dr. Chris Neil, Senior Scientist of the Woods Hole Research center will oversee the river nitrogen load monitoring task, Dr. Rachel Jakuba, Coalition Science Director will oversee the water quality monitoring program, and Coalition staff will oversee the Climate Vulnerability Assessment workshop series and trend analysis report products.

**NEP Staff:**

The NEP Executive Director and Regional Planner will help oversee the grants.

**Outputs/Products:**

Production of draft and final report on the outcomes of the pilot study.

**Milestones:**

Work on this project would begin in late fall of 2020 workshops and or webinars, with final reports and recommendations completed by June 2021.

**Budget:**

The total budget for each sub-award is listed in each section above, and in the more detailed information in Appendix 2.

**Outcomes:**

Short-term: Data defining the relationship between flow and nitrogen reduction under different control conditions.

Intermediate: A report summarizing the outcomes of the pilot study with recommended next steps and opportunities.

Long-term: If the technological approach is viable, application of the technology for larger scale volumes or field deployment for pump and treat of groundwater plumes. Further studies of bacterial process successful.

Pressures affecting outcomes: Because many of these projects will begin in the fall of 2020 or later, the COVID-19 crisis is not expected to materially affect the products generated by these sub-awards, Pressures for the NEP are defined by limited time availability of the Executive Director. There may be unanticipated costs when implementing the program.

This task supports several CWA core programs indirectly, including supporting sustainable wastewater infrastructure and CWA and state wetland protection efforts.



## Section 4: Budget Summary and Explanation

This work plan is a new Cooperative Agreement. The new budget is summarized in Table 2 and the pie chart in Fig. 10, according to EPA grant categories. Supplemental details of the budget are contained in Table 3. Beginning with this work plan, EEA has assumed the costs of phone and data/internet services to the NEP.

Table 2. Federal FFY20 BUDGET DETAIL (Award = \$922,500 (\$662,500 base funding + \$10,000 HQ CCMP climate vulnerability + \$250,000 SNEP add-on)

**Personnel\*:** \$368,452 (Personnel costs are based on the following staffing levels)

PERSONNEL	Cost	Full-Time Employees
Executive Director	\$113,103	1
Regional Planner	\$95,767	1
Stormwater Specialist	\$104,740	1
Stormwater Specialist part time	\$54,842	0.64

**Contractual\*:** \$8,000

Stormwater Designs Services \$4,000\*

Laboratory contracts for stormwater analyses \$4,000\*

**Travel:** \$3,100

Travel estimate is based on the actual in-state and out-of-state expenditure from other years and new projections, less the expected fall NEP meeting cancelation due to the COVID-19 crisis. The majority of 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. It is estimated that NEP staff will participate in the following:

- Executive Director: 1 national meeting, 4 NE tech transfer meetings, 17 in-state and watershed partner meetings, 30 in-state site visits.
- Regional Planner: 2 state and watershed partner meetings, 2 site visits.
- Stormwater Specialist (FTE): 1 NE tech transfer meeting, 10 state and watershed partner meetings, 26 site visits.
- Stormwater Specialist (HTE): 3 state and watershed partner meetings, 15 site visits.

**Fringe:** \$143,254

37.03% + 1.85% Medicaid, etc. charge on all personnel

**Supplies:** \$3,938

Postage, printing, paper, office and field supplies

**Other:** \$352,002

Program Operations	\$50,556
Municipal Grants	\$125,606
Coalition Monitoring	\$40,000
WHRC River monitoring	\$56,746
UMass Innovative Stormwater Monitoring Approaches	\$41,719
PRB optimization - wastewater treatment pilot	\$27,375
CCMP climate vulnerability assessment BBC	\$10,000

Program Operations includes 12 months' rent (offset by \$5,000 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. It should be noted that 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:** \$43,754

There is an 11.26% charge on "Personnel," "Contractual," plus selected expenditures in the "Other" category (detail in Table 4).

