

A Blueprint for the Bays

*Comprehensive Conservation and Management Plan
2023 – 2033*

Appendices



Massachusetts Bays
NATIONAL ESTUARY PARTNERSHIP

March, 2023

Appendix A. A Framework for Developing Long-term Habitat Targets for MassBays

A Framework for Setting Long-term Environmental Targets for MassBays National Estuary Partnership

Appendix to the
MassBays Comprehensive Conservation and Management Plan

October 2022

Massachusetts Bays National Estuary Partnership

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This document is an appendix to the MassBays National Estuary Partnership 2022
Comprehensive Conservation and Management Plan

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1.0 Introduction

Section 320 of the Clean Water Act requires all 28 National Estuary Programs to develop a Comprehensive Conservation and Management Plan (CCMP) to guide habitat protection and restoration of water quality and ecological integrity of estuaries of national significance. MassBays has recently concluded a revision of its CCMP, including the setting of habitat targets and a long-term framework strategy to monitor progress towards these targets. This document (an appendix to the CCMP) serves to describe the approach used to develop the long-term habitat targets based on local priorities, to restore estuarine ecosystem health in the MassBays area.

Mass Bays is dedicated to protecting, restoring, and enhancing living estuarine resources, including approximately 34,000 acres of salt marsh, 14,000 acres of tidal flats, 10,000 acres of seagrass, 700 acres of rocky intertidal shorelines, 11,000 acres of dunes and sand beaches, 155 miles of herring runs or fishways, and 69,000 acres of benthic shellfish habitat (Yee et al., In Review). To achieve this goal, MassBays worked with many partners and stakeholders over several years. Over numerous meetings and discussions, local expert input was provided and integrated with scientists' advice in order to develop a robust set of achievable and sustainable goals to improve conditions in the estuaries. This project was managed by MassBays collaborating with the Regional Service Providers (through Regional Coordinators (RCs)), the MassBays Science and Technical Advisory Subcommittee (STAC) and the MassBays Management Committee.

1.1 Purpose of the Project

Estuaries provide key ecosystem functions and services. They support critical habitats such as eelgrass, salt marsh, and oyster reefs that provide nursery and foraging grounds for fish, cycle and remove excess nutrients, play a key role in carbon cycling, and stabilize shoreline sediments (Beck et al, 2001; Jackson et al., 2001; in Hanley et al., 2021). However, they are also highly vulnerable to degradation which is the result of human development and activities (Halpern et al, 2008). In many regions there is limited understanding of environmental conditions and stressor levels in these complex ecosystems. Developing a clear understanding of existing levels of habitat and anthropogenic stressors through the collection of critical baseline data and information is important to enhance conservation and restoration efforts (Hanley et al., 2021).

MassBays planning area has a diverse and complex geomorphology, creating embayments with diverse ecological and socioeconomic characteristics which in turn result in specific management needs to address specific conditions (Hanley et al., 2021). Estuarine resources in many parts of the MassBays region have given rise to concerns over deteriorating conditions (e.g., almost 60% eelgrass loss from Duxbury-Kingston-Plymouth embayments since 1995). MassBays' mission includes providing support to local communities as they address their management priorities within their estuaries.

With the revision of the MassBays Comprehensive Conservation and Management Plan (CCMP), MassBays is focusing on priority needs of its communities and the changing ecosystem conditions at the embayment level. To support locally targeted efforts, MassBays applied a multistep approach that started by delineating its estuarine coast, defining landward and seaward boundaries as well as characterizing estuarine embayments. A suite of resource and stressor attributes were selected based on a set of criteria including availability and quality of data across the whole region and at the embayment scale.

Using the embayment-level data, MassBays then partnered with Northeastern University's Marine Science Center where a team of researchers conducted a series of analyses to: (1) characterize and develop clusters of MassBays embayments with similar resource, environmental, and stressor attribute levels, and (2) identify the stressor attribute(s) that were the strongest predictors of resource attribute levels within each embayment. At the same time, MassBays worked closely with EPA Office of Research and Development (ORD) and Office of Science and Technology (OST) to apply the Biological Condition Gradient (BCG) tool to establish long-term habitat targets that MassBays planned to reach by 2050. Importantly, this effort is informed by our knowledge that climate change already affects the trajectory of our most critical habitats; the understanding of our underlying physical systems gained throughout the process will enable us to work with partners to establish credible targets over time.

In this project we introduced a new concept – a combined approach of biological conditions and the ecosystem services that estuarine habitats provide (Ecosystem Services Gradient, ESG). The BCG/ESG approach can help managers better understand how an estuary (or group of estuaries) has changed over time, help establish a vision of a desired future for that estuary and develop targets to achieve the vision.

The BCG tells us the rate and extent of loss of nature relative to an undisturbed condition and allows us to compare nature among different scales, places and over time. This allows us to visualize nature in a desired future. The ESG incorporates the benefits that nature provides to people and allows us to visualize our lives in a desired future. Together, the BCG and ESG can inspire a vision of a desired future that resonates broadly with managers and the public.

The BCG approach has been successfully used (without ESG) to motivate people to create a vision of a desired future, set targets, and take actions to achieve that vision. But looking at the bigger picture, the goal of protecting and restoring the environment depends on the political will of the people, particularly decisionmakers and those who influence them. MassBays communities are empowered to make decisions that affect their local areas, and a motivated public is a powerful force in environmental protection. But “the public” includes a diversity of people that bring with them a range of beliefs and priorities. Expanding political will involves motivating people who are less engaged in protecting nature for its own sake. Communicating nature through things that a broad spectrum of people cares about get better results in protecting the environment.

Describing the benefits nature provides to people as an ecosystem services approach combined with BCG will in almost every case lead to stronger public support and political will for setting and achieving environmental goals. In this project, BCG - a mathematical quantification of the rate and extent of loss of nature – is applied as a starting point and to serve as a foundation for communicating ecosystem services that further resonate with a broad audience in support of environmental protection.

1.2 Goals and objectives

The main goal of this study is to establish long-term habitat target conditions that would guide and inform management actions towards improving the overall ecosystem condition of estuaries.

Objectives:

- Pick scale and area of interest (embayments)
- Assemble historic and modern data for estuarine habitats at embayment scale

- Assemble the Biological Condition Gradients (BCGs)
- Add ecosystem services
- Develop a strategy to engage with stakeholders, decisionmakers, and other audiences
- Establish credible long-term targets

The general approach involved several steps and the use of different tools (Figure 1). It was divided into three parts: data gathering, data synthesis, and outputs. The data gathering step included:

- (1) Developing the Estuary Delineation and Assessment (EDA) (Section 2.1) that resulted in the identification of 65 assessment areas and data on current estuarine habitat conditions
- (2) Using the EDA to develop Resource-Stressor clusters and using R statistical software to identify the main drivers affecting estuarine resources in each cluster.
- (3) Conducting a tidal residence time assessment¹ to measure the influence of tidal flux from the ocean versus freshwater.
- (4) Assembling habitat data to establish a historical “reference point” for the BCG.
- (5) Conducting a deliberative multicriteria decision analysis that generated information to add to the Estuarine Condition Gradient (ESG) tool.
- (6) Connecting the BCG and ESG models to develop long-term targets in the context of local priorities

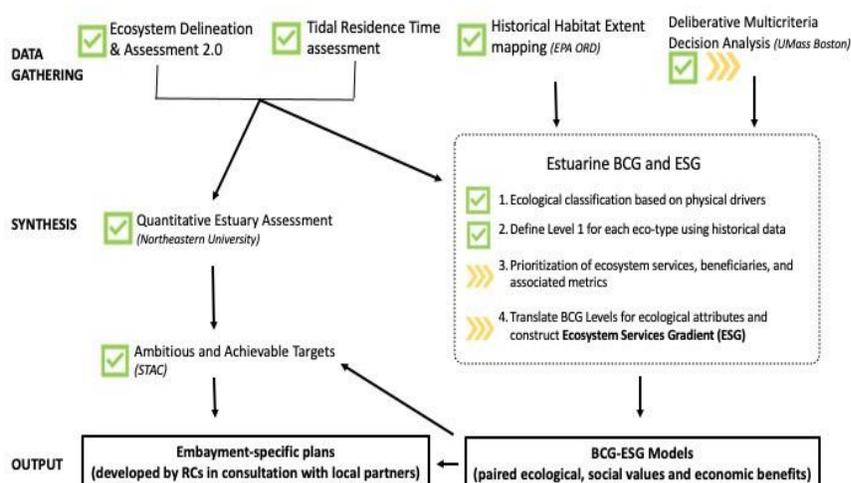


Figure 1. Model of the process used to develop ecosystem targets for the MassBays CCMP

1.3 The Study Area

MassBays’ planning area encompasses an offshore area of about 1,650 square miles with an inland watershed covering over 7,000 square miles. From coastal wetlands, it stretches offshore to Stellwagen Bank, 25 miles east of Boston. Its 1100-mile coastline from Salisbury to Provincetown is characterized by a diverse and complex geomorphology that has shaped unique estuaries where some of the harshest environmental challenges take place. By the very nature of their location and hydrography, these estuaries are rich in natural resources (including salt marsh, tidal flats, eelgrass beds, and diadromous fish habitat), attracting plenty of commercial and recreational uses.

¹ Description of this project is outside the scope of this document, but the report is available upon request. Woods Hole Group 2019.

The MassBays planning area is home to 1.7 million people living year-round in 50 communities along the coast of Ipswich Bay, Massachusetts Bay, and Cape Cod Bay. Each year between June and September, the area receives a heavy influx of tourists drawn to its vibrant coastline, its natural resources, and the many recreational and commercial opportunities it offers. Commercial and recreational uses in Massachusetts include coastal development (both urban and industrial), fishing, aquaculture, boating, and whale watching, maritime transportation, and more recently development of infrastructure to support offshore wind energy development. Although initially located south of Nantucket and Martha's Vineyard, over the next decade offshore wind energy development will be expanding to the Gulf of Maine, bringing with it a new set of challenges for which we need to be prepared.

The layout of shoreline habitats in the Bays is determined by geology, slope and orientation, and exposure to waves, as well as adjacent land use and freshwater flow from inland. In general, there is a habitat gradient north to south from Ipswich Bay, where salt marshes dominate, to the southern coast of Massachusetts Bay where rocky intertidal habitat mingles with marshes, and finally to Cape Cod Bay, which is dominated by sand beaches, dunes, and tidal flats. The average depth of the MassBays planning area is 30m (120ft) and the area is subject to a daily mean high tide of 9-12 ft. Currents flowing south in the Gulf of Maine vary seasonally, with cold water flowing through Ipswich and Massachusetts Bays south to Cape Cod Bay. This flow is influenced by riverine inputs, especially during Spring. Several rivers, including the Charles, Mystic, Neponset, Saugus, Parker, Ipswich, Rowley, and Essex rivers, as well as the Merrimack River, which discharges the largest volume of fresh water into the Bays, carry nutrients and pollutants from the upper watershed to coastal wetlands and into the bays.

MassBays' estuaries vary in size and condition – some estuaries (e.g., Boston Harbor which receives water from three major urban rivers), are densely populated and characterized by high impervious surface, tidal restrictions, habitat loss and fragmentation (including the impacts of multiple dams), and legacy and emerging pollutants, and where the impacts of climate change such as increased storms and floods are most felt. This is especially true for vulnerable communities. Estuaries in more rural areas provide critical support to vulnerable habitats such as salt marshes and sand dunes (e.g., Rowley, Ipswich and Parker Rivers which drain into Plum Island Sound), but also face their own set of challenges. Massachusetts Bay also receives discharge from the wastewater treatment plant on Deer Island from which about 300 MGD of secondary treated water are discharged through the outfall 9 miles from shore.

Cape Cod Bay is also a dynamic environment with its own hydrologic "regime" that influences observed differences in nutrient cycling and productivity patterns between open coastal waters and shallow embayments. Cape Cod Bay receives most freshwater input from groundwater inflow. Because Cape Cod residents rely primarily on septic systems, the groundwater that seeps into the Bay often carries more nutrients into coastal waters than the coastal rivers. Monitoring data suggest an overall decline in environmental conditions nearshore in Cape Cod Bay. Since 2019, an annual decline in DO in southern Cape Cod, often coinciding with a chlorophyll peak at the pycnocline and increased volume of HABs, Bay has also given rise to concerns about benthic organisms including lobster and scallops that inhabit the area.

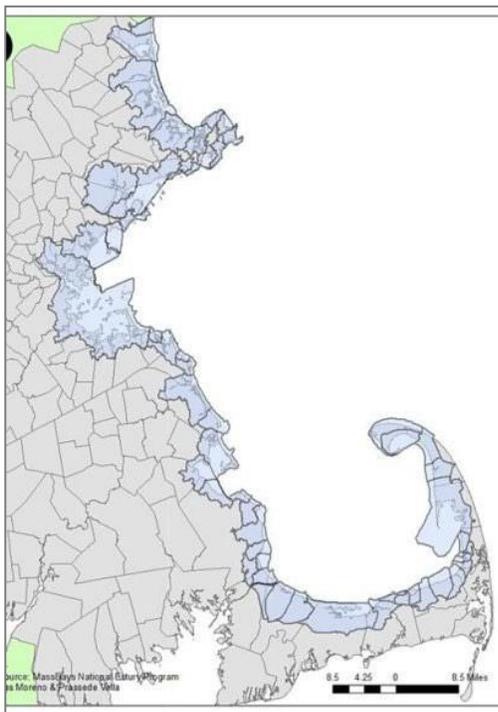
2.0 Estuary Delineation and Assessment

The MassBays planning area is diverse and complex, characterized by freshwater/brackish and marine habitats. MassBays' mission includes providing support to local communities as they address their management priorities within their estuaries. With the revision of the MassBays Comprehensive Conservation and Management Plan (CCMP), MassBays is focusing on priority needs and changing

ecosystem conditions at the embayment level.

This project included several steps and the use of different tools. The EDA developed in 2017 can serve as a tool for assessing and tracking trends and changing conditions of estuarine and inter- estuarine habitats at the embayment level; with its expansive inventory of attributes and indicators it can provide actionable information for use by resource managers and decision-makers to improve ecosystem health and alleviate the impacts of stressors on estuarine ecosystems as well as the wellbeing of communities that depend on them.

MassBays delineated its coastal planning area, defining a landward boundary and a seaward boundary. The boundaries were depicted using topography and indicators of tidal influence², as well as existing USGS and MassGIS watershed boundary lines. At the sub watershed level, 65 assessment areas were identified. The first delineation was conducted in 2013, with a revision in 2017 to update the existing data and include additional attributes that highlighted similarities and differences among the assessment areas (EDA 2.0).



Given the variety of embayment characteristics across the estuaries, the process used to delineate the estuarine watershed boundaries sometimes varied on a case-by-case basis. For assessment areas that do not have a major freshwater tributary on which to establish a landward boundary, their watersheds were delineated simply by determining the proximal area contributing to the embayment using topography. Assessment areas located on Cape Cod are influenced by groundwater contribution rather than by a typical watershed defined by surficial topography; to address this and other special circumstances, the process developed a deviation from the general delineation process, using best professional judgment to determine how the most informative and useful “estuarine watershed” would be delineated.

Figure 2: MassBays planning area with 65 assessment areas

Method

The 65 assessment areas include 44 embayments and 21 “inter-estuarine” areas that include nearshore stretches of beach, straight rocky shore, and headlands that exist between estuaries. In order to define and delineate these inter-estuarine assessment areas the MassGIS “Drainage Sub-basins” data layer was intersected with the embayment assessment areas. The resulting coastal subbasins and subbasin segments that did not overlap with embayment assessment areas were selected as the basis for the inter-estuarine assessment units. After completing this process, the draft delineations were reviewed by the MassBays Regional Coordinators who provided local expertise. Subject matter experts also weighed in on

² The extent of Chapter 91 Jurisdiction was determined by overlaying the MassGIS “Tidelands Jurisdiction Datalayer” on the assessment areas. Chapter 91 Jurisdiction was used to indicate the landward extent of tidal influence.

various components.

Unlike estuarine areas which often have a specific waterbody to use as the basis for the seaward boundary, assessment areas located along barrier beaches, linear coastlines, and other inter-estuarine areas directly border the ocean and have no obvious seaward boundary that could be dictated by geography or features. To establish the seaward boundary, the 10-meter isobath was selected as a suitable basis for the new seaward boundaries. This depth was chosen because it encompasses the photic zone, which generally includes many of the near-shore marine ecological resources of interest. In some cases, seaward boundaries were expanded outward from the 10-meter isobath in order to include any marine ecological resources that existed at greater depths within the vicinity of the assessment area.

For estuaries with one or more significant freshwater tributaries, the furthest extent of tidal influence was used to determine the location of the landward boundary. The two primary data sources used to interpret this location included: (1) maps of salt marsh locations; and (2) Massachusetts General Law Chapter 91 Tidelands Jurisdiction maps. Salt marshes were mapped using the MassDEP Wetlands data layer (2005). Details of how the landward and seaward boundaries were determined are described in the Estuary Delineation and Assessment 2.0 (Geosyntec Consultants, 2017).

Each assessment area was characterized using datalayers for several indicators or attributes that included 7 estuarine resources, 15 anthropogenic stressors, and 8 socioeconomic indicators (Table 1).

Table 1. Estuarine resources, anthropogenic stressors and socioeconomic attributes included in the assessment area characterization (2017)

Estuarine Resources	Eelgrass, salt marsh, tidal flats, rocky intertidal, sandy beaches and dunes, shellfish habitat, shorebird habitat, shorebird nesting sites, anadromous fish runs
Stressors	High-intensity land use, annual stormwater discharge impervious area, population density, wastewater discharge to surface water, wastewater discharge to groundwater, % population using septic systems, 303(d) impairments estuaries (bacteria & nutrients), 303(d) impairments tributaries (bacteria & nutrients), designated shellfish growing area classification, # impoundments causing fish passage barriers, #stream crossings, # road crossings in tidal areas.
Socioeconomic	Beach closure days, marinas, mooring fields, dredging projects, seawalls and related infrastructure, boating access, public/semi-public beach length, beach access

Attributes were analyzed using spatial analysis to determine areal extent within each watershed. Data for spatial extent for each attribute was normalized: aquatic attributes (such as shellfish habitat, eelgrass extent) were normalized to the area of open water within the estuarine watershed boundary; land attributes (land use, impervious area, population density, etc.) were normalized to the area of land within the estuarine watershed boundary; attributes that existed in both open water and on land, or in transitional areas, were normalized to the entire area within the estuarine watershed boundary (such as salt marsh, tidal flat, shorebird habitat). Wastewater was quantified in MGD to allow for intercomparison.

The results include a series of GIS maps that were compiled into the Estuary Delineation and Assessment

(EDA) and used to: (1) create a story map³ to showcase the assessment areas and allow users to access datalayers in their area of interest for management decisions, and (2) develop tools to track changes in conditions, to establish long-term environmental targets and to measure progress towards reaching those targets. All the attributes, methods and analyses are described in detail in Geosyntec Consultants, 2017.