Table 3. Supplemental budget details

OTHER Program Operations detail	
rent (includes \$5,000 offset from CZM)	\$30,940
cleaning	\$2,496
utility electric	\$960
utility gas	\$600
water/sewer	\$950
alarm system	\$360
repairs, maintenance (copy/printer, etc.)	\$365
Phone, internet	\$0
Core technology, single audit, other chargebacks*	\$11,993
Printer/Copier/Scanner lease	\$1,892
SUPPLIES Detail	
Field monitoring supplies, equipment	\$1,848
janitorial supplies	\$225
office supplies (paper, printer, plotter, copier)	\$1,565
postage	\$300
total	\$3,938
(*) Charge Back Detail	
MMARS IT Chargeback	\$1,273
HRCS Chargeback	\$220
Core Tech. Serv. & Security Fees (BCS) Chargeback	\$8,000
Single State Audit	\$2,500

Table 4. Indirect Cost Table

PERSONEL	\$368,452
CONTRACTUAL	\$8,000
OTHER Program Operations sub-elements	
cleaning	\$2,496
alarm system	\$360
Selected chargebacks (MMARS IT & Core Tech)	\$9,273
Total	\$388,581
<b>Indirect Rate (0.1126)</b>	<b>\$43,754</b>

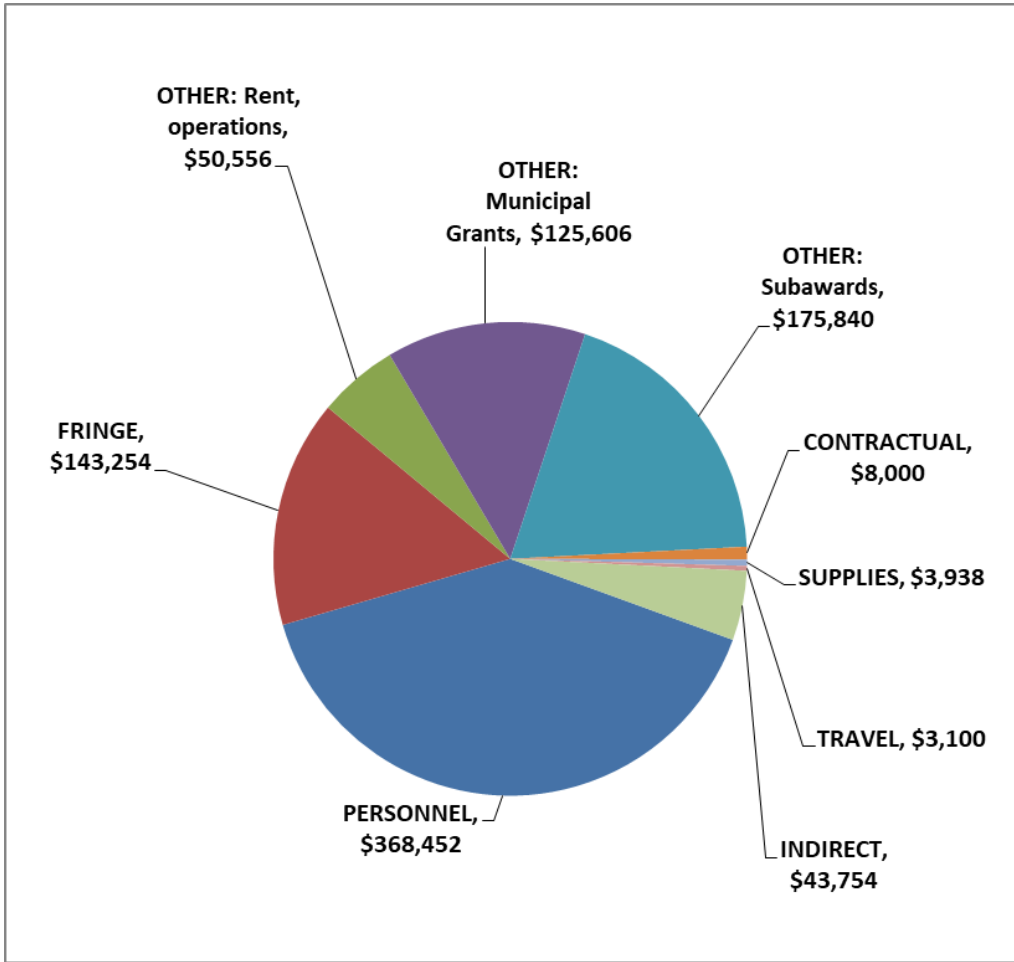


Fig. 10 Pie chart of FFY20 federal budget

## Section 5: Match to the Cooperative Agreement

Below is a summary of the \$912,500 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.

### **1) Coalition Water Quality Monitoring Program (\$162,901)**

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 (\$162,901 based on \$33.11/hr. x 4920 hours reported in 2019). The hourly rate was adopted from <https://independentsector.org/value-volunteer-time-methodology/> for the 2019 rate in the Commonwealth of Massachusetts.

### **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 (\$14,300)**

Municipal official participation in BBAC and NEP meetings (assume 11 meetings, average 10 people per meeting, 2 hours meeting time, and a \$65/h loaded rate. Some of these meetings are expected to move to webinars during the COVID 19 health emergency.

### **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, especially 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 BBC 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 (\$176,099)**

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

### **6) Match to the municipal grant program (\$310,000)**

Based on past multipliers, the NEP expects to receive \$310,000 in match toward the \$125,606 in

municipal grants awarded.

Table 5. Summary of proposed match.

<b>Proposed MATCH (non-state)</b>	<b>Personnel</b>	<b>Fringe</b>	<b>Contractual</b>	<b>Other</b>	<b>Supplies</b>	<b>Travel</b>	<b>Indirect</b>	<b>TOTAL</b>
1. Coalition WQ Monitoring Program (1)			\$162,901					\$162,901
2. BBAC dues			\$25,000					\$25,000
3. BBAC, other municipal meetings, workshops (2)	\$14,300							\$14,300
4. Other Coalition Support (3)	\$232,500					\$1,700		\$234,200
5. CZM Coastal Resiliency Grant program				\$176,099				\$176,099
6. Municipal match to BB NEP grants				\$310,000				\$310,000
<b>Summary</b>	<b>\$246,800</b>	<b>\$0</b>	<b>\$187,901</b>	<b>\$476,099</b>	<b>\$0</b>	<b>\$1,700</b>	<b>\$0</b>	<b>\$922,500</b>

Footnote (1): In this category, we are including the value of the time volunteers contribute to the Coalition's Water Quality Monitoring Program. This contribution is based on 4,920 volunteer hours reported in 2019 for the Baywatchers program times a \$33.11 Massachusetts rate (see [https://independentsector.org/resource/vovt\\_details/](https://independentsector.org/resource/vovt_details/)). Travel includes both in-state and out-of-state estimated reimbursements. "Other" includes state and local cash and match

Footnote (2): Estimated municipal official participation in BBAC and NEP meetings and webinars (typically 11 meetings, avg 10 people per meeting, 2 hours, \$65/h loaded rate.

Footnote (3): Portions of Coalition Staff in these positions: VP Education & Public Engagement VP Watershed Protection, Director of Land Protection, Communications Specialist, Director of Land Protection, and Restoration Specialist.

Table 6. Summary of Match by Source

	State	Other (non-profit)	Local (municipalities)	Total
PERSONNEL	0	\$232,500	\$14,300	\$246,800
FRINGE	0	\$0	\$0	\$0
TRAVEL	0	\$1,700		\$1,700
SUPPLIES	0	\$0		\$0
CONTRACTUAL	0	\$162,901	\$25,000	\$187,901
OTHER	0		\$486,099	\$486,099
INDIRECT	0	\$0	\$0	\$0
TOTAL	\$0	\$397,101	\$525,399	\$922,500

## Section 6: Reprogramming of FFY20 Funds

No reprogramming is required.

## 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 helps 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 1. Index of Tasks

*Section 2 (FFY2019 Work Plan Tasks) represents status of last year's tasks, Section 3 (FFY2020 Work Plan Tasks) represents this year's tasks.*