3.0 Developing a Biological Condition Gradient for Estuarine Embayments

MassBays' goal is to establish long-term targets of habitat conditions based on underlying physical and biological characteristics and to develop a framework to measure progress towards these targets over time. MassBays worked with the Management Committee (which includes numerous stakeholders) and with its five Regional Coordinators (representing their respective local communities) to better understand what we want the NEP to look like by 2050. To answer this question, MassBays needed to look at what the estuaries looked like historically, look closely at current conditions, and use this information to help develop a future vision for what we want the NEP to look like. /This process could be quite complicated given the limited availability of historical data, the changes in habitat conditions over decades of development and land use change, and the uncertainty of the future regarding climate change impacts.

The tool that best addressed these needs is the Biological Condition Gradient (BCG), a scientific framework developed by USEPA that can be used to interpret biological responses from the cumulative effects of stressors for different types of water bodies. The BCG helps managers and practitioners more precisely define and interpret baseline biological conditions, help evaluate potential for improvement in degraded waters, and measure and document incremental changes in condition along a gradient of anthropogenic stress (Davies and Jackson, 2006; USEPA, 2016). As depicted in Figure 3, the BCG starts by describing the biological condition in natural or minimal disturbed habitats and the expected changes in biological conditions along a stressor gradient caused by human-induced environmental changes. The gradient extends from undisturbed (Level 1) to very degraded (Level 6). Not all levels need to be applied for all areas under study. As the stressor increases (x-axis), the biological condition becomes more degraded (y-axis). In Figure 3, the Y-axis depicts changes in taxonomic make-up and integrity.

USEPA and MassBays piloted the BCG tool in estuarine ecosystems to establish long-term future targets for selected habitats in each embayment. Based on expert input and local priorities, the BCG was applied to four key estuarine habitats: eelgrass, salt marsh, tidal flats, and diadromous fish habitat. For MassBays, natural conditions (Level 1) or minimally disturbed (level 2) were equated to conditions before settlement or to the oldest recorded data, representing when population was low and pre-industrial conditions. The metric used is percent area remaining for each habitat.

The x-axis known as the Generalized Stress Index (GSI) conceptually describes the range of anthropogenic stress that may adversely affect estuarine resources in a particular embayment or group of embayments. For the MassBays BCG framework, the GSA was made to represent changes over time (1770's to the present day), assuming that stressors were increasing over time. MassBays aimed to develop a well-defined GSI to possibly serve as a nexus between biological and causal assessments, thereby linking management goals and selection of management actions for protection or restoration (USEPA, 2016).

³ [MassBays Assessment Areas \(arcgis.com\)](https://arcgis.com)

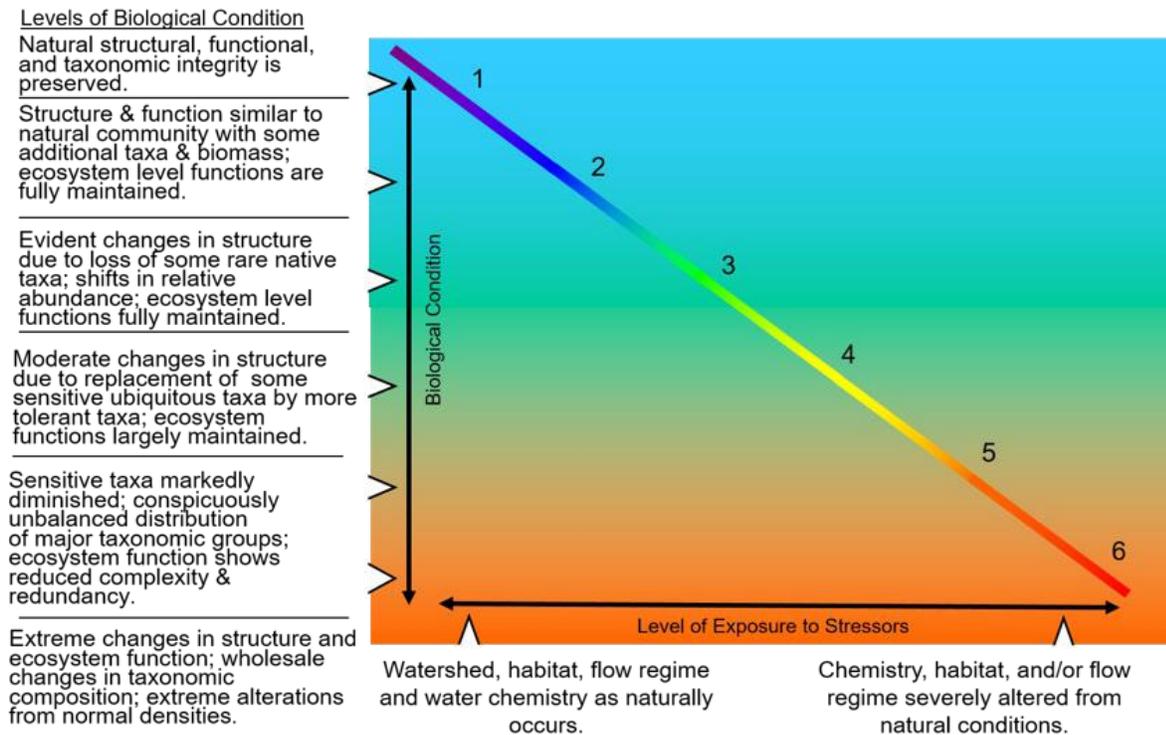


Figure 3. Biological Condition Gradient showing levels of degradation with exposure to stressors.

In 2021 BCGs and habitat targets were developed for three of the four habitats selected. Work to develop a target for diadromous fish habitat is currently underway. Details of this approach are described in the sections below. The first step in developing a BCG for estuarine embayments was to look at the physical and geomorphological features of embayments without any human impact. This “site suitability assessment” would serve as an indicator for the area’s (embayment’s) ability to support specific habitat based on natural conditions only. The analysis results in a classification of the embayments into ecotypes. The next step was to examine historical data and/or maps that could show the historic location and/or extent of eelgrass, salt marsh and tidal flat habitat. We are currently working on similar steps for diadromous fish habitat.

3.1 Developing estuarine embayment eco-types

To develop credible long-term targets for MassBays, it is important to understand the physical and geomorphological suitability of each embayment to support a specific habitat or mosaic of habitats. Assessing the planning areas through this lens resulted in the development of specific ecotypes. Ecotypes represent the biological potential of an area (embayment) to support a habitat or mosaic of habitats under conditions of no human impact. Defining these ecotypes not influenced by anthropogenic factors provides the ability to truly track the impact of changing levels of stressors over time. Each of the 44 embayments was categorized into one of four ecotypes (Figure 4) based on three criteria: exposure, amount of sediment available, and water depth.

Method

Eco-types⁴ were first generated using two datasets: tidal flux⁵ and the 10m-resolution CZM/USGS (Andrews et al., 2019) defined as percent of seaward area less than 2m deep. This combination of layers resulted in four proposed eco-types: fewer shallow habitats with higher tidal flux; fewer shallow habitats with lower tidal flux; more shallow habitats with higher tidal flux; and more shallow habitats with lower tidal flux. In reviewing the draft eco-types, the MassBays Science and Technical Advisory Committee (STAC) and the RCs provided input and suggestions on additional data to refine the initial eco-types.

Results

The MassBays eco-type classification was revised based on input on shallow water habitat area, energy regime, and exposure. Information about coastal geology and morphology was also compiled and incorporated into the classification. By combining the information about modern sediment, energy regime, and exposure, the MassBays embayments fell into the following groups:

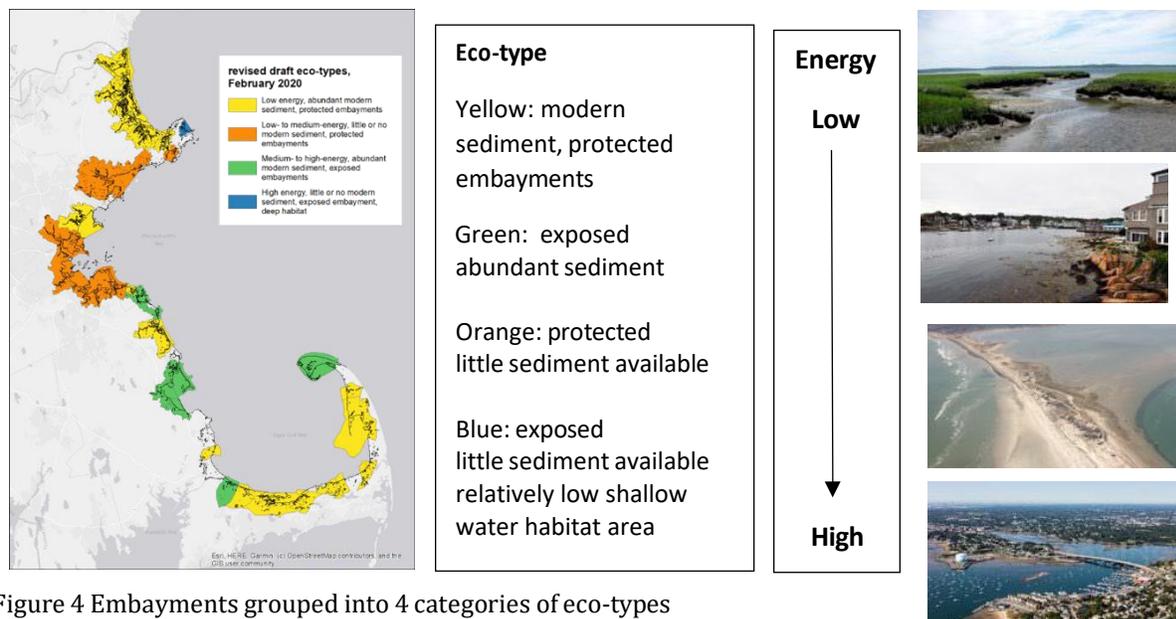


Figure 4 Embayments grouped into 4 categories of eco-types

Yellow ecotype includes protected embayments with abundant sediment. These are usually low energy embayments with abundant salt marsh. For example, areas on the north shore where the Great Marsh is located and areas around Cape Cod Bay which are characterized by sandy beaches as well as salt marshes.

Orange ecotype embayments are also protected and low energy but with little sediment available. These embayments tend to form natural harbors and are usually urbanized. E.g., Boston area and Salem Sound.

Embayments in the green ecotype are more exposed and subject to moderate energy waves. They have abundant sediment and despite greater exposure tend to support extensive eelgrass and areas with tidal flats e.g., Duxbury-Kingston-Plymouth Bays and Provincetown Harbor.

The blue ecotype is highly exposed with high energy waves and therefore with very little sediment. Such areas have rocky shores and are characterized with rockweed and kelp. Only one embayment, Rockport,

⁴ Generated by E&C Enviroscope

⁵ WHG tidal flushing study

which has a rocky intertidal shore, fell into this category.

3.2 Developing historic maps for estuarine habitats to inform Level 1 definitions

A BCG approach for MassBays requires an understanding of eelgrass habitat “as naturally occurs” or “minimally disturbed” habitat. The BCG tool can help managers better understand how an estuary (or group of estuaries) has changed over time, help establish a vision of a desired future for that estuary and inform the development of targets to achieve the vision (Figure 5). On the right of present time (2021) Figure 7 shows three possible future scenarios resulting from different levels of conservation and restoration. Using historic and present data, the BCG provides a comparison between past conditions and the present and provide the framework to craft a future vision that is based both on desired natural conditions and ecosystem benefits for communities whose wellbeing depend on them.

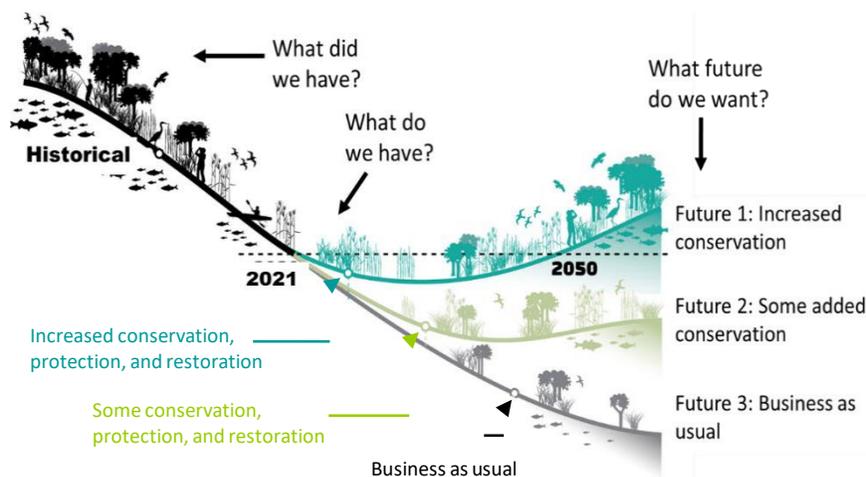


Figure 5. Diagram shows nature in the historic past (left, in black) degrading through the present time (2021). This models the BCG. Vector symbols in diagram courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science. ian.umces.edu/symbols/.

Recent maps and data on areal extent and habitat condition of eelgrass, salt marsh and tidal flats show that significant amounts of eelgrass and salt marsh have been lost from various embayments around MassBays because of changes in land use and land cover, increase in development and impervious surface, as well as changes in agricultural practices and impacts of climate change over time. The BCG tool shows what can be attained over time going forward under different scenarios: increased conservation and restoration, some conservation, or business as usual. Ultimately this depends on the capacity available and how invested communities are in a brighter future.

Method

Developing a Level 1 estimate for salt marsh and tidal flats in estuarine embayments

Historical data and maps were used to establish natural/minimally disturbed (Level 1) conditions which would then be compared to current conditions in each embayment. For MassBays, it was decided to use percent remaining habitat as the BCG metric (y-axis) against which to measure progress towards future targets. Scientists from USEPA ORD and OST examined numerous historic maps and documents, and conducted a rigorous process to compile historic data, interpret maps and navigational charts, and ultimately develop GIS shapefiles that depict the historic areal distribution of salt marsh and tidal flats across the MassBays region. Where there was no quantitative information, qualitative or descriptive analysis was used to describe Level 1 conditions.

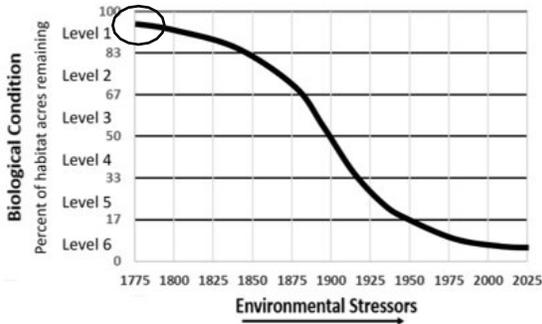


Figure 6. Draft Level 1 narratives for each eco- type based on biological potential and physical drivers (Figure above). Supplemented by historical ecological data (resources and stressors). An example Level 1 information from historical ecology research (Figure on the right).

“Cod, bass, mackerel, skate, herring, tomcod, eels and smelt were abundant. Resident Indians caught bass and other species with spears and arrows.” - A study of the marine resources of Plymouth, Kingston, and Duxbury Bay, MassDMF

“Prior to arrival of English colonists on the Lynn shores, Indians fished from canoes with bone fish hooks and hemp lines...At night, pine torches were carried to attract fish...Salmon were often speared from the rivers, and primitive nets of sticks tied together with strips of animal skins were used to catch salmon or trout... Early colonists in the Lynn area gathered mussels and clams as a source of food.” – A study of the marine resources of Lynn-Saugus Harbor, MassDMF

The oldest maps for the Boston area dated back to 1776 showing salt marsh, beaches, and flats. Sources of maps included Library of Congress, Boston Public Library, NOAA Historical Maps, and USGS Historical Topomaps. Larger scale Revolutionary War era maps were used for consistency among embayments, but quality declined with distance from Boston. Small scale Revolutionary War era maps for better mapping quality across Massachusetts were patched in. This resulted in better maps. However, Cape Cod was poorly mapped at the time, so 1877 U.S. Coastal Survey maps were patched in to include Cape Cod Bay. Revolutionary War era coastal maps cut off inland area for many marshes, so data on inland spatial extent of marshes are missing. Finally, a patchwork of spatial and temporal maps with acceptable map detail were used to best represent BCG Level 1 for salt marsh and tidal flats. These maps from 1775 served as a historical “reference point” where minimally disturbed conditions could be considered as the Level 1 for these habitats.

Not all the data from historical sources could be used as the mapping methods changed over the years and were subject to interpretation. In addition, substantial changes had taken place in certain areas and embayments, enough to render some of the data unusable. For example, most of the area around Boston Harbor that used to be tidal marsh was filled around the 1850s, so that the original marsh extent cannot be recovered. However, there were enough data to generate historic layers for salt marsh and tidal flats across most of MassBays area. In the case of eelgrass, however, comparable maps could not be generated.

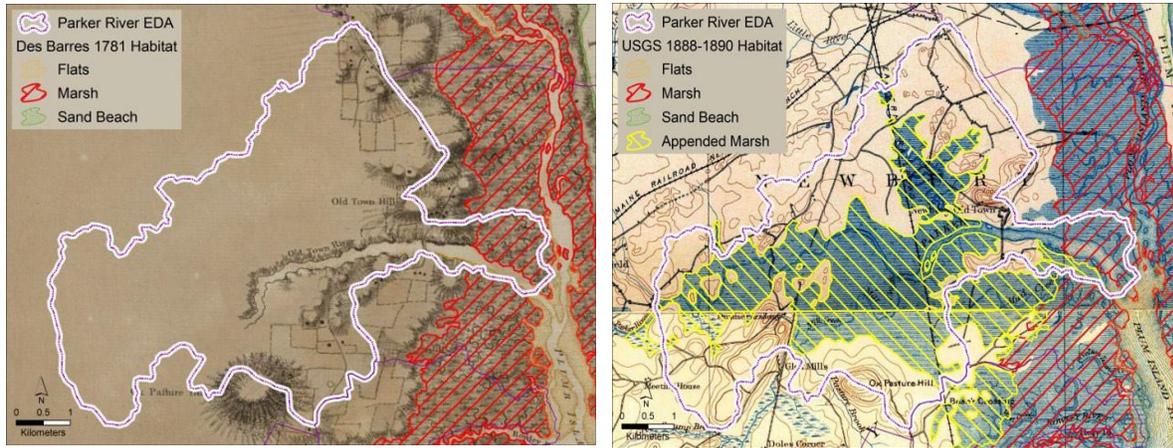


Figure 7. Revolutionary War era maps cut off inland area of many marshes (Left). Using maps from different eras resulted in a patchwork of maps over space and time.