FFY19 Work Plan Task 1 - Wetland Restoration and Open Space Protection and Restoration .....	4
FFY19 Work Plan Task 2 - Stormwater Remediation and Technical Assistance .....	6
FFY19 Work Plan Task 3 - NEP Technical Assistance and Municipal Grant Program .....	8
FFY19 Work Plan Task 4 - Program Oversight and Administration .....	9
FFY19 Work Plan Task 5 - Buzzards Bay Citizens' Water Quality Monitoring.....	10
FFY19 Work Plan Task 6 - Environmental Indicators and Outcomes Tracking .....	10
FFY19 Work Plan Task 7 - Outreach and Education .....	12
FFY19 Work Plan Task 8 - Other Specialized Technical Assistance .....	14
FFY19 Work Plan Task 9 - Technology Transfer to Other Estuaries .....	14
FFY19 Work Plan Task 10 - Website Maintenance and Innovation.....	14
FFY19 Work Plan Task 11 – Scientific collaboration on nitrogen TMDLs, climate impacts, and water quality impacts on natural resources.....	15
FFY19 Work Plan Task 12 – Salt Marsh Loss Assessment collaboration with Buzzards Bay Coalition. 15	
FFY19 Work Plan Task 13 – Technical assistance to support Coastal Resiliency and Municipal Vulnerability Preparedness.....	16
FFY19 Work Plan Task 14 – Collaboration with the Ecosystem Center to evaluate PRB Technology for remediation of residential nitrate in treated wastewater (\$60,531 sub-award to the Marine Biological Laboratory Ecosystem Center).....	16
FFY20 Work Plan Task 1 - Wetland Restoration and Open Space Protection and Restoration ...	18
FFY20 Work Plan Task 2 - Stormwater Remediation and Technical Assistance.....	19
FFY20 Work Plan Task 3 - Municipal Grant Program and Stormwater Collaborative Contractual Support 23	
FFY20 Work Plan Task 4 - Program Oversight and Administration .....	24
FFY20 Work Plan Task 5 - Buzzards Bay Citizens' Water Quality Monitoring.....	25
FFY20 Work Plan Task 6 - Environmental Indicators and Outcomes Tracking .....	27
FFY20 Work Plan Task 7 - Outreach and Education .....	29
FFY20 Work Plan Task 8 - Specialized Technical Assistance .....	31
FFY20 Work Plan Task 9 - Technology Transfer to Other Estuaries .....	32
FFY20 Work Plan Task 10 - Website Maintenance and Innovation.....	33
FFY20 Work Plan Task 11 - Scientific collaboration on nitrogen TMDLs, climate impacts, and water quality impacts on natural resources.....	34
FFY20 Work Plan Task 12 - Salt Marsh Loss Assessment and Runnel Study Collaboration with Buzzards Bay Coalition .....	36
FFY20 Work Plan Task 13 - Technical Assistance to Support Coastal Resiliency and Municipal Vulnerability Preparedness.....	37
FFY20 Work Plan Task 14 - Targeted Grant Sub-awards .....	38

## **Appendix 2. Sub-award Proposals**

1. Monitoring Program and CCMP Climate Vulnerability Assessment Support (Coalition, \$50,000)
2. Stormwater Designs and Innovative Stormwater Monitoring Approaches (UMass Dartmouth Civil Engineering Department, \$41,719)
3. Determining Nitrogen Inputs to Buzzards Bay from Coastal Rivers (Woods Hole Research Center, \$56,746)
4. Wareham Water Pollution Facility Permeable Reactive Barriers Test Facility, Phase 2 (Ecosystem Center, Marine Biological Laboratory, \$27,375)



## **Buzzards Bay Water Quality Monitoring and CCMP Climate Vulnerability Assessment Support**

**Rachel Wisniewski Jakuba, PhD, Science Director**  
114 Front Street, New Bedford, MA 02740  
Tel – 508-999-6363 x229 – [jakuba@savebuzzardsbay.org](mailto:jakuba@savebuzzardsbay.org)

### **Project Description**

Task 1 of this proposal would fund continuation of the Coalition's Baywatchers program in Buzzards Bay during a critical funding period. The Baywatchers program is largely funded by Coalition fundraising events, like the Buzzards Bay Swim, and in the past has received direct state funding. However, the Swim has been canceled this year due to the COVID-19 health emergency, and funding from the legislature is not anticipated either. The funds requested will help ensure core elements of the Baywatchers program continue. Task 2 of this proposal enables the Coalition to support CCMP climate vulnerability assessment and related reported long-term trends of natural resources and toxic contaminants in Buzzards Bay.

### **Task 1. 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 (Baywatchers) was designed to assess nutrient-related bay health, documenting the impact of nitrogen pollution on the bay's harbors and coves.

For 28 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.

### **Task 1. Proposed Activities**

The \$40,000 requested for this task would be used to support the 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 in late summer 2020 and early summer 2021 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 Quality Assurance Project Plan that has already been approved by the Massachusetts Department of Environmental Protection (MassDEP) and the U.S. Environmental Protection Agency (EPA).

**Task 1. Expected Environmental Benefits of Proposed Work** 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 28 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 MassDEP to develop a nutrient reduction plan known as a Total Maximum Daily Load (TMDL). Baywatchers data has been used in the development of all the nitrogen TMDLs for impaired embayments around Buzzards Bay. MassDEP 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.

### **Task 2. Description of Need**

In 2021, the NEP will undertake a Climate Change Vulnerability Assessment to meet the needs of the program, and to help guide climate-related recommendations in the planned CCMP 2023 Update. The NEP's effort will largely adopt the methodology and approach defined in EPA's Climate Ready Estuaries Program's *Being Prepared for Climate Change: A Workbook for Developing Risk-Based Adaptation Plans* (U.S. EPA, 2014). However, rather than assessing species and habitat impacts due to predicted climate stressors, the NEP's assessment will characterize how climate change may impact the NEP's ability to meet management goals outlined in the 2013 CCMP and planned 2023 Update. Specifically, through forums and meetings hosted by the Coalition, the NEP will identify climate related management goals and priorities that should be included in the 2023 CCMP update. This activity is required for the update of a National Estuary Program CCMP.

### **Task 2. Proposed Activities**

The \$10,000 requested for this task would be used to support BBC staff to host meeting and workshops with key stakeholders, synthesize responses, and prepare graphics associated with climate and pollutant trends in Buzzards Bay. 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 will facilitate the communication and consultation phases associated with the development of the CCMP climate vulnerability assessment. Specifically, the Coalition will use the forums to assess needs of each stakeholder group to gauge their interests or concerns about climate change risks and the adaptation planning process. The Coalition will hold a minimum of four workshops (webinars or in person meetings depending on the COVID-19 health emergency conditions) and develop a schedule for stakeholder involvement. The stakeholders consulted in this assessment will include 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. Included in this task are the development of graphics to communicate environmental trends ranging from toxic contami-

nants from the mussel watch program to habitat change related to climate drivers. Deliverables include meetings, summary reports with recommended actions and changes to the CCMP goals and objections, presentation graphics, and visual aids as needed.

**Budget**

Salaries	\$28,755
Fringe	10,500
Indirect (21.49%)	10,745
Total	\$50,000

**Match**

The Coalition will provide an in-kind match of \$50,000 from private foundations/donations.



**Stormwater Designs and Innovative Stormwater Monitoring Approaches**

**Daniel MacDonald, PhD**

**Professor, Civil & Environmental Engineering  
School for Marine Science & Technology**

**Mazdak Tootkaboni, PhD**

**Associate Professor, Graduate Program Director  
Department of Civil & Environmental Engineering  
University of Massachusetts, Dartmouth**

**Tel: 508-910-6334**

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**Email: dmacdonald@umassd.edu**

**Proposed Work**

Under this initiative, the NEP will enter into partnership with UMass Dartmouth to fund both a senior studies project and a graduate student research project to develop stormwater treatment designs and conduct investigations of illicit connections and pollution sources in stormwater networks.

The senior student project will involve a team of students that will develop engineering designs to treat a stormwater discharge. This effort will complement an ongoing stormwater designs project by the Horsley Witten Group under contract with the NEP that began in May 2020. In the summer of 2020, Horsley Witten Group will develop conceptual designs for six of fifteen priority stormwater catchments in the Buzzards Bay watershed. These priority sites were identified through the stormwater network mapping and monitoring efforts of the Buzzards Bay Stormwater Collaborative. Under the Horsley Witten Group contract, by December 2020, three or four of these six conceptual designs will be brought to the final design and permitting stage. The senior student project will take one of the remaining conceptual plans and develop engineering designs for that site in the spring of 2021. This work will involve participation of NEP, municipal, and HWG staff.

The second project will involve a student in the BS-MS program. This student will be diagnosing pollution sources in a stormwater network containing elevated coliform concentrations. This effort will involve participation between the Stormwater Collaborative, municipal DPW staff, and NEP staff to evaluate a complex stormwater network with multiple potential contributing sources of pollution. The student will help develop a monitoring approach to be undertaken by the Stormwater Collaborative to diagnose pollution sources in the selected stormwater network. The one-year student study will include a GIS evaluation of land use, stormwater networks, water quality data, and implementation of innovative monitoring approaches. The findings of the study will inform pollution source reduction efforts by the municipality, and the development of stormwater treatment designs.