The historical data were used to support Level 1 estimates for MassBays habitats which could represent the habitat “as naturally occurs” or “minimally disturbed”. Estimating habitat extent in MassBays prior to extensive anthropogenic influence was used to represent BCG “Level 1” and generate a more complete time series of habitat changes in MassBays to create context for further condition assessment and target-setting. Attaining a Level 1 may not be possible for many estuarine embayments within MassBays due to the substantial changes that have taken place over decades and centuries of development. Although estimating Level 1 conditions for the three habitats (salt marsh, tidal flats, and eelgrass) is essential to guide viable restoration efforts, long-term habitat restoration targets will not be set to Level 1 conditions (1775 levels for salt marsh and tidal flats) due to irreversible changes over time.

Developing a Level 1 estimate for eelgrass in estuarine embayments

As for salt marshes and tide flats, the BCG approach for MassBays requires an understanding of eelgrass habitat “as naturally occurs” or “minimally disturbed” habitat. The consensus among eelgrass scientists is that there are no existing eelgrass beds in MassBays that reflect these conditions. Over the years several attempts to estimate historical eelgrass extent and condition in Massachusetts to understand trends in loss and select potential restoration sites have not been successful (Colarusso et al., 2006). The oldest comprehensive, quantitative, survey-quality dataset characterizing eelgrass in Massachusetts is from 1995. An additional eelgrass coverage estimate exists from 1950s aerial photographs interpreted by the Massachusetts Department of Environmental Protection (MassDEP), but the data are not comparable to current survey-quality data although they may be useful for understanding eelgrass trends broadly. Nevertheless, estimating eelgrass extent in MassBays prior to extensive anthropogenic influence to represent “Level 1” for BCG is necessary to create a more complete time series that will provide context for further assessment and target-setting.

To develop a Level 1 estimate of eelgrass in MassBays, a habitat suitability approach was applied. Using available data representing current physical habitat conditions, expert judgment of eelgrass habitat requirements was applied to develop a model of eelgrass extent assuming little to no anthropogenic

disturbance. Key assumptions included: (1) current physical habitat conditions generally reflect Level 1 physical habitat conditions, and (2) eelgrass habitat requirements have not changed since historical times.

Table 4. Physical habitat variables and values used to model Level 1 eelgrass extent in MassBays.

Physical habitat data	Source	Range of suitable values	Notes
Depth	Continuous Bathymetry and Elevation Models of the Massachusetts Coastal Zone and Continental Shelf (ver. 3.0, December 2019)	Depth ranges by eco-type: <ul style="list-style-type: none"> • Yellow (low energy, abundant modern sediment, protected): 1.5 – 5.0m • Green (medium to high energy, abundant modern sediment, exposed): 1.5 – 5.0m • Orange (low to medium energy, little or no modern sediment, protected): 1.5 - 7.5m • Blue (high energy, little/no modern sediment, exposed): 1.5 - 7.5m 	MassBays STAC ²⁸ members advised that eelgrass would exist at different depths depending on the ecotype due to the influence of energy regime, sediment availability, and exposure on turbidity and light limitation.
Sediment type	Massachusetts CZM Surficial Sediment data 2020	All values suitable EXCEPT: <ul style="list-style-type: none"> • Very high confidence mud • Very high confidence rock 	Criteria used by MA Division of Marine Fisheries to develop an eelgrass restoration suitability model.
Exposure/fetch	Calculated aspect from: Continuous Bathymetry and Elevation Models of the MA Coastal Zone and Continental Shelf (ver. 3.0, Dec 2019)	All values suitable EXCEPT: <ul style="list-style-type: none"> • Areas with predominant (90th percentile within 100m moving window) northeast exposure • Areas with northeast exposure in Salisbury, Hull, Scituate to Plymouth 	Following guidance from STAC, areas with northeast exposure were eliminated from consideration as suitable habitat.

Results

Results showed that the habitat suitability model alone representing potential eelgrass habitat without anthropogenic influence (and before merging the 1950s and 1995 layers) predicted 37,338 acres of eelgrass across the estuarine embayments of MassBays. The model alone, moreover, was able to correctly predict the location and extent of 77-78% of eelgrass meadows from the 1950s and 1995 datasets. As expected, the model predicted far more eelgrass in places where none existed in either the 1950s or 1995 datasets, meaning that there was likely much more eelgrass in previous decades. When the habitat suitability model was merged with the 1950s and 1995 eelgrass layers to ensure that all existing and historical eelgrass meadows were included in the final Level 1 estimate, the total eelgrass area for historical MassBays was estimated at 41,218 acres. As is the case today, some of the largest beds were predicted to occur in Wellfleet Harbor, Provincetown Harbor, and the Kingston-Plymouth-Duxbury Bays complex.

Table 5. Comparison of habitat suitability model predictions with historical eelgrass datasets.

Layer	Acres correctly predicted	Acres missed	Excess acres predicted
1950s DEP	8,738 (77% of total)	2,565	26,035
1995 DEP	8,138 (78% of total)	2,289	26,910

Can eco-types predict historical habitat?

Historic data prior to settlement are very limited and therefore the oldest data from pre-industrial times are used in this study as a Level 1. Additionally, since there is not enough information on habitat extent to inform future suitability of an embayment to support a specific habitat(s), eco-types were developed to portray basic physical conditions that could potentially support estuarine habitats in embayments. The in-depth study of historical resources, including maps and literature, historical coastal habitat conditions were suitable to support the “natural” biotic communities that existed prior to human settlement and development in the 1600s. From this it can be deduced that:

- A mosaic of coastal habitats including saltmarsh, eelgrass, and tidal flats provided breeding and nursery habitat for a variety of fish, shellfish, birds, and other fauna.
- Coastal habitats existed under diverse physical environments (i.e., sediment, energy, and exposure regimes) such that as a whole they were resilient and adaptable to disturbance events such as storms.
- Coastal habitats had natural hydrology and connectedness with each other and with upland areas that also allowed for the migration and spawning of abundant anadromous fish populations.
- Water quality was unaffected by chemical contaminants, domestic animal waste, human waste, or urban and agricultural runoff.

Eco-type evaluation

Table 6. Acreage of habitat in each ecotype representing loss over time

	Eco-type	Marsh acres/km shoreline	Tidal flats acres/km shoreline	Length of shoreline (km)
	Yellow: low-energy, abundant modern sediment, protected	19.0 HIGH MARSH ACRE	5.6 LOW FLATS ACRES	1675
	Green: Medium- high-energy, abundant modern sediment, exposed	13.1 LOW MARSH ACRES	17.7 HIGH FLATS ACRES	404
	Orange: Low- to medium-energy, little/no modern sediment, protected	14.7 MID- ABUNDANCE OF MARSH AND FLATS ACRES	13.3	496
	All embayments	17.3	9.0	2575

Evidence shows that eco-types can accurately predict historic habitat acres. As can be seen from Table 6, eco-types can associate with distinct and explicable distribution of estuarine habitat.

Table 7. Key components specific to salt marsh habitats:

<p>MassBays (all ecotypes)</p>	<ul style="list-style-type: none"> • Natural hydrology and connectedness <ul style="list-style-type: none"> ○ No ditching or berms (microtopographic alterations) ○ No tidal restrictions (e.g., road and railroad crossings, no tide gates) ○ Natural pool/panne ratios ○ No stormwater/point/nonpoint source inputs (e.g., associated with road and railroad crossings) • Maintenance of high marsh habitat vegetation and natural vegetated/unvegetated ratio • No invasive species (e.g., Phragmites, purple loosestrife, etc.) • Natural undeveloped upland buffer • Ability to migrate upland – adaptation zones • Provides habitat <ul style="list-style-type: none"> ○ for breeding fauna (e.g., silversides, salt marsh sparrow, horseshoe crabs) ○ for species expanding ranges (this is more related to target-setting) ○ Nursery (e.g., winter flounder, horseshoe crab larvae, smelt, tomcod) • Presence of multi-host parasites • Robust macroinvertebrate community • Provides carbon storage • Buffers inland habitats against storm damage • Soil properties and organic content as naturally occurs • Intact marsh banks • Sediment source is present • Elevation capital • Connectivity with other habitats such as barrier beaches (which in-turn offer marsh protection)
<p>Yellow - Low-energy, abundant modern sediment, protected</p>	<p>Marshes are broad; extensive back barrier marshes and tidal creeks present</p>
<p>Orange - Low-to-medium-energy, little or no modern sediment, protected</p>	<p>Combination of broad and fringing marsh</p>
<p>Green - Medium- to-high-energy, abundant modern sediment, exposed</p>	<p>Marshes are fringing</p>
<p>Blue - High-energy, little, or no modern sediment, exposed embayments (with rel. low shallow water habitat area)</p>	<p>Marshes are fringing and may not be present</p>

Table 8. Key components specific to eelgrass habitats:

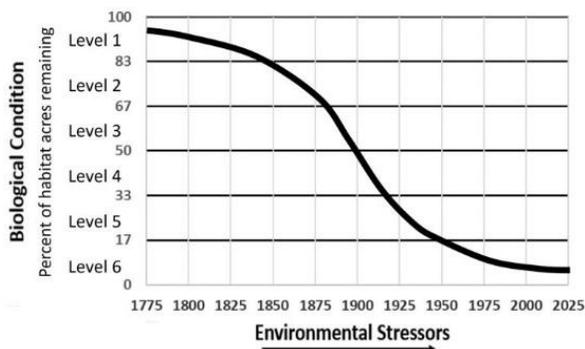
<p>MassBays (all ecotypes)</p>	<ul style="list-style-type: none"> • Shoot densities at or above 1000/m² • Eelgrass present in deeper (25-30'), clear water • Few epiphytes • Lush meadow • Continuous meadows in protected sites; patchy meadows in more exposed sites • Provide habitat for fish and other fauna
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Yellow - Low-energy, abundant modern sediment, protected	Eelgrass limited to shallows; more continuous meadows
Orange - Low-to-medium-energy, little or no modern sediment, protected	Eelgrass exists in deeper water; meadows are patchier
Green - Medium- to-high-energy, abundant modern sediment, exposed	Eelgrass meadows are patchier
Blue - High-energy, little or no modern sediment, exposed embayments (rel. low shallow water habitat area)	Eelgrass can exist in deeper water but may not be present

Table 9. Key components specific to tidal flat habitats:

MassBays (all ecotypes)	<ul style="list-style-type: none"> • Abundant shellfish • Diverse benthic faunal communities • Provide foraging area for migratory and resident birds • Habitat for fish • Natural water circulation and water depth (i.e., no dredging, extraction, and natural levels of erosion) • Sediments uncontaminated by metals, PCBs, and other toxic compounds • No invasive epifauna/flora • No adjacent or overhead structures such as docks, piers, aquaculture gear, derelict fishing gear • No bottom disturbance from fishing gears
Yellow - Low-energy, abundant modern sediment, protected	
Orange - Low-to-medium-energy, little or no modern sediment, protected	
Green - Medium- to-high-energy, abundant modern sediment, exposed	
Blue - High-energy, little or no modern sediment, exposed embayments (with relatively low shallow water habitat area)	

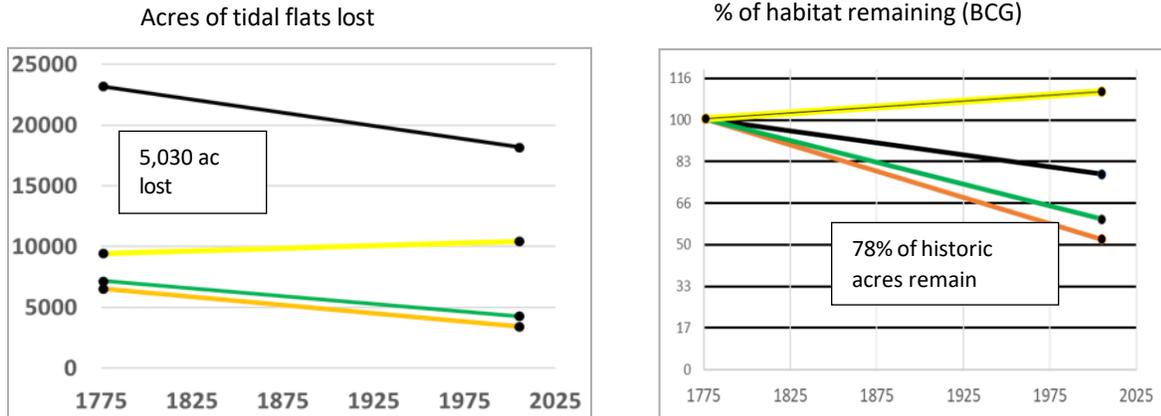
3.3 Developing BCGs for each eco-type



Using historic and current information of areal extent of salt marsh, eelgrass, and tidal flats, BCGs were developed for each habitat within each of the four eco-types. These preliminary results are shown graphically in Figures 9 and 10.

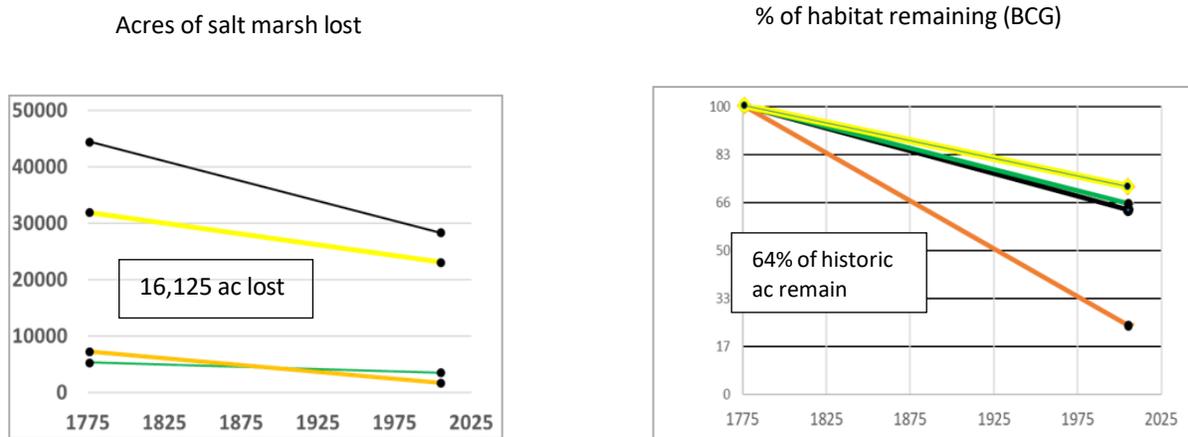
Figure 8. BCG levels as percent of acres remaining from level undisturbed condition

Figure 9. Draft BCGs for Tidal Flats in each embayment eco-type



Shoreline % anthropogenic	Historic acres	Eco-types
5%	9500	Yellow-low energy, abundant modern sediment, protected
14%	7200	Green – medium-high energy, abundant modern sediment exposed
38%	6600	Orange – low-medium energy, little or no modern sediment
12%	23200	Black – All embayments

Figure 10. Draft BCGs for Salt marsh in each embayment eco-type



Shoreline % anthropogenic	Historic acres	Eco-types
5%	31900	Yellow-low energy, abundant modern sediment, protected
14%	5300	Green – medium-high energy, abundant modern sediment exposed
38%	7300	Orange – low-medium energy, little or no modern sediment
12%	44400	Black – All embayments

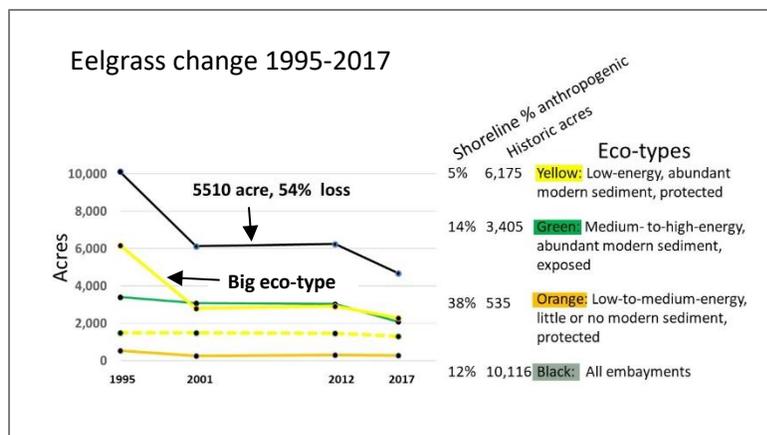


Figure 11. Eelgrass change from 1995-2017. Earlier “historic” data are not available across all MassBays, and a Level 1 definition was difficult to develop.

prolific in nearshore waters and estuaries. Between 1995-2017 it is estimated that over 54% of eelgrass was lost from all embayments taken together, and that estimate may be conservative based on the limitations of fixed-wing aerial surveys. The biggest losses occurred from the yellow eco-type embayments but the reasons why well protected embayments have suffered the biggest losses are still being investigated, although the amount of modern sediment and associated shoaling could play a role.

On the other hand, it was noted that the embayment that lost most eelgrass was Wellfleet Harbor, for a variety of reasons including nutrient discharge from septic systems. If the losses in Wellfleet Harbor were excluded from the calculations for all embayments, a different picture emerges. In this case, eelgrass loss across all embayments would make up 11% from 1995-2012, followed by a 23% loss after 2012-2017. It is also noted that between 1995-2017, the eelgrass stayed quite stable in embayments in the yellow eco-type. Wellfleet Harbor is a yellow eco-type embayment, which explains the big eelgrass loss from yellow eco-type embayments which actually offer the best conditions to support this habitat.

It is not all bad news however, as embayments within the Boston area as well as Provincetown Harbor gained substantial amounts of eelgrass over the past 25 years. In 1993 Provincetown became sewerred and since then it has gained 94 ac of eelgrass. Nearby, Pamet River gained 69 acres over the same period. Boston Harbor gained 34 acres, partly as a result of the relocation of the sewage outfall from the harbor out into Massachusetts Bays.