**Budget**

The total budget for this project is \$41,719 as per the table to the right. The University is waiving its 59% overhead for this project, which will be used toward match.

Student Stipend (\$15/hr *1467 hrs)	\$23,000
Student Tuition	\$12,500
Travel (mileage 1000 mi x 0.575/mi)	\$575
Indirect (25% limit, excluding tuition)	\$5,644
<b>Total</b>	<b>\$41,719</b>



# WOODS HOLE RESEARCH CENTER

**Determining Nitrogen Inputs to Buzzards Bay from Coastal Rivers**  
**Chris Neill, Senior Scientist, Woods Hole Research Center**  
**Phone 508-444-1559 | Email [cneill@whrc.org](mailto:cneill@whrc.org)**

## **Project Description**

Nitrogen arriving in the water discharged through coastal rivers is one of the major nitrogen sources to Buzzards Bay. Although the water quality in the estuarine embayments into which these rivers flow has been monitored for 28 years as part of the Coalition's Baywatchers program, the amount of nitrogen contributed by rivers remains poorly quantified. A recent modeling analysis estimated that the seven watersheds with the largest rivers (Acushnet River, East Branch of the Westport River, Mattapoisett River, Slocums River, Wareham River, Weweantic River) are the watersheds that contribute the largest annual nitrogen loads to Buzzards Bay<sup>1</sup>. Although some of the nitrogen inputs occur within the estuarine portions of these watersheds (e.g., to New Bedford Inner Harbor on the Acushnet River), a substantial but unknown portion of nitrogen loads are derived from the watersheds upstream of tidal influence. Quantifying and understanding nitrogen 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 nitrogen delivery to Buzzards Bay.

Quantifying nitrogen loads through rivers requires measurement of river discharge and regular sampling of river water to determine concentrations of different nitrogen 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. Two recent efforts have begun to address this major sampling gap. In 2018, Casey Kennedy of the UMass Cranberry Station and the USDA Agricultural Research Services initiated measurement of river discharge and nutrient concentrations in the Weweantic River. He extended discharge and concentrations sampling to the Agawam River in 2019. The Cape Cod Rivers Observatory (CCRO) at the Woods Hole Research Center began sampling concentrations but not discharge in Red Brook and the Pocasset River in 2019.

In this project, the Woods Hole Research Center will initiate discharge and concentration sampling on six additional Buzzards Bay rivers: East Branch Westport River, Slocums River (Paskamansett River), Acushnet River, Mattapoisett River, Sippican River, and Wankinco River. In addition, we will be quantifying discharge in Red Brook and the Pocasset River to combine with concentrations measured by the CCRO. We will 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 Kennedy, this will provide nitrogen load estimates for ten total rivers. We will develop a database of river discharge and concentrations to be made available by the WHRC.

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 riv-

er 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.

Staff gages and Onset Hobo level loggers will be installed in near river mouths inland of tidal influence. Rating curves will be developed by measuring discharge monthly with a SonTek FlowTracker2 hand-held flow meter. Nutrient concentrations will be measured in the laboratory according to methods and protocols used for the Baywatchers program. Annual loads will be calculated from discharge and concentrations using LOADEST and other similar data and modeling approaches (Runkel et al. 2004)<sup>2</sup>.

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. 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.

### **Budget**

#### Salaries and wages

Chris Neill	0.25 months for project direction	\$ 3,788
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Research Assistant I	4 months for field, data and laboratory work	\$ 15,054
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Fringe benefits		\$ 9,986
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Travel	Local travel to field sites in personal vehicles	\$ 1,035
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#### Materials and supplies

Level recorders	Onset Hobo (6 @ \$500 each)	\$ 3,000
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Field supplies	Includes waders, staff gages, installation materials, locking caps, locks, data notebooks	\$ 2,000
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Laboratory supplies	Includes sample bottles, reagents for analyses	\$ 2,000
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Equipment	One SonTek FlowTracker2 flow meter and wading rod assembly	\$ 11,910
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#### Other expenses

Communications	Includes writing material for the WHRC website and newsletters, preparation of graphics for presentations	\$ 500
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Indirect costs	Calculated at 20% of total direct costs (excluding equipment)	\$ 7,473
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<b>Total</b>		<b>\$ 56,746</b>
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**Wareham Water Pollution Facility Permeable Reactive Barriers Test Facility, Phase 2**  
**Ken Foreman, Director, Semester in Environmental Science**  
**Tel: 508-289-7348 | E-mail: kforeman@mbledu**

In 2019, we evaluated the feasibility of applying permeable reactive barrier (PRB) technology, using wood chips as a carbon source, to reduce nitrogen inputs from an advanced wastewater effluent under different controlled flow conditions. This work was undertaken in partnership with the Wareham Water Pollution Control Facility (WPCF) where the PRB test columns were installed. This facility is under a permit limiting total nitrogen discharges to 4 mg/L for seven months of the year. 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 study was to evaluate the use of PRBs to further polish the effluent of advanced nitrogen reduction facilities like Wareham's.

In the pilot project, we constructed six replicate small-scale test reactors (6" diameter pipe x 4.5 foot long) and manipulated conditions within these to maximize denitrification and removal of the residual nitrate (Fig. 1). Reactors were filled with either fresh wood or wood excavated from an existing 14-year-old PRB barrier (to evaluate longevity of the media). We pumped treated effluent from the WPCF through these systems at varying flow rates to control residence time and also tested the capabilities of the system by adding nitrate to the inflow at levels up to 12 mg/l. Data collected included inflow, outflow, and interstitial water within the reactor to measure total dissolved N, NH<sub>3</sub>, NO<sub>3</sub>, PO<sub>4</sub>, DOC and Chromophoric Dissolved Organic Matter (CDOM) at different points along the flow path. All experiments were run between June-August at ambient summer temperatures (24-29°C). We collected and processed 210 samples in which we measured ammonia (NH<sub>4</sub><sup>+</sup>), nitrate (NO<sub>3</sub><sup>-</sup>), total dissolved nitrogen (TDN) and dissolved organic carbon (DOC). The key data and findings are summarized in Table 1 and Fig. 2 below.

During the study, it was determined that the facility often discharged far less than the permitted discharge limit 4 mg/L total nitrogen, and most of this nitrogen was refractory (not the inorganic forms of nitrogen that stimulate algal blooms and would be easily treated by PRBs). Consequently, the

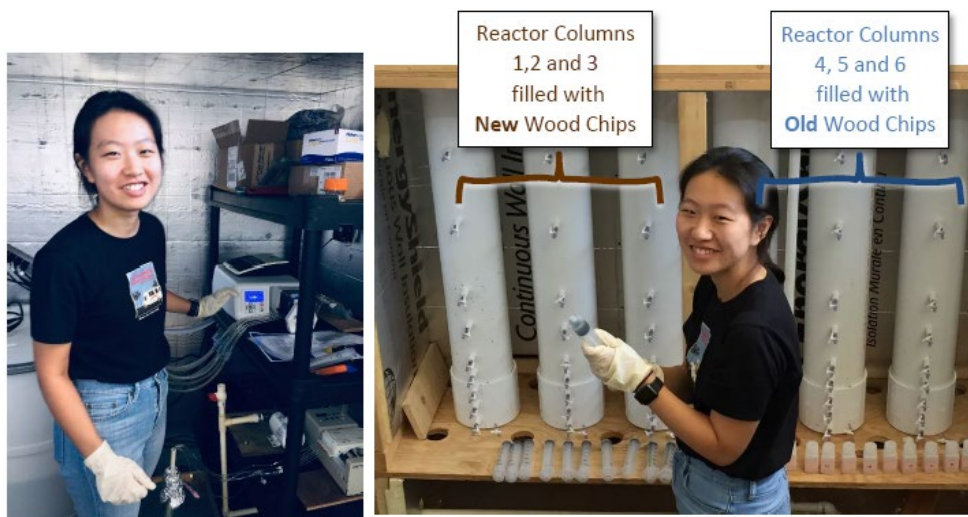


Fig 1. PRB test columns.