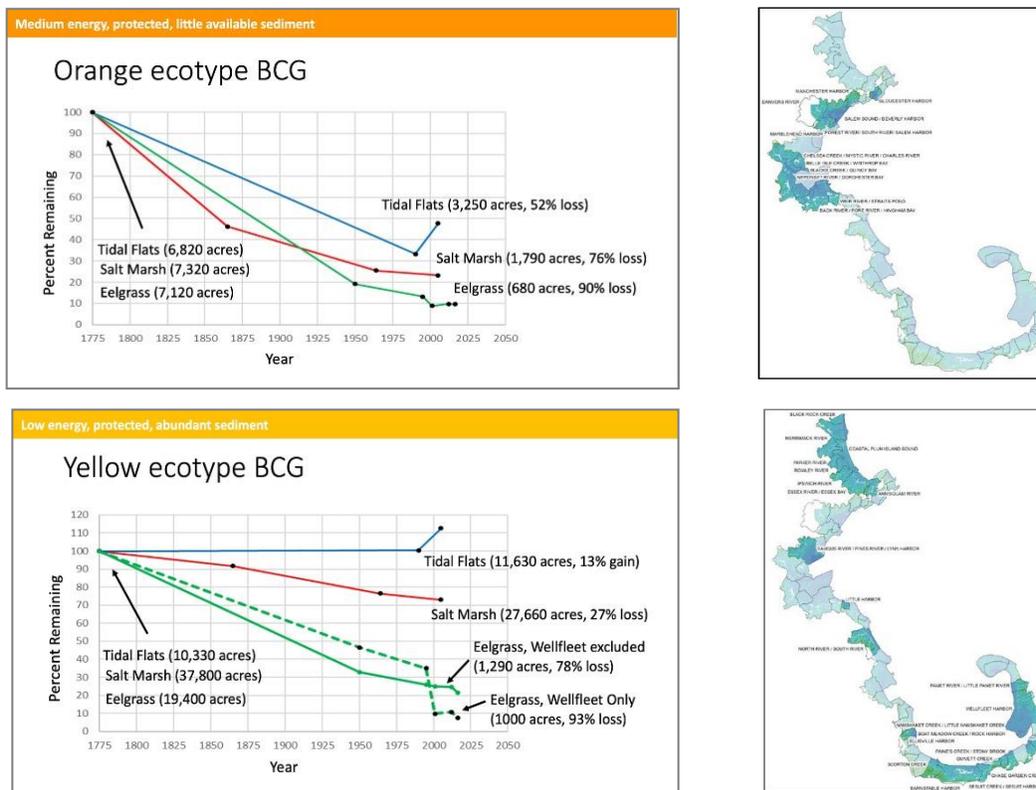
Table 10. Summary of habitat results and associated BCGs. MassBays lost significant acres of habitat.

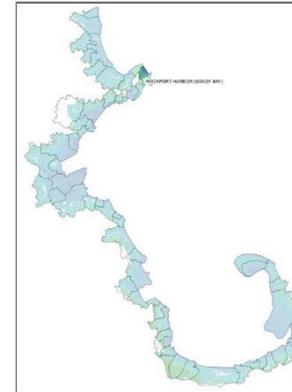
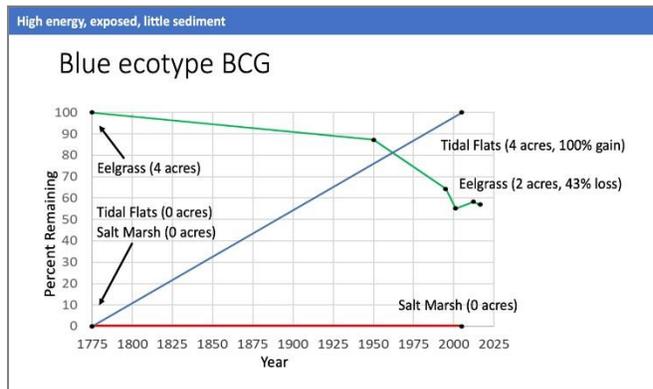
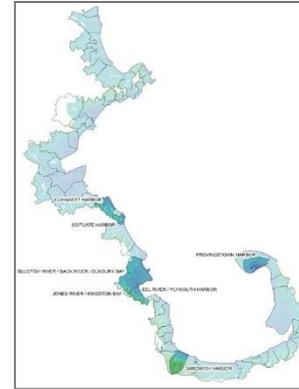
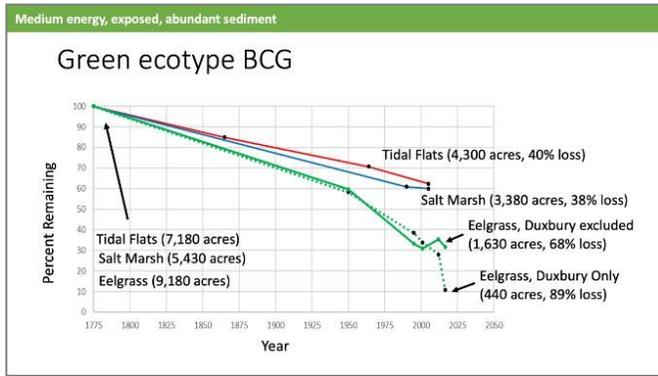
	Acres lost	% Lost	Data quality	
Salt marsh 1700s-2005	16125	36	Good	Significant losses will have occurred after 2005 with increasing stressors including Sea Level Rise, population density, nutrient pollution; new surveys are needed.
Tidal flats 1700s-2005	5030	22	Fair	
Eelgrass 1995-2017	5510	46	Excellent	Reflects huge seagrass loss in Wellfleet Harbor
Eelgrass 1995-2017 (Wellfleet excluded)	1827	33	Excellent	MassBays lost 33% of eelgrass over 22 yrs The rate of eelgrass loss from 2012 to 2017 was twice that of the previous 17 years.

As can be seen in Figure 12, a BCG was developed for the embayments within each eco-type. Despite the minimal historical information, it provided enough data points to generate BCGs that reflect conditions reviewed and confirmed by subject matter experts as well as by local stakeholders. From historical records, a “reference point” in 1775 was used for all three habitats. The maps and literature had more details about tidal flats and salt marshes. The most recent data points for these two habitats are from 2005 wetland maps (MassDEP). Although lots of work has been done on these habitats, especially on salt marshes, since that time, the MassDEP maps have not yet been updated. Therefore the “present” data point for these two habitats is 2005. In the case of eelgrass, the most reliable complete data set started in 1995. MassDEP also have converted 1950s data into maps. However, it was decided to use 1995 as the “reference point” and then scale back to 1775. On the other hand, in the case of eelgrass, data are still being regularly collected by various entities. The longest-term official datasets are the ones collected via MassDEP’s aerial surveys which take place about every 3 years.

Figure 12 served as the basis to start looking into the future based on historic and present rates of changes. The BCGs provide values for habitat loss, as well as present values and these numbers provide us with the opportunity to establish long-term future targets and based on the stressors lay the road for actions that need to be done to reach the targets. The next big step was to develop a target for each of the habitats (salt marsh, eelgrass, and tidal flats) for each of the four ecotypes.

Figure 12 a-d BCGs developed for each eco-type





3.4 Setting long-term targets for habitat restoration

The BCG tool uses the data input to help inform the establishment of potential long-term targets for each habitat type. Rather than set targets by embayment, it was decided to identify long-term targets for each habitat type by ecotype. Because embayments within each ecotype are similarly suited for supporting a specific habitat or habitats, an assumption was made that a specific habitat has the potential of being conserved, expanded and/or restored.

The habitat targets metrics are associated with either areal extent, or with condition of each habitat, or both. These are informed by the results of the BCGs using historical and current resource data as well as the stressors driving resource conditions. Targets also had to be ambitious but attainable, informed by the suitability of an embayment to support restoration (natural or manmade), the primary stressors, (including projected impacts of climate change), and the support of the community for improved future estuarine conditions. An understanding of the ecosystem benefits that these habitats provide and on which their livelihood depends will gain the support of local communities.

Each habitat type was assigned a long-term target (2050). The reason for establishing long-term targets is to allow for definition of a stressor through monitoring (e.g., stormwater runoff), preparation of design and management plans, obtaining funding needed to address the stressor/s, and importantly, allow adequate time for the ecosystem to respond following implementation. Because these targets are long-term, associated water quality, sediment, and biological metrics are selected to track progress through monitoring programs. MassBays CCMP is itself a long-term effort by design, acknowledging that achieving its goals will require flexible implementation and adaptive management over time, even while keeping to the goals of ecosystem health and human well-being.

Draft target numbers were identified using the results from historical assessment, current data, and resource-stressor clusters. The process of target setting was conducted with oversight from the STAC and input from various subject matter experts. During multiple meetings, STAC provided input on the proposed approach to develop target conditions, to discuss proposed targets, and to provide advice on studies and products that helped advance our thinking. MassBays and STAC established three subgroups, one each for eelgrass, salt marsh, and tidal flats, with subject matter experts to focus on and discuss specific including methods used, the data used to establish the targets and how the results were interpreted to develop targets. There was much discussion over whether targets could or should be established and what is the appropriate “reference point”, what constitutes an ideal eelgrass bed or healthy salt marsh, and how to take into consideration climate change impacts that may entail additional actions over the coming years.

The process of target setting was developed with local expert input. Regional coordinators provided expert guidance on how to apply the BCG framework and incorporate the concept of ecosystem services to communicate about targets in their communities. They also provided key information through their in-depth knowledge of the embayments within their region that helped provide a better understanding of the uniqueness of each embayment and helped refine the targets to address these differences.

Table 12 shows that for eelgrass, targets were selected to restore areal extent of eelgrass beds to the 1995 levels (the most historic year where we have statewide data in which we are confident). If there is no longer enough space to expand, focusing on improving the health of a habitat is also an important target. For example, saltmarsh surrounded by impervious surface may no longer have room to expand or migrate landward in the event of sea level rise. However, efforts can be dedicated to eliminating *Phragmites*, for example, by removing tidal restrictions, or transplanting to restore denser coverage, thereby improving the hydrology, and enhancing growth of native saltmarsh species. In this case, the target would be a “hold the line” approach for areal extent and improve condition in terms of health.

Table 12. 2050 estuarine habitat goal by eco-type

Ecotype	Habitat	Goal by 2050	Acres to restore/maintain	Associated ecosystem benefits
Green	Eelgrass	Increase acres, improve quality	2,040	<ul style="list-style-type: none"> Habitat for fish, birds, invertebrates Improved water quality Nitrogen uptake Carbon sequestration Shoreline protection & erosion control Aesthetics Shellfish production Food sources Recreational opportunities
	Salt Marsh	Maintain acreage, improve quality	2,800	
	Tidal flats	Maintain acreage, improve quality	4,060	
Yellow	Eelgrass	Increase acres, improve quality	4,560	
	Salt Marsh	Maintain acreage, improve quality	27,170	
	Tidal flats	Maintain acreage, improve quality	11,720	
Orange	Eelgrass	Increase acres, improve quality	10	
	Salt Marsh	Maintain acres, improve quality	1,730	
	Tidal flats	Maintain acres, improve quality	3,270	
Blue	Eelgrass	Maintain acreage, improve quality	2	
	Salt Marsh	Maintain acreage, improve quality	0	
	Tidal flats	Maintain acreage, improve quality	4	

Because habitat improvement is often a slow process, a set of associated metrics was developed by MassBays and OST to help track progress over the short term as management actions are put in place and implemented. For example, restoring eelgrass in an embayment may require the reduction of stormwater discharge. Planning, designing, and constructing stormwater BMPs may take several years (if funding is available), and post construction it may take some time for water clarity to be restored and for eelgrass to come back. Therefore, over time water quality improvements will be monitored by measuring this and other key metrics to keep track of progress towards the long-term targets.

4.0 Developing embayment resource-stressor clusters

Although the MassBays planning area has a diverse geomorphology, many embayments share similar resources and stressors. As such, management efforts may benefit from clustering embayments with similar attributes to achieve set targets (Hanley et al., 2021). For example, urban embayments tend to share similar stressors and natural resource conditions but may be very different from embayments in rural areas. However, it is important to note that even in embayments that have similar attributes, it may be easier to improve certain conditions (e.g., reduce stormwater) than others (e.g., reduce population density). Ultimately, it is the nature of the embayment system and the conditions of estuarine resources as well as the levels of specific anthropogenic stressors that enables the choice of restoration tools by resource managers to conserve and restore critical coastal embayments and the ecosystem benefits they provide.

This section describes how data from the EDA were used to identify similar clusters of embayments and subsequently try to identify the primary driving stressors impacting estuarine resources. The results will ultimately be used by managers in making decisions on which conservation or restoration actions to implement to address the stressor, improve conditions, and restore estuarine habitats.

Method

Embayment suitability for multivariate analysis

Using the 44 embayment assessment areas and a suite of embayment-level data, a series of analyses was conducted to: (1) characterize and develop clusters of embayments with similar estuarine resource conditions and stressor attribute levels, and (2) identify the stressor attribute(s) that are the strongest predictors of estuarine resource levels within each embayment.

This analysis was only applied to the 44 embayment assessment areas (Phase 1) but not to the inter-estuarine areas⁶. Additionally, not all the stressor and resource attributes initially used to characterize estuarine embayments were used in the analysis. Some attributes were excluded for specific reasons such as being dependent variables, while others were modified to fit into the analyses (Table 13). A detailed account of the rationale behind the decisions to make these adjustments is outside the scope of this document and is described in detail in the final report (Hanley et al., 2021).

⁶ Phase 2 will include analysis of all 65 assessment areas, including both embayment and inter-estuarine areas.

Table 13. Estuarine resources and anthropogenic stressors included in the statistical analysis (2020)

Estuarine Resources	Eelgrass, salt marsh (% shoreline length), salt marsh (areal extent), tidal flats, rocky intertidal (natural unhardenable shoreline), tidal flushing
Stressors	High-intensity land use, annual stormwater discharge, population density, % population using septic systems, 303(d) impairments estuaries (bacteria & nutrients), septic system use; CAPS tidal restrictions, shoreline hardened

The following method was applied by the Northeastern University team and is described in Hanley et al., 2021.

Using multivariate analyses, stressor and natural resource attributes for each embayment were aggregated into a single dataset. Principle component analysis (PCA) was used to analyze the data after it was transformed using Hellinger transformation R statistical analysis software⁷ (Oksanen et al., 2013). This transformation divides each value in a data matrix by the square root of its marginal sum of squares. A partitioning around medoids (PAM)⁸ approach was then applied using R⁹ to determine the appropriate number of clusters based on optimum average silhouette width (Hennig, 2013, in Hanley et al., 2021). PCA results were extracted and visualized graphically with clusters differentiated by color (Figure 13). The appropriate number of components to include was determined by visually inspecting the screen plot (e.g., the percentage of variance explained by each component) for a drop-off in explained variance (Hanley et al., 2021). This analysis resulted in four resource-stressor categories (R-S Categories) of embayments to inform MassBays and communities when applying different management strategies to improve habitat conditions (Figure 14).

Similarity percentages (SIMPER) analysis was implemented to determine the contribution of each variable (attribute) to the observed dissimilarity between clusters. A Bray-Curtis method was used on Hellinger transformed data. The results were used to propose potential target stressor and resource levels for each estuarine embayment.

Identify stressors that drive resource conditions for each embayment cluster

Regression tree analysis was used to determine which continuous stressor attributes are the most powerful predictors of select resource attributes. This univariate analysis explains variation in a response variable (resource attributes) using a select suite of explanatory variables (stressor attributes) by repeatedly partitioning data into increasingly homogeneous groups and maximizing homogeneity within and heterogeneity between the resulting subgroups (De'ath & Fabricius, 2000). The effect of the nine stressor attributes used in the PCA (hardened shoreline, high intensity land use, population density, annual stormwater discharge, % population using septic systems, septic system use, impairment for nutrients, impairment for bacteria, and CAPS tidal restriction) were applied to the five resource attributes (salt marsh shoreline, salt marsh areal extent, seagrass beds, tidal flats, and rocky intertidal shoreline). Details of the advantages of using regression trees and how these are interpreted are described in detail

⁷ Using the decostand procedure from the vegan package (R v. 3.4.3, R Core Team, 2016)

⁸ A mediod is defined as a cluster and the surrounding space with minimal average dissimilarity to all objects in the cluster.

⁹ Using pamk procedure from the fpc package (R v. 3.4.3, R Core Team, 2016)

in Hanley et al., 2021. *The full method is described in Hanley et al., 2021.*

Regression trees provide threshold values of the stressor attributes that are most powerful in predicting each resource attribute; the results, coupled with the PCA (and Bray Curtis) cluster results which defines ranges for each attribute for each cluster, provide the basis for threshold recommendations. Depending on the specific resource attribute (e.g., eelgrass extent), the regression tree results and accompanying cluster tables can be used to: 1) set realistic targets for habitat coverage (i.e., within the range of its cluster), 2) determine the stressors that are driving the health of the resource, and 3) define optimal or target stressor levels that correspond with greater resource extent or condition.

Results

The PCA and PAM analyses (Figure 13) described above identified four clusters of embayments. While the cluster analysis revealed that groups that include embayments that are proximal to each other are more likely to be in the same cluster, geography alone was a poor predictor of similarity in embayment characteristics. Although cluster 4, for instance, primarily included embayments in the metro Boston area – an unsurprising result given that region’s high population density and correspondingly higher levels of anthropogenic stressors – the other three clusters included embayments from across the entire MassBays region. Municipalities often tend to compare themselves to neighboring municipalities, but the multivariate method reveals that this approach may be misleading. Instead, by comparing embayments/ municipalities that cluster together based on quantitative stressor and resource attributes, local regulators can compare the characteristics of their embayments with those in the same category and apply the same management strategies to address stressors (Hanley et al., 2021). These results support the use of stressor and resource attributes rather than geography alone to compare and set realistic and achievable targets among similar embayments.

Table 14. Means and ranges of the four clusters of stressor and resource attributes.

	Cluster 1		Cluster 2		Cluster 3		Cluster 4	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Hardened Shoreline	62.41	(36.58-92.43)	9.93	(0.00-37.59)	9.75	(0.00-55.15)	51.55	(30.44-92.64)
High Intensity Land Use	44.32	(18.26-56.78)	23.75	(4.23-47.86)	28.83	(0.11-56.17)	65.33	(38.08-91.09)
Annual Stormwater Discharge	2.43	(0.19-8.43)	1.09	(0.16-2.10)	1.52	0.21-4.47)	1.42	(0.28-3.05)
Population Density	3.11	(0.80-5.91)	0.63	(0.27-0.98)	1.08	(0.20-2.53)	10.58	(2.00-19.48)
% Population Using Septic	50.68	(50.08-51.17)	82.87	(52.03-104.07)	58.97	(0.50-100.16)	1.12	(0.00-8.94)
Septic System Use	1.57	(0.41-2.96)	0.54	(0.23-1.02)	0.58	(0.07-1.26)	0.02	(0.00-0.18)
Nutrient Impairment 303(d)	0.00	(0.00-0.00)	2.18	(0.00-15.26)	1.90	(0.00-24.92)	0.00	(0.00-0.00)
Bacterial Impairment 303(d)	98.74	(96.75-99.76)	7.33	(0.00-12.84)	95.62	(65.44-100.00)	99.74	(98.12-100.00)
CAPS Tidal Restriction	0.00	(0.00-0.00)	10.74	(0.00-48.36)	25.81	(0.00-84.41)	48.83	(9.53-96.52)
Salt Marsh Shoreline	32.73	(0.00-59.79)	71.35	(38.03-100.00)	83.38	(51.85-100.00)	72.01	(40.29-95.20)
Salt Marsh Extent	19.03	(0.00-44.14)	46.15	(22.10-81.01)	32.14	(12.29-97.36)	18.08	(8.82-32.89)
Eelgrass	13.39	(0.77-27.44)	4.87	(0.00-15.14)	3.73	(0.00-27.54)	3.23	(0.00-11.19)
Tidal Flats	2.38	(0.00-8.92)	19.39	(0.00-42.90)	14.36	(0.12-49.43)	11.96	(0.00-33.07)
Unhardenable	19.77	(0.00-52.18)	10.76	(0.00-35.43)	9.03	(0.00-46.11)	6.02	(0.00-18.31)
Tidal Flushing	37.95	(10.2-70.5)	4.77	(1.40-11.30)	6.79	(2.90-15.00)	21.04	(9.00-38.10)

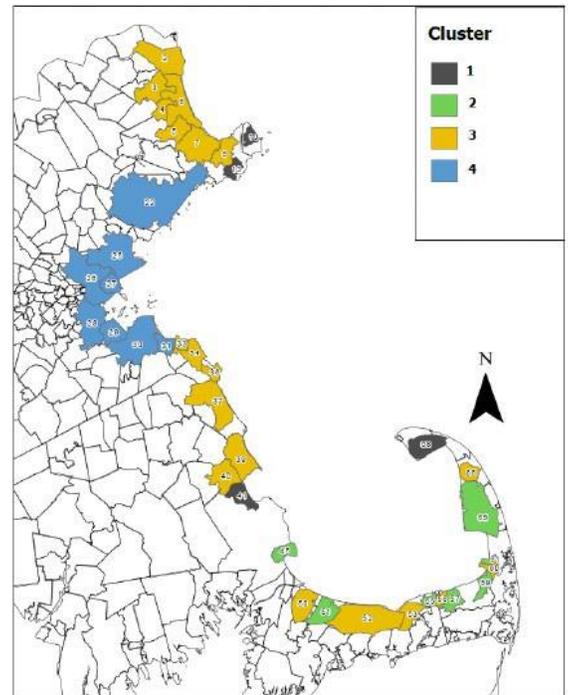
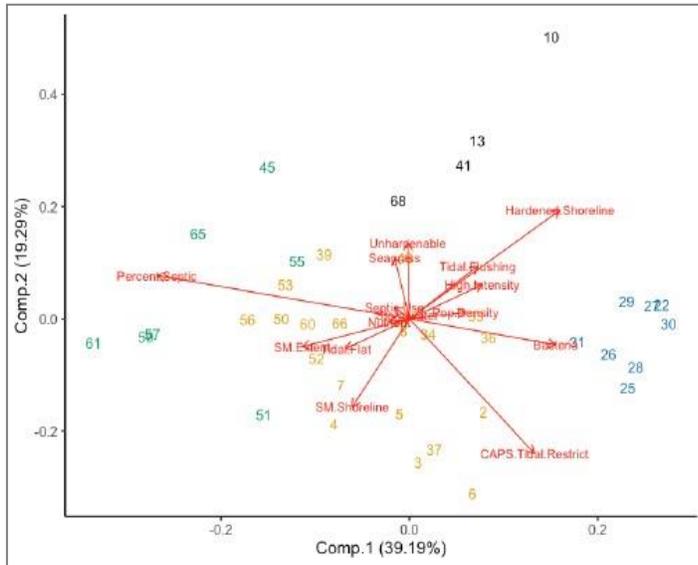


Figure 13. PCA splitting the embayments into 4 clusters based on combined stressor and resource attributed data. Numbers correspond to embayments (see Tables 4 & 5 in Hanley et al., 2021.) and colors correspond to clusters

Table 15. Main stressor drivers for each cluster

Cluster 1 – Salt marsh extent and tidal flat area	Cluster 2 – Hardened shoreline and seagrass extent	Cluster 3 – Salt marsh shoreline and impairment for nutrients	Cluster 4 – High intensity land use, mean pop. density, CAPS tidal restriction
High % population using septic systems and septic system use	Highest mean shoreline hardened	Highest impairment for nutrients (not significant)	High mean shoreline hardened
Low impairment for bacteria	High mean population density	High % of population using septic systems and septic system use	Highest mean high intensity land use
Low mean CAPS tidal restriction	High impairment for bacteria	High impairment for bacteria	Highest mean population density
Highest mean salt marsh extent	No impairment for nutrients	High mean CAPS tidal restriction	Low % of population using septic systems
High mean salt marsh shoreline	Low mean CAPS tidal restriction	Highest salt marsh shoreline	High impairment for bacteria
Highest mean tidal flat area	Lowest mean salt marsh shoreline	High saltmarsh extent	No impairment for nutrients
	Low salt marsh extent		Highest mean CAPS
	Highest mean eelgrass Lowest mean tidal flat		Low salt marsh extent

SIMPER analysis indicated that differences between cluster means were most often driven by a suite of stressor and resource attributes (Hanley et al., 2021). Highlights of results from analysis include:

- Mean shoreline hardened was significantly higher for embayments in Clusters 1 and 4 than in

Clusters 2 and 3 ($p < 0.05$ for all pairwise comparisons).

- Mean high intensity land use was highest for embayments in Cluster 4 but only Cluster 3 significantly differed from Cluster 4.
- In general, annual stormwater discharge differed relatively little between clusters, though this stressor attribute did differ between Clusters 1 and 2 ($p = 0.049$), and between Cluster 1 and 3 ($p = 0.049$).
- Mean population density was significantly higher for embayments in Cluster 4 than in Clusters 2 or 3, but not for Cluster 1.
- Both metrics of septic system use were significantly lower for embayments in Cluster 4 than embayments in the other clusters.
- No significant differences in mean impairment for nutrients were detected among clusters. Mean impairment for bacteria was universally high for Clusters 1, 3 and 4, all of which had significantly higher mean impairment for bacteria than Cluster 2.
- Mean CAPS tidal restriction was greatest for embayments in Cluster 4, which differed significantly from Clusters 1 and 2, but Cluster 3 did not.
- Mean salt marsh shoreline was significantly lower for embayments in Cluster 1 than in Clusters 2 and 3 but Cluster 4 did not differ significantly from the others. Salt marsh extent was significantly higher for embayments in Cluster 2 than in Clusters 1 and 4. However, Cluster 3, which has the second highest mean salt marsh extent, was not significantly different from the other clusters for this resource attribute.
- Mean seagrass (acres seagrass per acres open water < 10 m) was greater for Cluster 1.
- Mean tidal flat area (area tidal flats per acres open water < 5 m) was significantly greater for embayments in Cluster 2 than embayments in all other clusters.
- The proportion of natural, unhardenable shoreline (i.e., rocky intertidal, vertical escarpments, etc.) differed less among clusters than other resource attributes, with no significant differences among clusters ($p < 0.05$).
- Tidal flushing, differed among a subset of clusters, with embayments in Clusters 1 and 4 having generally higher rates of tidal flushing. Cluster 1 differed significantly from Clusters 2 and 3, but Cluster 4 did not.

As described in Hanley et al., 2021, the results provide insight into targets for the lower bounds of stressors and upper bounds of resources that might be achievable for embayments within a specific cluster. However, reducing levels to the lower bound within a cluster may be unrealistic given the range of competing demands within an embayment, and therefore using the mean or median for a stressor to be reduced may be a more realistic target. The analyses also provided insight into which major stressor levels impacted which resources most. For example, results indicated that salt marsh habitat is vulnerable to a variety of stressors, a primary predictor being population density, with higher densities (≥ 1.23 persons per acre) corresponding to lower salt marsh extent. In areas with lower population densities, CAPS tidal restriction was an important predictor of salt marsh extent: embayments with $< 0.73\%$ tidally restricted salt marsh had on average 28 more acres of salt marsh per km salt marsh shoreline than embayments with $\geq 0.73\%$ tidally restricted salt marsh. These results indicate the stressors that are most likely responsible for degradation of salt marsh habitat and suggest critical stressor thresholds for embayments experiencing higher levels of these stressors. These same considerations are true for setting targets for resource attributes (i.e., whether to aim for the upper bound vs. the mean or median). Given that several stressors may individually and cumulatively be contributing to declines in a resource attribute, achieving targets for

resource metrics may be even more challenging (Hanley et al., 2021).

Regression tree analysis was used to examine each resource attribute to determine the most predictive stressor attributes and their thresholds. Regression tree analyses of the potential drivers of differences in tidal flat, seagrass, and rocky intertidal habitat levels did not reveal any stressors that were strong predictors. The failure of regression tree analysis to identify critical thresholds of potential predictors could be a consequence of several factors discussed below. As mentioned above, results of multivariate analysis provided potential levels (e.g., lower bound, mean, or median) that could also be used to set targets for stressor attributes (Hanley et al., 2021).

General conclusions:

- geography alone is a poor predictor of stressor and resource levels in the MassBays region.
- results provide a potential realistic target for the lower bounds of stressors and upper bounds of resources that might be achievable for embayments within a given cluster.
- range of methods to set target: the lower bound of the range is the current lowest level within a cluster, and likely is the minimum level achievable for each stressor attribute. Because reducing levels to the lower bound within a cluster may be unrealistic given the range of competing demands within an embayment, the mean or median may be a more realistic target. These same considerations are true for setting targets for resource attributes
- 20% of shoreline hardened appears to be a critical threshold, above which both salt marsh shoreline and salt marsh extent decline precipitously
- in areas with low levels of shoreline hardening, septic system use was an important predictor of salt marsh shoreline loss
- realistic targets for habitat coverage = within the present range of its cluster.¹⁰

5.0 Ecosystem services of estuarine habitats

Improving habitat conditions is an exciting goal but getting the required buy-in and support from stakeholders often poses many challenges. Each of the three habitats (eelgrass, salt marsh and tidal flats) provides a suite of ecosystem attributes that sustain organisms within the ecosystem. These attributes also provide services that benefit the communities which depend on these habitats for their wellbeing. Therefore, communicating to local communities and stakeholders the ecosystem services and benefits provided by each habitat, and emphasizing that improved habitat conditions result in better ecosystem benefits is important to garner support from local communities for the protection, conservation, and restoration of vulnerable habitats. For example, ecosystem services provided by saltmarshes include clean water, food (shellfish and fish), recreational opportunities (birding, kayaking), economic benefits, and shoreline protection (buffering against waves).

This project went the next step to align consideration of benefits with ecosystem condition by developing a parallel Ecosystem Services Gradient (ESG) to: (1) identify priority ecosystem services associated with each habitat type, and (2) understand that ecosystem services improve with improved habitat conditions. The elements to this process are described in the following subsections: (1) applications of ESG to evaluate benefits of restoration (using an embayment in MassBays as an example), (2) assessment of how local stakeholders will prioritize restoration efforts based on ecosystem benefits they value most, (3) identifying beneficiaries and ecosystem services, and (4) linking the BCG and ESG as applied to MassBays estuarine

habitat targets. (1) and (2) will be briefly described in this document since they are both parts of ongoing projects and the details will be fully described through separate publications.

5.1 Applications of Ecosystem Service Gradient (ESG) to evaluate restoration benefits

As stated in the beginning of this document, the MassBays CCMP update includes setting restoration targets for coastal habitats that support sustainable ecosystem services for communities dependent on them. MassBays' vision includes sustainable ecosystems that support life and the communities dependent on them. As such, target setting will address not only "What kind of ecological future do we want?" but also "What kind of socio-economic future do we want?". An understanding of potential natural resource benefits of ecosystem restoration can help to communicate potential benefits of restoration in ways that motivate local support for implementation and provide a means toward measuring progress in ways that take into account local concerns (Yee et al., In press).

MassBays and EPA¹¹ collaborated to identify the top ecosystem services associated with the main habitats (eelgrass, salt marsh, tidal flats, and soon diadromous fish habitat) and that are related most closely to ecological conditions and socioeconomic interests in MassBays. The goal was to develop an approach to describe and quantify the delivery of critical ecosystem functions and services associated with desired beneficial uses and how they shift with ecological condition. ESG is a science-based descriptive model of ecosystem services production that measures response to changing environmental conditions and human beneficiary populations. Therefore, ESG is a tool that can help in identifying meaningful measures, defining reference points, communicating, and monitoring the relevant social and economic impacts of actions, and evaluating tradeoffs across multi-sector objectives.

The conceptual foundation for an ESG follows that of the BCG. As described previously, the BCG leverages expert knowledge and biomonitoring data to describe ecological condition along a gradient from undisturbed reference conditions to severely altered. Similarly, the ESG framework aims to create a framework, based on measurable ecologically important attributes, that can be used to describe the complete range of condition, provide a rational and consistent means for setting targets and actions to achieve them, and to communicate how delivery of ecosystem services varies either as the consequences of different management choices or along some other continuum, such as distance from the site. In this way, BCG and ESG are closely linked, and this link will be used in the development of habitat targets that are informed not only by the biology of the estuarine embayment and its ecosystem functions, but also by the ecosystem benefits that communities prioritize.

The ESG leverages a number of practical strategies for integrating ecosystem services into decision-making, including: prioritizing information and analysis to what is most important for a given area or decision, using the concept of final ecosystem goods and services (FEGS) to identify metrics that are unambiguous and directly relevant to human beneficiaries, applying ecosystem services production functions (EPFs) to link changing condition to changes in ecosystem services, understanding the range of potential outcomes, and considering tradeoffs across multiple objectives (Yee et al.,2020).

¹¹ Gulf Ecosystem Measurement and Modeling Division, Center for Environmental Measurement and Modeling, USEPA

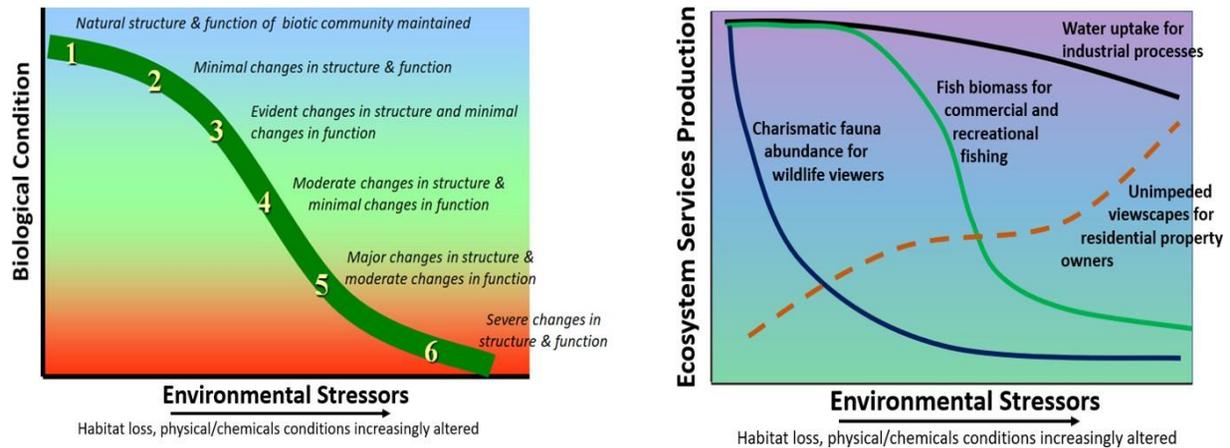


Figure 14. Figures showing relationship between BCG and ESG.

The ESG approach will help decision-makers to: 1) identify priority ecosystem services most relevant to local stakeholder needs, 2) understand current levels of ecosystem services provisioning by the habitat e.g., salt marsh, in comparison to potential or desired provisioning, 3) understand what levels of restored condition are needed to achieve desired levels of ecosystem services, and 4) compare potential benefits (or tradeoffs) across priority ecosystem services to facilitate choosing among alternative restoration options.

The goal for MassBays was to develop an ESG that can be integrated into decision-making for comparing restoration options (i.e., setting restoration targets, setting budget priorities, identifying metrics for monitoring to track restoration success). It is important to identify the ecosystem services associated with a particular habitat and at the same time identify the beneficiaries and stakeholder priorities. Once a set of prioritized ecosystem services are selected, development of the ESG can begin. Developing an ESG involves seven steps that are summarized in Table 16 and are currently being tested in the Belle Isle – Rumney Marsh – Chelsea complex.

Table 16

Ecosystem Services Gradient Steps	Process
1. What ecosystem goods & services (FEGS) are relevant?	Identify and prioritize FEGS with stakeholders.
2. How will we measure them?	Identify FEGS metrics and indicators, and the biophysical attributes that provide them.
3. What FEGS could we have?	Establish potential availability under a range of bio-physical conditions using historic data, reference sites, or ecological production function (EPF) models.
4. What FEGS do we have now?	Establish current availability using monitoring data, spatial maps, or EPF models.
5. What FEGS do we want?	Evaluate potential co-occurring benefits and tradeoffs at varying levels of restored condition or alternative restoration options
6. How do we get there?	Identify restoration activities such as habitat creation or stressor reduction to achieve desired levels of restored condition.
7. What are the social and economic consequences?	Conduct and communicate an optional benefits assessment using ecological benefit functions (EBFs) to translate ecosystem services supply into socio-economic, monetary, or human health and well-being benefits.

An essential first step is identifying key stakeholders and understanding what benefits are important to them. In evaluating variability in beneficial uses of estuarine habitats across coastal communities in MassBays, the final ecosystem goods and services (FEGS)¹² classification framework and related prioritization tool to identify users, or beneficiaries, of natural resources and the ecosystem services they care about, based on the relative frequency of mentions in over 1400 community planning documents (Yee et al., In Review).

This approach provided insight into the groups of people or stakeholders directly using or indirectly benefitting from the three estuarine habitats (eelgrass, salt marsh, and tidal flats), and allows for analysis of individual embayment communities to help support local restoration decisions, as well as those for estuarine embayments across the MassBays region.

Top beneficiaries included residents, viewers, property owners, educators and students, and commercial and recreational fishing. Top ecosystem services they care about included naturalness, fish and shellfish, water movement and navigability, water quality and quantity, viewsheds, availability of land for development, flood mitigation, and birds. Community-level priorities were primarily related to regional differences, the local job industry, and whether the community was predominantly a high minority urban area or retirement community. Priority ecosystem services identified from community planning documents provide a starting point for setting locally relevant restoration goals and targets, designing and implementing projects that reflect what stakeholders care about, and implementing post-restoration monitoring in terms of accruing benefits to local communities (Yee et al., In Review). A follow-up to these variables will include the EJ metrics that are becoming a priority in some MassBays communities.