Nominal Treatment	Inflow (mg/liter)			New Wood				Old Wood (after 14 yr in field)			
	TDN	DIN	DON	DIN out (mg/l)	% DIN Lost	DON out (mg/l)	% DON Lost	DIN out (mg/l)	% DIN Lost	DON out (mg/l)	% DON Lost
Unamended	0.8	0.1	0.7	0.0	81%	0.8	-0.9%	0.3	-214%	0.7	-3%
+ 5 mg/l NO <sub>3</sub> <sup>-</sup>	5.8	4.4	1.3	0.3	93%	1.4	-0.8%	0.6	86%	0.9	36%
+12 mg/l NO <sub>3</sub>	15.4	12.9	2.4	0.1	99%	1.1	52.8%	4.0	69%	1.8	27%

**Table 1.** Data in blue shaded portion of table show **inflowing** concentrations of **Total Dissolved Nitrogen** (TDN) and **Dissolved Inorganic N** (DIN= NO<sub>3</sub>+NH<sub>4</sub>). **Dissolved Organic N** is estimated by difference (DON=TDN-DIN). Data in orange and yellow shaded portions of table show nitrogen concentrations in the **outflow** and percent N removal for DIN and DON in reactors containing either New Wood or Old Wood.

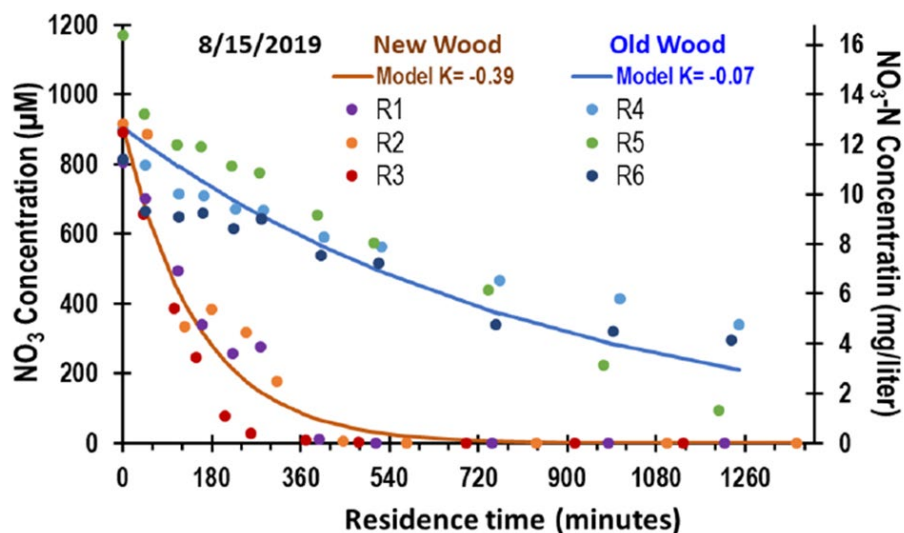


Fig 2. PRB nitrate removal versus residence time for different treatments and columns.

experimental treatments required the addition of nitrate to the reactor influent. We found that the woodchip media reactor systems were effective in removing all nitrate added up to levels of 12 mg/l. The funding in last year's study did not include funding to monitor for the spring of 2020 when the wastewater facility discharges an effluent higher in DIN, in part because the permit for the plant only requires 4 mg/L total nitrogen limit for 7 months of the year and also it is difficult to achieve that level of treatment in cooler winter/spring conditions. The processes involved in nitrate removal (nitrification and denitrification) are affected by temperature and the reactor function should be evaluated throughout the seasons when both temperature and effluent quality change.

We propose to use additional funds (\$27,375) to evaluate function of the reactors throughout the seasons, with special focus on the cool spring and fall conditions at the WWPCF. The findings of this study will not only be useful in defining strategies to further reducing nitrogen loads from the Wareham facility but will be relevant to other wastewater facilities where stringent nitrogen controls are not required under an NPDE permit and the use of the wood chip reactor technology in other settings where a pump and treat approach to N-reduction might be useful.

**MBL -WWPCF BUDGET**

RA1	5mo	\$15,000
fringe	38.0%	\$5,700
supplies		\$1,200
<b>TOTA DIRECT COST</b>		<b>\$21,900</b>
Overhead	25.0%	\$5,475
<b>Total Cost</b>		<b>\$27,375</b>