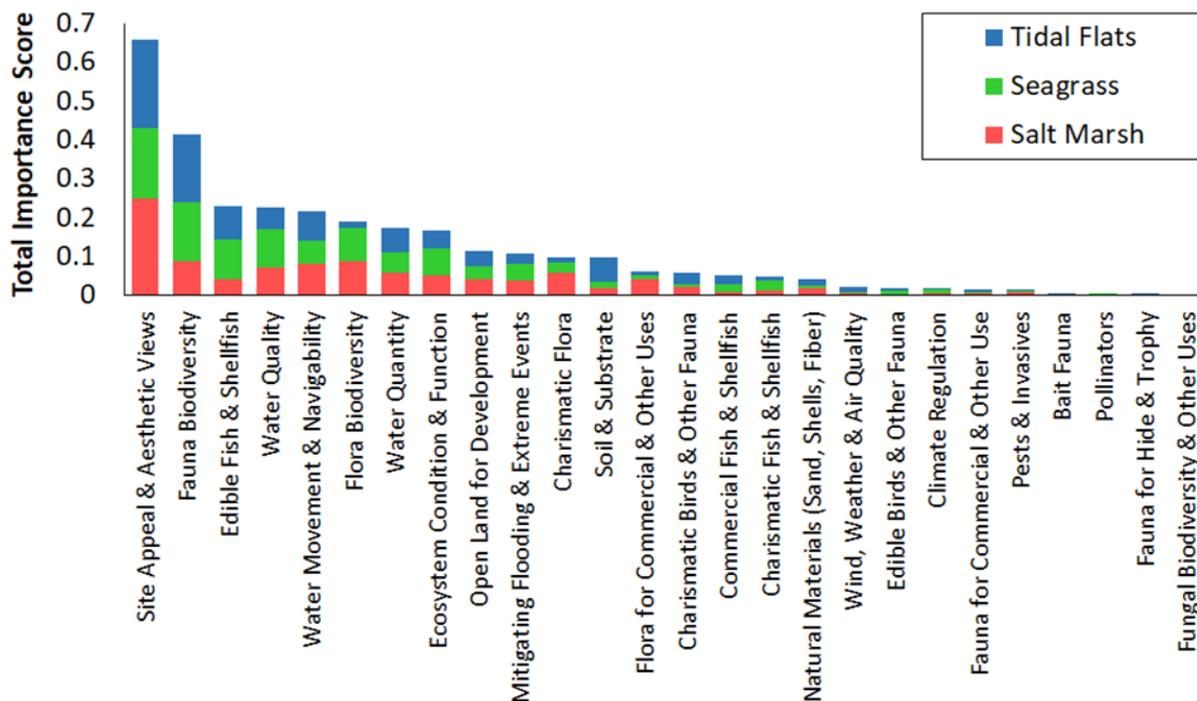
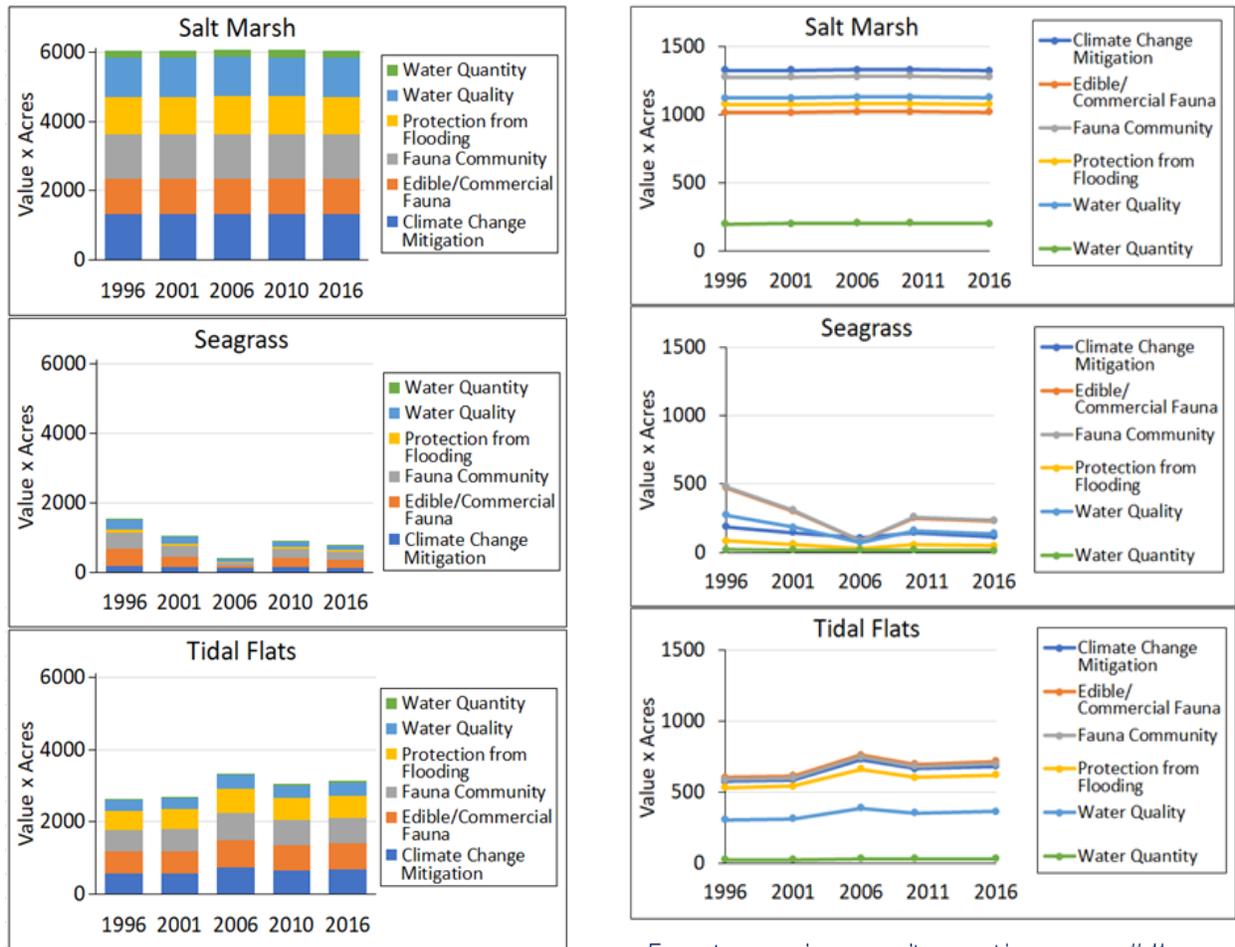


Figure 15. Document analysis provided the relative frequency with which beneficial uses and ecosystem service attributes were mentioned

¹² <https://www.epa.gov/eco-research/national-ecosystem-services-classification-system-nescs-plus>



Ecosystem services capacity over time across all Mass Bays embayments for the three focal ecosystems.

Ecosystem services capacity over time across all Mass Bays embayments for the three focal ecosystems.

Figure 16. Variation of ecosystem services capacity over time across 44 embayments for salt marsh, eelgrass, and tidal flats.

Overall, in the MassBays region salt marsh was the habitat making the most substantial and consistent contribution to ecosystem service capacity, particularly for climate change mitigation and fauna biodiversity. Over the last 20 years, eelgrass ecosystem service capacity showed the most significant declines, with edible fauna and fauna biodiversity being hardest hit (Yee et al., In Review).

This body of work supports productive discussions exploring historic losses, current potential, and the desired future that is critical for setting restoration targets for MassBays. As the work continues, the focus is shifting to identification and validation of metrics for monitoring restoration progress and applying the ESG process at local scales to prioritize restoration projects, support specific management decisions and to communicate and track the potential benefits of restoration to motivate projects and/or sustain long-term community and policymaker investment and support.

5.2 Exploring stakeholders' ecosystem services perceptions across MassBays region using a deliberative valuation approach

A key priority of this project was to gather information on ecosystem services that resonate with stakeholders that live around, work in, recreate or utilize MassBays estuaries. The project was designed and implemented in collaboration between MassBays and the University of Massachusetts Boston School for the Environment, to inform future outreach efforts. MassBays' question was: Do stakeholder prioritization of coastal ecosystem services vary with physical and demographic characteristics of the local ecosystem? (Lyon-Mackie et al., In review).

In December 2020 a unique series of workshops were held to identify priority ecosystem services associated with the three critical habitats based on local expert input. In this case, "stakeholders" were defined as representatives of sectors within the community that MassBays anticipates communicating with to promote project implementation – municipal staff, homeowners and real estate professionals, local environmental groups and stewards, and business associations. Four workshops were held, one for each of the four-embayment resource-stressor clusters described in Section 2.1 (Figure 4). A deliberative multicriteria evaluation approach was used: (1) to assess community-based values of four coastal ecosystem services, and (2) to explore spatial variability of group values along the MassBays coastline.

Four ecosystem services were selected that apply to eelgrass and salt marsh habitats. These included biodiversity (fish abundance), food availability and security (shellfish landings), coastal resilience (blue carbon), and clean water (water quality). Quantitative data came from individual survey results and group preferences, while qualitative data were derived through analysis of video recordings and transcripts of deliberations (LyonMackie et al., In Review). Stakeholders voiced their preferences for these ecosystem services based on a series of tradeoff analysis

The clusters of embayments used in the deliberative analysis take into account natural estuarine as well as anthropogenic similarities and differences across the embayments within their clusters. Knowing the anthropogenic stressors driving habitat conditions in these embayments will help practitioners and communities prioritize and meet their goals by guiding change and supporting work at the local level.

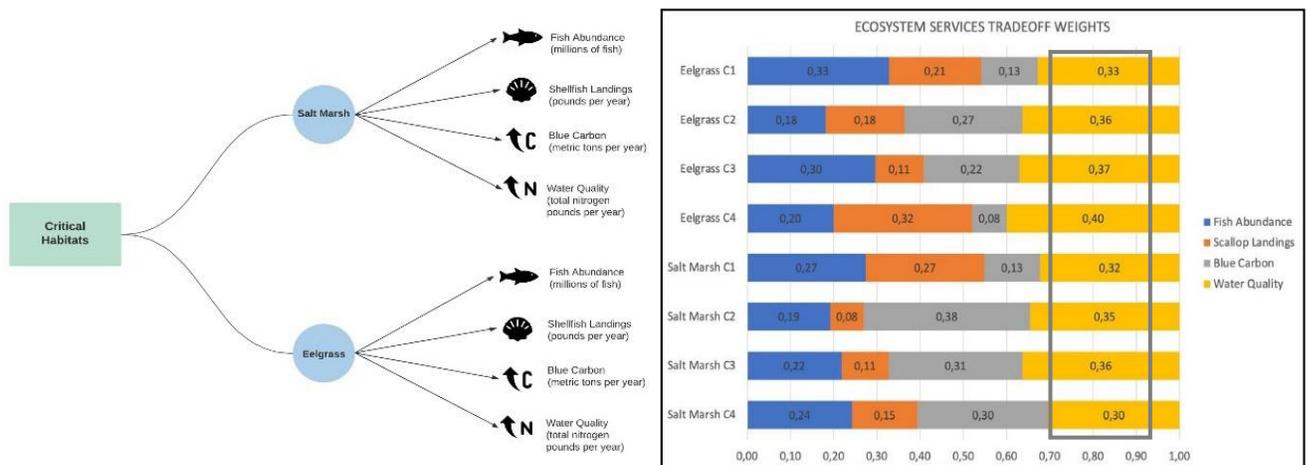
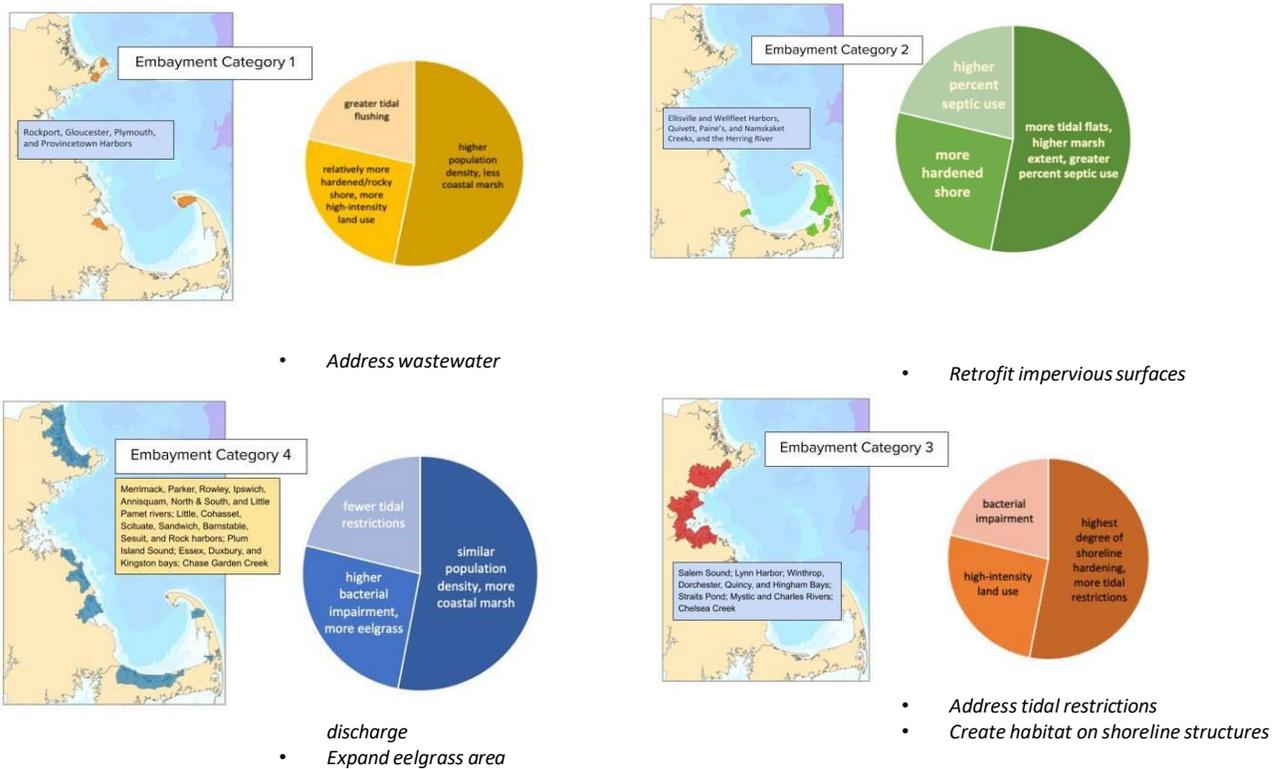


Figure 17: ecosystem services for critical habitats (Lyon-Mackie et al. In review)

Preliminary results

In this exercise, coastal stakeholders placed a particular emphasis on the need for access to clean water and services that provide direct economic benefits. Isolating the differences in the quantitative and qualitative results of these deliberative tasks between groups provided insight into the need for localized policymaking to complement and inform regional or statewide management. Policymakers and environmental managers will use these observations to address local values and priorities as we implement habitat restoration efforts (LyonMackie et al., In review).

Figure 18 Ecosystem services driving embayment categories



Similar local actions and strategies can be used in different embayments in a resource-stressor category. This will help facilitate management decisions and actions. For example, embayments in category four are characterized by extensive saltmarsh, varying eelgrass extent that is vulnerable to changing conditions, and fewer tidal restrictions. At the same time, habitat conditions are driven by higher bacterial impairments (e.g., due to septic systems). Local action to improve conditions would include addressing wastewater discharge, protecting marsh buffers, and working to expand eelgrass areas and restore eelgrass where it has been lost. In another example, embayments in category 3 are characterized by high bacteria impairment, high intensity land use and urbanization, higher degree of shoreline hardening and more tidal restrictions. Local action to be undertaken in these embayments includes retrofitting impervious surfaces, addressing tidal restrictions, and creating habitat on shoreline structures.

6.0 Communication strategies

The BCG-ESG process has been innovative and highly collaborative and has enabled MassBays to establish credible long-term habitat targets - by 2050, eelgrass must come back to 1995 levels while salt marsh and tidal flats will hold the line. A similar target will be established for diadromous fish habitat. In the interim years there is lots of work to be done, including prioritizing embayments and habitats and making decisions on what management actions need to be taken to improve water quality and ecosystem conditions and functions to progress towards these goals.

A key aspect is to develop a communication strategy that resonates with key stakeholders, documents the presence and value of the ecosystem services that these habitats offer, and builds their support to act. When communicating about the different options on how to improve our estuaries there are various strategies that can be used. For example:

- Restore the Balance (restore habitats to historic proportions)
- Bring Back What We Had (a time the public remembers as good)
- Hold the Line (no more loss, e.g., for salt marsh and tidal flats)
- Bring Back Our Benefits (prioritize ESG)
- Save Our Salt Marsh (prioritize a habitat)
- Restore Duxbury Bay (prioritize a place)

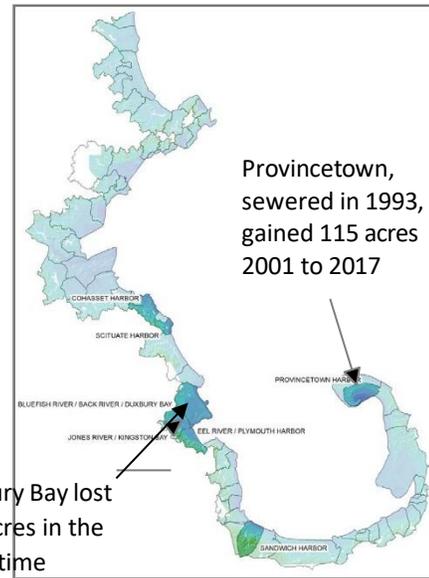
In the case of the long-term targets for MassBays, as described above, a consensus was reached to restore eelgrass to 1995 levels and to hold the line for salt marsh and tidal flats. Here are examples of what that may look like. Figure 20 is an example of prioritizing a place (Duxbury) and prioritizing a habitat (eelgrass). The strategy would focus on local actions at the embayment level by engaging the public and encouraging habitat protection or restoration by comparing Duxbury's status to a successful embayment (Provincetown).

Figure 19. Prioritize a place [Green Ecotype Strategy: Restore Duxbury Bay Eelgrass]

Eelgrass trends from 1995 (green) to 2016 (orange)



Duxbury eelgrass from 1995 to 2016:
 Lost 1120 ac (72%) in 21 yrs
 700 acres (38% of that) lost in last 4 years (2012-2016)
 Duxbury = 87% of green ecotype losses
 5 of 8 Green embayments lost < 10 acres or gained acres



Duxbury Bay lost 929 acres in the same time

Provincetown, sewered in 1993, gained 115 acres 2001 to 2017

The long-term targets are ambitious, and communities may feel overcome when thinking of all the money and work that needs to be done to restore eelgrass in an embayment, or even keeping an existing habitat such as salt marsh from losing more acreage or deteriorating in condition. In order to measure progress over the short- and medium term, MassBays intends to implement a monitoring program to measure interim progress towards the ultimate goal. As management actions are taking place to address issues such as discharge from land or sewerage, regular monitoring will capture step-by-step improvements necessary to achieve the ecosystem outcome and will encourage communities to maintain their support of the actions being taken at the community level.

MassBays has a monitoring framework that is intended to support and possibly enhance ongoing monitoring programs and help others start as needed. Importantly, MassBays has been working side by side with various groups to train them on QA/QC of their data and to upload their data to USEPA's WQX where they may be shared by others. MassBays has also been working with citizen scientists by providing tech support for their monitoring programs and to seek funding, developing tools such as AquaQAPP (to develop QAPPs), the Ecohealth Tracking Tool (a data portal) and MassWaterR (to enhance their data to share with their audience, forthcoming), and developing initiatives such as the annual Eelgrass Blitz in Duxbury-Kingston-Plymouth bays to monitor eelgrass. All these tools are transferable and can be used by the 50 communities within MassBays

6.1 Tracking progress: The Ecohealth Tracking Tool

Because habitat improvement is often a slow process, associated metrics were identified to track progress over the short term as management actions are implemented. For example, restoring eelgrass in an embayment may require the reduction of stormwater discharge. Planning, designing, and constructing stormwater BMPs may take several years (once funding is available) and after construction it will take some time for water clarity to be restored and for eelgrass to come back. Therefore, a water quality

monitoring plan should be in place before the project starts and should be continued during and after the project is complete to measure progress towards long-term targets.

There are several monitoring programs that survey different embayments and that will provide much needed information to policymakers and environmental managers and practitioners to use to address local priorities as habitat restoration efforts are implemented. However, these datasets are not in one place.

To address this gap, in August 2022, MassBays launched a new interactive tool to track estuary health. The Ecohealth Tracking Tool¹³ provides a portal for the public, scientists, and policy makers to access coastal habitat and water quality data across the MassBays region. Users can check the status and trends of salt marshes, eelgrass meadows, tidal flats, and diadromous fish habitats (coming soon). Within each embayment, users can track progress toward MassBays goals for each habitat type. In addition, water quality data are available from hundreds of sampling stations, allowing users to access data (including bacteria, nutrients, temperature, and other parameters) from estuaries across the region. Water quality stations can be selected to view a time series of the data and to see if measurements are within healthy thresholds. The water quality data used in the tool are downloaded from USEPA's WQP.

It is important to mention that the tool will be adapted to incorporate new ecosystem services data and metrics, and this will be the next phase of the implementation. MassBays is exploring the possibility of using the tool to develop potential habitat indices which will serve to inform management decisions in restoration projects.

7.0 Next steps

There are many products that have emerged from the process of using the BCG to establish long-term habitat targets. Some products are complete and ready to be shared, some are still in process and will be forthcoming. Here is a list of products we have so far:

[MassBays National Estuary Partnership Data Exploration Tool](#) is a dashboard that provides access to multiple products that have been produced since the start of this work. This includes interactive dashboards where users can access different eco-types, habitats, resource-stressor clusters, and eventually the ecosystem services tool as well. The data exploration tool is mostly for use by MassBays, its regional coordinators to help in decision making in their regions, and by STAC.

[Ecohealth Tracking Tool](#) was released in August 2022 and presents water quality and habitat data where users can interact and access the data in their embayment of interest. It allows the user to look at progress towards targets as well as access water quality data. The ETT tool only shows data that have been uploaded to the WQP and is working with organizations to help them upload their data so that it can be used and included. This tool is available to the public.

[MassBays Assessment Areas](#) is a story map that shares resource and stressor datasets for all 65 assessment areas. This tool is available to the public.

The BCG process is an evolving process that will be updated and made adaptable to incorporate ecosystem services as well as update the resources and stressor datasets to keep managers informed with current data as management actions are implemented. Therefore, the following next steps will be

¹³ [MassBays Ecohealth Tracking Tool](#)

implemented over the next several months:

- 1) Develop a BCG for diadromous fish habitat
- 2) Expand the Ecohealth Tracking Tool to incorporate ecosystem services as part of the communication strategies.
- 3) Develop a Habitat Potential Index that will evaluate the “suitability” of a site, based on a set of criteria, for restoration of a habitat. This will help ensure that efforts are implemented where there is most need and more potential for success.
- 4) Implement the monitoring framework to track changes in water quality resulting from management actions, to track progress towards the long-term habitat targets.

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Appendix B. 2003 CCMP Action Items

1. Protecting Public Health

- 1.1. Establish a central clearinghouse program for all beach testing and closure information generated for Massachusetts' coastal public beaches

2. Protecting and Enhancing Shellfish Resources

- 2.1. Conduct three Sanitary Survey Training Sessions annually -- one each on the North Shore, Metro Boston/South Shore, and Cape Cod -- to educate local shellfish constables and health officers on the proper techniques for identifying and evaluating pathogen inputs into shellfish harvesting areas
- 2.2. Develop and administer a local Shellfish Management Grants Program to help communities finance the development and implementation of effective local shellfish management plans
- 2.3. Continue and expand the Shellfish Bed Restoration Program to restore and protect shellfish beds impacted by nonpoint source pollution
- 2.4. Through the Shellfish Clean Water Initiative (SCWI), complete an Interagency Agreement to define agency roles and contributions to protect shellfish resources from pollution sources

3. Protecting and Enhancing Coastal Habitat

- 3.1. Prepare and implement an EOEA - approved Open Space Plan to preserve and protect key wetlands, floodplains, fish and wildlife habitat, and other ecologically- and recreationally-important natural resource areas
- 3.2. Adopt and implement a local Riverfront District Bylaw to maintain river water quality, preserve fish and wildlife habitat, and protect downstream nursery and shellfish resources
- 3.3. Work cooperatively with neighboring communities, EOEA agencies, and other interested parties to develop proactive, long-term ACEC Management Plans to preserve and protect these vital resource areas
- 3.4. Adopt and implement a local Wetlands Protection Bylaw to supplement the state Wetlands Protection Act Regulations
- 3.5. Prepare and implement ecosystem-based Barrier Beach Management Plans to promote responsible use and protection of these critical coastal resources
- 3.6. Employ full-time, professionally trained conservation staff to provide ongoing technical and administrative support to local Conservation Commissions
- 3.7. Continue to develop Resource Management Plans for all DCR-owned coastal properties
- 3.8. Develop and promote the use of river basin planning reports to facilitate responsible water resources planning and management at the local and regional levels
- 3.9. Acquire and restore undeveloped coastal properties that offer outstanding living resources habitat and public recreation opportunities
- 3.10. Complete the statewide inventorying and mapping of coastal and inland wetlands, and provide local Conservation Commissions with 1) accurate base maps depicting wetland boundaries, and 2) instruction on proper wetland map interpretation and use

- 3.11. In collaboration with the Riverways Program, prepare an up-to-date inventory of anadromous fish runs in the Massachusetts Bays region and develop a strategy to prioritize, restore, and maintain these runs
- 3.12. In collaboration with the Riverways Program, develop and implement a citizen based Fishway Stewardship Program to restore and maintain anadromous fish runs along the Massachusetts Bays coast
- 3.13. Continue the Wetlands Restoration Program to restore and protect degraded coastal and inland wetlands
- 3.14. Continue and expand current efforts to support eelgrass habitat protection and restoration in Massachusetts and Cape Cod Bays
- 3.15. Work with CZM to develop scientific methods for assessing the ecological integrity of coastal wetlands and to train volunteers in data collection

4. Reducing and Preventing Stormwater Pollution

- 4.1. Adopt subdivision regulations that require the incorporation of stormwater runoff best management practices (BMPs) into all new development plans
- 4.2. Implement best management practices to mitigate existing stormwater discharges that are causing or contributing to the closure of shellfish harvesting areas and swimming beaches
- 4.3. In collaboration with Regional Planning Agencies, Natural Resources Conservation Service/MassCAP (formerly US Soil Conservation Service), and Massachusetts Coastal Zone Management Office, should: 1) disseminate its Nonpoint Source Management Manual and Urban Best Management Practices for Massachusetts, and 2) sponsor public workshops to educate local officials about best management practices and performance standards for controlling stormwater runoff
- 4.4. Develop a coordinated and streamlined regulatory system within DEP to assure effective implementation of the stormwater components of the Massachusetts Clean Water Act, Wetlands Protection Act, and Federal Stormwater Program (Federal Clean Water Act, Sections 401 and 402)
- 4.5. Reduce stormwater pollution in the Massachusetts Bays watersheds through: (a) technical assistance to communities in developing comprehensive stormwater management programs; and (b) National Pollutant Discharge Elimination System (NPDES) compliance for industrial stormwater dischargers Targeted areas are the lower Charles River for the stormwater management programs and the Neponset River for the industrial stormwater dischargers
- 4.6. Prepare an Environmental Manual to complement the Highway Design Manual and provide for the integration of environmental concerns (including stormwater management) into all phases of highway project planning, design, construction, and maintenance
- 4.7. As part of its forthcoming pollution prevention plan, develop a Stormwater Pollution Mitigation Program to identify, prioritize, and correct existing stormwater pollution problems associated with state highway drainage facilities
- 4.8. Sponsor annual workshops to train local public works personnel on the proper use of stormwater runoff best management practices
- 4.9. Require the use of on-site stormwater best management practices as a precondition to the permitting of private property tie-ins to state drainage facilities
- 4.10. Develop and implement stormwater management plans for compliance with Phase II NPDES regulations

- 4.11. Provide technical assistance for developing and implementing non-structural Best Management Practices, support efforts to create local stormwater utilities, provide grant writing support to municipalities for implementing the stormwater policy, Phase II requirements, and resource protection efforts, and support the efforts of DEP and CZM to revise and update the stormwater policy

5. Reducing and Preventing Toxic Pollution

- 5.1. Adopt and implement the following set of regulations to ensure the safe use, storage, and disposal of toxic and hazardous materials: 1) Toxic and Hazardous Materials Regulation, 2) Underground Storage Tank Regulation, 3) Commercial/Industrial Floor Drain Regulation
- 5.2. Establish Household Hazardous Waste Collection Programs for difficult-to-manage hazardous products to ensure their proper disposal on a regular basis
- 5.3. In collaboration with the Department of Environmental Protection, develop and offer continuing education courses on hazardous materials management to create a pool of trained "HazMat Specialists" at the local level
- 5.4. Form partnerships to facilitate the safe management of hazardous products, emphasizing reduced products use and recycling wherever possible
- 5.5. Reduce and prevent toxic pollution through targeted National Pollutant Discharge Elimination System (NPDES) permitting of significant discharges in the Massachusetts Bays; in particular, oil tank farms on Chelsea Creek and the Island End River
- 5.6. Continue to perform on-site assessments and provide instructional materials to help businesses and industries in the Massachusetts Bays region reduce the use of toxic substances

6. Reducing and Preventing Oil Pollution

- 6.1. Establish and promote the use of Used Motor Oil Collection Facilities to ensure the proper collection and disposal of used motor oil from do-it-yourself oil changes
- 6.2. In collaboration with the US Coast Guard, EPA, and NOAA, implement the Policy on the Use of Oil Spill Chemical Countermeasures (Dispersants) to protect coastal resources from the adverse effects of oil spills
- 6.3. In collaboration with other federal, state, and local agencies, continue to update and implement the Massachusetts coastwide Area Contingency Plans to assure a rapid and effective response to discharges of oil and other hazardous substances into the marine environment

7. Managing Municipal Wastewater

- 7.1. In collaboration with other state and federal agencies, continue to implement the Ocean Sanctuaries Act by closely monitoring all facilities plans which propose increased wastewater treatment plant discharges into an ocean sanctuary
- 7.2. Support the control of combined sewer overflows in the Massachusetts Bays watersheds, especially the lower Charles River, and target National Pollutant Discharge Elimination Systems (NPDES) permitting to implement technology and water quality-based requirements in the Merrimack River watershed
- 7.3. Work collaboratively to develop and implement an effective program for monitoring and enforcing point source discharges from wastewater treatment plants and energy-producing facilities

- 7.4. In cooperation with UMass, EOE, CZM, and MBP, analyze and determine the Total Maximum Daily Loads (TMDLs) of nitrogen for coastal embayments and develop management plans for wastewater treatment facilities to adapt to these new standards
- 7.5. Identify resource areas sensitive to wastewater and develop management plans appropriate to these areas, focusing on the capacities of natural systems to assimilate wastewater
- 7.6. In cooperation with DEP, develop and implement regular inspection and maintenance (I/M) programs for on-site wastewater systems
- 7.7. Employ full-time, professionally trained public health staff to provide ongoing technical and administrative support to the local Boards of Health
- 7.8. Establish a Title 5 and alternative systems technical assistance program directed to local Boards of Health and health agents, systems engineers/ installers, and homeowners
- 7.9. Evaluate and build upon the centralized statewide repository for testing information on alternative technologies, to be established as part of the Buzzards Bay Project's two-year Environmental Technology Initiative Project
- 7.10. Plan for decentralized wastewater management and treatment

8. Managing Boat Wastes and Marine Pollution

- 8.1. Work cooperatively with neighboring communities, private boatyards and marinas, and state agencies (DFG and CZM) to establish, promote, and maintain Boat Pumpout Programs in targeted embayment areas
- 8.2. With assistance from CZM and DEP, require private boatyards and marinas to implement effective stormwater runoff control strategies which include the use of pollution prevention measures and the proper design and maintenance of hull servicing areas

9. Managing Dredging and Dredged Materials Disposal

- 9.1. Continue to monitor dredged material disposal sites in the Massachusetts Bays region and initiate the planning necessary to begin a capping demonstration project at the Massachusetts Bay Disposal Site
- 9.2. Coordinate the development of a comprehensive Dredging and Dredged Materials Disposal Plan to improve and maintain access to the Commonwealth's ports, harbors, and channels, and to minimize adverse impacts to the marine environment

10. Reducing Marine Debris and Marine Floatables

- 10.1. Work cooperatively with the Massachusetts Coastal Zone Management Office (CZM), neighboring communities, and waterfront users to design and implement Beach and Marine Debris Reduction Programs

11. Protecting Nitrogen Sensitive Embayments

- 11.1. Strengthen Massachusetts Water Quality Standards to enhance and protect nitrogen-sensitive coastal embayments
- 11.2. Work collaboratively to expand upon current Massachusetts Bays Program efforts to identify nitrogen-sensitive embayments, determine critical loading rates, and recommend actions to manage nitrogen to prevent or reduce excessive nitrogen loading to coastal waters and groundwater

12. Enhancing Public Access and the Working Waterfront

- 12.1. Develop and implement Municipal Harbor Plans which: 1) promote marine-dependent waterfront uses, 2) enhance public access to the water, and 3) protect habitat of shellfish and other living resources
- 12.2. Enhance the Designated Port Area (DPA) program with new planning and promotional initiatives
- 12.3. Establish a new technical assistance program to accelerate municipal efforts to identify and legally reclaim historic rights-of-way to the sea
- 12.4. In collaboration with the Department of Conservation and Recreation and MassGIS, prepare and distribute a statewide Coastal Access Guide to facilitate public access to the shoreline
- 12.5. In collaboration with coastal municipalities, develop and implement an Access-Via-Trails program to enhance public access along the coast

13. Planning for a Shifting Shoreline

- 13.1. Adopt and implement strict development/ redevelopment standards within FEMA A and V flood hazard zones and other areas subject to coastal flooding, erosion, and relative sea level rise
- 13.2. Continue to assist communities in the development of effective Floodplain Management Regulations

14. Managing Local Land Use and Growth

- 14.1. Develop and implement Local Comprehensive Plans (LSPS) which: 1) direct development into areas in the community capable of absorbing the impacts of growth and its associated facilities, and 2) preserve and protect the community's important natural resources
- 14.2. Adopt local bylaws and ordinances that promote open space preservation and natural resource protection
- 14.3. Work with the Massachusetts Highway Department and other transportation agencies to ensure that facilities and infrastructure do not endanger sensitive resource areas
- 14.4. Work with EOEa and the Massachusetts Bays Program to assist communities in creating Community Development Plans
- 14.5. Work with EOEa to provide local support and expertise to communities on the Community Preservation Act and facilitate regional links and networking among neighboring communities
- 14.6. Provide technical assistance to municipalities to adopt and implement plans and bylaws that promote open space preservation and natural resource protection
- 14.7. Support Conservation Commission Networks (Con Com Networks) in the coastal region by providing technical and management assistance

15. Enhancing Public Education and Participation

- 15.1. In collaboration with the Executive Office of Environmental Affairs, continue to develop and integrate environmental education as an important component of the curriculum in the public schools of the Commonwealth, making broad use of the Benchmarks for Environmental Education developed by the Secretaries' Advisory Group on Education (SAGEE)
- 15.2. Continue to work closely with the Department of Education through the Secretaries' Advisory Group on Environmental Education (SAGEE) in order to develop a strategy for the

implementation of the "Benchmarks for Environmental Education" Further, EOEa should continue to place a priority on the role of environmental education and provide adequate staffing to ensure that appropriate state leadership is maintained

- 15.3. In cooperation with the Department of Education, continue to develop a grant relationship with the National Science Foundation and other funding agencies in order to provide technological outreach aimed at enhancing environmental literacy. The goal is to make resource and curriculum materials widely accessible and to provide ongoing coordination among the various members of the education community. The Massachusetts Bays Program represents an important aspect of the total environmental picture and should play a key role in this effort, helping to establish a unified voice to speak for environmental education concerning the Bays region
- 15.4. Empower exemplary teachers, administrators, and/or schools, who demonstrate the competence, to carry out formal and non-formal environmental education initiatives that complement the Commonwealth's environmental education programs
- 15.5. Continue and expand its current efforts to build a community of educators who can ably teach about and promote the protection of the Massachusetts Bays, their shores, and watersheds
- 15.6. Continue to serve as a vehicle for bringing information to and from the government on environmental issues affecting the Bays, with a particular emphasis on proposed projects or regulatory changes
- 15.7. Continue to provide a public forum for the exchange of information and ideas on CCMP development and implementation among the Bays' business community and resource users
- 15.8. Continue to offer undergraduate marine science and policy courses; and, through the bi-annual Massachusetts Marine Environment Symposium, bring together diverse marine interests to promote a better understanding of marine policy issues
- 15.9. Develop and maintain a clearinghouse of NPS education, information, and technical assistance materials, as well as a database of available state NPS materials and programs
- 15.10. Develop and maintain a matrix, by topic, of NPS education, information, and technical assistance materials produced by state agencies and associated organizations
- 15.11. Expand upon Massachusetts Bays Program efforts and develop a strategy for NPS outreach and technical assistance statewide that would coordinate the development and production of NPS education, information, and technical assistance materials, and provide technical assistance in order to implement NPS pollution controls

16. Preventing Marine Invasive Species

- 16.1. In collaboration with the MBP, work with other state agencies and partners to develop a public education program on marine invasive species
- 16.2. Coordinate with managers and scientists to develop a monitoring strategy for marine invasive species and periodically conduct rapid assessment surveys in coastal resource areas for the presence of marine invasive species
- 16.3. Work with CZM, MIT Sea Grant, and other parties to develop a monitoring and industry education strategy for pathways for marine invasive species

17. Monitoring the Marine Environment

- 17.1. In coordination with the MBP, DMF, DEP, BBP, and university scientists, coordinate on the design and implementation of a marine monitoring plan

- 17.2. Work with the MBP and the BBP to develop and produce a State of the Coast report
- 17.3. Coordinate with the CZM and the MBP on the implementation of the state and federal Beaches Bills

Appendix C. Progress and Accomplishments, 2003 through 2018 [legal-size pages]

Task	Description	Lead Agency	Status* as of 1998 (new = 2003 CCMP)	Status as of 2018	Notes/documentation
1.1	Establish a central clearinghouse program for all beach testing and closure information generated for Massachusetts' coastal public beaches	Department of Public Health	substantial	completed	DPH presented results from their database at the 2015 SOTB Symposium.
2.1	Conduct three Sanitary Survey Training Sessions annually -- one each on the North Shore, Metro Boston/South Shore, and Cape Cod -- to educate local shellfish constables and health officers on the proper techniques for identifying and evaluating pathogen inputs into shellfish harvesting areas	Division of Marine Fisheries	full	discontinued/ deemed obsolete	DMF conducts sanitary surveys on each growing area every 12 years. DMF states (https://www.mass.gov/service-details/learn-about-shellfish-sanitation) that "areas also must have an evaluation every three years along with an annual review," but no information about training is provided.
2.2	Develop and administer a local Shellfish Management Grants Program to help communities finance the development and implementation of effective local shellfish management plans	Division of Marine Fisheries	substantial	discontinued/ deemed obsolete	last mention on mass.gov was 1999
2.3	Continue and expand the Shellfish Bed Restoration Program to restore and protect shellfish beds impacted by nonpoint source pollution	MassBays (with DMF, MACD, NRCS)	moderate	discontinued/ deemed obsolete	MassBays 1997 fact sheet states "while most SBRP projects are still in the early...stages" encouraging early successes included: Scituate BOH enforcement order that opened 400ac in Cohasset Harbor; Quincy installed a tide gate at Wollaston Beach and replaced sewer pipes; MassBays trained citizens to collect "reliable shellfish bed pollution data." A SBR Coordinator was hired in 1998; subsequent activities included sewer upgrades in Duxbury. A 2000 report states "There are no cheap, quick fixes to shellfish bed restoration remaining in the [MassBays] area."
2.4	Through the Shellfish Clean Water Initiative (SCWI), complete an Interagency Agreement to define agency roles and contributions to protect shellfish resources from pollution sources	Office of Coastal Zone Management	new		no evidence of this named program online
3.1	Prepare and implement an EOE - approved Open Space Plan to preserve and protect key wetlands, floodplains, fish and wildlife habitat, and other ecologically- and recreationally important natural resource areas	Municipalities	substantial	ongoing	EEA's Division of Conservation Services keeps a status list of Open Space and Recreation Plans, but the website version is dated June 2014
3.2	Adopt and implement a local Riverfront District Bylaw to maintain river water quality, preserve fish and wildlife habitat, and protect downstream nursery and shellfish resources	Municipalities	substantial	completed	implemented statewide via the Rivers Protection Act
3.3	Work cooperatively with neighboring communities, EOE agencies, and other interested parties to develop proactive, long-term Areas of Critical Environmental Concern Management Plans to preserve and protect these vital resource areas	Municipalities	some	ongoing	per ACEC website

Task	Description	Lead Agency	Status* as of 1998 (new = 2003 CCMP)	Status as of 2018	Notes/documentation
3.4	Adopt and implement a local Wetlands Protection Bylaw to supplement the state Wetlands Protection Act Regulations	Municipalities	substantial	completed	per MACC, 2006
3.5	Prepare and implement ecosystem-based Barrier Beach Management Plans to promote responsible use and protection of these critical coastal resources	Municipalities	moderate	discontinued/ deemed obsolete	No progress (other than delineation) reported since the publication of Guidelines for Barrier Beach Management in 1994. (http://www.mass.gov/eea/docs/czm/stormsmart/beaches/barrier-beach-guidelines.pdf)
3.6	Employ full-time, professionally trained conservation staff to provide ongoing technical and administrative support to local Conservation Commissions	Municipalities	moderate	ongoing	Over 100 Commissions have permanent full-time employees, many of whom are conservation professionals providing invaluable support to volunteer Commissioners. More than half of Conservation Commissions have some level of staffing.
3.7	Continue to develop Resource Management Plans for all DCR-owned coastal properties	Department of Conservation and Recreation	substantial	ongoing	As of June 2015, 18 sites management plans have been adopted, two of those are coastal properties. Two additional coastal property plans are in development as of 1/16
3.8	Develop and promote the use of river basin planning reports to facilitate responsible water resources planning and management at the local and regional levels	Department of Conservation and Recreation	some	completed	DEP and DCR direct and consult with municipalities to develop comprehensive water resource management plans, required for SRF funding and other state assistance.
3.9	Acquire and restore undeveloped coastal properties that offer outstanding living resources habitat and public recreation opportunities	Department of Conservation and Recreation	some	ongoing	Land trusts and other nonprofits continue to acquire coastal properties; CZM is advising re: facilitating salt marsh migration due to sea level rise.
3.10	Complete the statewide inventorying and mapping of coastal and inland wetlands, and provide local Conservation Commissions with 1) accurate base maps depicting wetland boundaries, and 2) instruction on proper wetland map interpretation and use	Department of Environmental Protection	substantial	completed	http://maps.massgis.state.ma.us/images/dep/omv/wetviewer.htm
3.11	In collaboration with the Riverways Program, prepare an up-to-date inventory of anadromous fish runs in the Massachusetts Bays region and develop a strategy to prioritize, restore, and maintain these runs	Department of Fish and Game	substantial	completed	http://www.mass.gov/eea/agencies/dfg/dmf/programs-and-projects/anadromous-fish-restoration.html
3.12	In collaboration with the Riverways Program, develop and implement a citizen based Fishway Stewardship Program to restore and maintain anadromous fish runs along the Massachusetts Bays coast	Department of Fish and Game	substantial	ongoing	Division of Marine Fisheries maintains fish migration data collected by volunteers. MassBays funded the establishment of the River Herring Network (riverherringnetwork.com).
3.13	Continue the Wetlands Restoration Program to restore and protect degraded coastal and inland wetlands	Executive Office of Energy and Environmental Affairs	substantial	ongoing	Corporate Wetlands Restoration Program works primarily with the Division of Ecological Restoration.
3.14	Continue and expand current efforts to support eelgrass habitat protection and restoration in Massachusetts and Cape Cod Bays	U.S. EPA, National Marine Fisheries Service, U.S. Army Corps of Engineers	substantial	ongoing	ongoing, see conservation mooring implementation, 2014 ACOE GP
3.15	Work with CZM to develop scientific methods for assessing the ecological integrity of coastal wetlands and to train volunteers in data collection	MassBays National Estuary Program	new	ongoing	program sits with CZM, MassBays RSPs participate

Task	Description	Lead Agency	Status* as of 1998 (new = 2003 CCMP)	Status as of 2018	Notes/documentation
4.1	Adopt subdivision regulations that require the incorporation of stormwater runoff best management practices (BMPs) into all new development plans	Municipalities	some	completed	Nearly all Massachusetts municipalities must document the application of BMPs for stormwater under MS4 permits.
4.2	Implement best management practices to mitigate existing stormwater discharges that are causing or contributing to the closure of shellfish harvesting areas and swimming beaches	Municipalities	moderate	ongoing	some slow-down due to delay in MS4 permitting
4.3	In collaboration with Regional Planning Agencies, Natural Resources Conservation Service/MassCAP (formerly US Soil Conservation Service), and Massachusetts Coastal Zone Management Office, should: 1) disseminate its Nonpoint Source Management Manual and Urban Best Management Practices for Massachusetts, and 2) sponsor public workshops to educate local officials about best management practices and performance standards for controlling stormwater runoff	Department of Environmental Protection	substantial	ongoing	CZM is launching a new initiative with the MS4 permit
4.4	Develop a coordinated and streamlined regulatory system within DEP to assure effective implementation of the stormwater components of the Massachusetts Clean Water Act, Wetlands Protection Act, and Federal Stormwater Program (Federal Clean Water Act, Sections 401 and 402)	Department of Environmental Protection	substantial	unknown	
4.5	Reduce stormwater pollution in the Massachusetts Bays watersheds through: (a) technical assistance to communities in developing comprehensive stormwater management programs; and (b) National Pollutant Discharge Elimination System (NPDES) compliance for industrial stormwater dischargers Targeted areas are the lower Charles River for the stormwater management programs and the Neponset River for the industrial stormwater dischargers	U.S. Environmental Protection Agency	substantial	completed	EPA has shifted its focus to other rivers, e.g., Mystic; industrial discharges are subject to the 2015 Industrial Stormwater Multisector General Permit. (https://www.epa.gov/npdes/final-2015-msgp-documents)
4.6	Prepare an Environmental Manual to complement the Highway Design Manual and provide for the integration of environmental concerns (including stormwater management) into all phases of highway project planning, design, construction, and maintenance	Department of Transportation	some	ongoing	MassDOT Environmental Services Division in place, annual reporting to EPA re: NPDES permit compliance is up-to-date (http://www.massdot.state.ma.us/highway/Departments/EnvironmentalServices/StormwaterManagementUnit/NationalPollutantDischargeEliminationSystem.aspx). 2006 Project Development and Design Guide (http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/ManualsPublicationsForms/ProjectDevelopmentDesignGuide.aspx) includes runoff and drainage aspects (Chapter 8), but do not appear to be applied consistently.
4.7	As part of its forthcoming pollution prevention plan, develop a Stormwater Pollution Mitigation Program to identify, prioritize, and correct existing stormwater pollution problems associated with state highway drainage facilities	Department of Transportation	moderate	completed	sustainability plan published 2006, implemented by MassDOT Environmental Services Division's Environmental Management Systems and Sustainability Unit

Task	Description	Lead Agency	Status* as of 1998 (new = 2003 CCMP)	Status as of 2018	Notes/documentation
4.8	Sponsor annual workshops to train local public works personnel on the proper use of stormwater runoff best management practices	Department of Transportation and Department of Conservation and Recreation	substantial	ongoing	via Bay State Roads
4.9	Require the use of on-site stormwater best management practices as a precondition to the permitting of private property tie-ins to state drainage facilities	Department of Transportation	some	completed	http://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2012/MassDOT12.pdf
4.10	Develop and implement stormwater management plans for compliance with Phase II NPDES regulations	Municipalities	new	ongoing	updated MS4 permit in draft form
4.11	Provide technical assistance for developing and implementing non-structural Best Management Practices, support efforts to create local stormwater utilities, provide grant writing support to municipalities for implementing the stormwater policy, Phase II requirements, and resource protection efforts, and support the efforts of DEP and CZM to revise and update the stormwater policy	MassBays National Estuary Program	new	ongoing	
5.1	Adopt and implement the following set of regulations to ensure the safe use, storage, and disposal of toxic and hazardous materials: 1) Toxic and Hazardous Materials Regulation, 2) Underground Storage Tank Regulation, 3) Commercial/Industrial Floor Drain Regulation	Municipalities	substantial	unknown	
5.2	Establish Household Hazardous Waste Collection Programs for difficult-to-manage hazardous products to ensure their proper disposal on a regular basis	Municipalities	substantial	completed	
5.3	In collaboration with the Department of Environmental Protection, develop and offer continuing education courses on hazardous materials management to create a pool of trained "HazMat Specialists" at the local level	Department of Education	some	ongoing	online resources hosted by DEP
5.4	Form partnerships to facilitate the safe management of hazardous products, emphasizing reduced products use and recycling wherever possible	Executive Office of Environmental Affairs	substantial	ongoing	program funding reduced
5.5	Reduce and prevent toxic pollution through targeted National Pollutant Discharge Elimination System (NPDES) permitting of significant discharges in the Massachusetts Bays; in particular, oil tank farms on Chelsea Creek and the Island End River	U.S. Environmental Protection Agency	full	completed	per http://www.epa.gov/region1/npdes/mass.html
5.6	Continue to perform on-site assessments and provide instructional materials to help businesses and industries in the Massachusetts Bays region reduce the use of toxic substances	Office of Toxics Use Reduction	substantial	ongoing	ongoing

Task	Description	Lead Agency	Status* as of 1998 (new = 2003 CCMP)	Status as of 2018	Notes/documentation
6.1	Establish and promote the use of Used Motor Oil Collection Facilities to ensure the proper collection and disposal of used motor oil from do-it-yourself oil changes	Municipalities	substantial	completed	point-of-sale return, municipal drop-off
6.2	In collaboration with the US Coast Guard, EPA, and NOAA, implement the Policy on the Use of Oil Spill Chemical Countermeasures (Dispersants) to protect coastal resources from the adverse effects of oil spills	Department of Environmental Protection	full	completed	SPCC plans required
6.3	In collaboration with other federal, state, and local agencies, continue to update and implement the Massachusetts coastwide Area Contingency Plans to assure a rapid and effective response to discharges of oil and other hazardous substances into the marine environment	U.S. Coast Guard	substantial	completed	uploaded 4/2014 to http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/massachusetts-contingency-plan.html
7.1	In collaboration with other state and federal agencies, continue to implement the Ocean Sanctuaries Act by closely monitoring all facilities plans which propose increased wastewater treatment plant discharges into an ocean sanctuary	Department of Conservation and Recreation	substantial	ongoing	addressed through Ocean Planning
7.2	Support the control of combined sewer overflows in the Massachusetts Bays watersheds, especially the lower Charles River, and target National Pollutant Discharge Elimination Systems (NPDES) permitting to implement technology and water quality-based requirements in the Merrimack River watershed	U.S. Environmental Protection Agency	full	completed	Reduction of CSO in Charles River 1998-present from 1742 million gallons to 13 million gallons. Completion (Dec 2015) of construction under the MWRA's Long-Term Control Plan reduced total CSO discharge volume in a typical rainfall year by approximately 88%. Nearly all (93%) of the remaining discharge volume is treated at MWRA's 4 CSO treatment facilities. See http://www.mwra.com/annual/csoar/2015/2015csoar-r3.pdf
7.3	Work collaboratively to develop and implement an effective program for monitoring and enforcing point source discharges from wastewater treatment plants and energy-producing facilities	U.S. Environmental Protection Agency, Executive Office of Energy and Environmental Affairs, Department of Environmental Protection, and Office of Coastal Zone Management	moderate	ongoing	Monitoring under NPDES permits is consistent.
7.4	In cooperation with UMass, EOEA, CZM, and MassBays, analyze and determine the Total Maximum Daily Loads (TMDLs) of nitrogen for coastal embayments and develop management plans for wastewater treatment facilities to adapt to these new standards	Department of Environmental Protection	new	ongoing	only a few finalized in Mass Bay & Cape Cod Bay

Task	Description	Lead Agency	Status* as of 1998 (new = 2003 CCMP)	Status as of 2018	Notes/documentation
7.5	Identify resource areas sensitive to wastewater and develop management plans appropriate to these areas, focusing on the capacities of natural systems to assimilate wastewater	Municipalities	substantial	ongoing	especially Cape Cod 208 plan
7.6	In cooperation with DEP, develop and implement regular inspection and maintenance (I/M) programs for on-site wastewater systems	Municipalities	substantial	revised	Title 5 only addresses issue at change-of-title
7.7	Employ full-time, professionally trained public health staff to provide ongoing technical and administrative support to the local Boards of Health	Municipalities	substantial	ongoing	reduced funding, see 2006 publication: http://www.mphaweb.org/resources/strength_lph_6_06.pdf
7.8	Establish a Title 5 and alternative systems technical assistance program directed to local Boards of Health and health agents, systems engineers/ installers, and homeowners	Regional Planning Agencies	substantial	ongoing	Barnstable County testing facility
7.9	Evaluate and build upon the centralized statewide repository for testing information on alternative technologies, to be established as part of the Buzzards Bay Project's two-year Environmental Technology Initiative Project	Department of Environmental Protection	full	completed	DEP alternatives certification program
7.10	Plan for decentralized wastewater management and treatment	Multiple	full	ongoing	not sure how this is listed as "full" in 1998?
8.1	Work cooperatively with neighboring communities, private boatyards and marinas, and state agencies (DFG and CZM) to establish, promote, and maintain Boat Pumpout Programs in targeted embayment areas	Municipalities	full	completed	No-discharge zones were approved in 2014 for the entire Massachusetts coast, which requires pumpout sites (https://www.mass.gov/service-details/no-discharge-zones-ndzs). EPA issued Vessel General Permit (https://www.epa.gov/npdes/vessels-vgp) in 2013 and Small Vessel General Permit (https://www.epa.gov/npdes/vessels-svvp) in 2014.
8.2	With assistance from CZM and DEP, require private boatyards and marinas to implement effective stormwater runoff control strategies which include the use of pollution prevention measures and the proper design and maintenance of hull servicing areas	Municipalities	some	ongoing	Stormwater pollution (drains) from boatyards is covered by the EPA's industrial stormwater MSGP, (SECTOR R: SHIP AND BOAT BUILDING AND REPAIRING YARDS). Sheet stormwater runoff is not covered. (https://www.epa.gov/npdes/final-2015-msgp-documents) CZM provides technical assistance re: the General Permit and stormwater control best practices.
9.1	Continue to monitor dredged material disposal sites in the Massachusetts Bays region and initiate the planning necessary to begin a capping demonstration project at the Massachusetts Bay Disposal Site	U.S. Army Corps of Engineers	substantial	ongoing	A pilot project (Cohasset Harbor Capping Project) was conducted in 1998 to 2000 with clean sediment to determine whether capping is feasible at this deep-water site. Extensive monitoring has indicated that the capping project was successful in isolating underlying sediment
9.2	Coordinate the development of a comprehensive Dredging and Dredged Materials Disposal Plan to improve and maintain access to the Commonwealth's ports, harbors, and channels, and to minimize adverse impacts to the marine environment	Executive Office of Energy and Environmental Affairs	substantial	completed	completed 2004

Task	Description	Lead Agency	Status* as of 1998 (new = 2003 CCMP)	Status as of 2018	Notes/documentation
10.1	Work cooperatively with the Massachusetts Coastal Zone Management Office (CZM), neighboring communities, and waterfront users to design and implement Beach and Marine Debris Reduction Programs	Municipalities	some	ongoing	see: Coastsweep
11.1	Strengthen Massachusetts Water Quality Standards to enhance and protect nitrogen-sensitive coastal embayments	Department of Environmental Protection	some	ongoing	Only one wastewater treatment facility in MassBays (Cohasset) has a permitted limit for Nitrogen; others have "monitor only" requirements.
11.2	Work collaboratively to expand upon current Massachusetts Bays Program efforts to identify nitrogen-sensitive embayments, determine critical loading rates, and recommend actions to manage nitrogen so as to prevent or reduce excessive nitrogen loading to coastal waters and groundwater	Regional Planning Agencies, Department of Environmental Protection, Municipalities	some	ongoing	
12.1	Develop and implement Municipal Harbor Plans which: 1) promote marine-dependent waterfront uses, 2) enhance public access to the water, and 3) protect habitat of shellfish and other living resources	Municipalities	substantial	ongoing	CZM is the lead agency in this effort. (https://www.mass.gov/service-details/czm-port-and-harbor-planning-program-municipal-harbor-plans)
12.2	Enhance the Designated Port Area (DPA) program with new planning and promotional initiatives	Office of Coastal Zone Management	substantial	completed	https://www.mass.gov/service-details/czm-port-and-harbor-planning-program-designated-port-areas
12.3	Establish a new technical assistance program to accelerate municipal efforts to identify and legally reclaim historic rights-of-way to the sea	Office of Coastal Zone Management	full	completed	handbook published 1999
12.4	In collaboration with the Department of Conservation and Recreation and MassGIS, prepare and distribute a statewide Coastal Access Guide to facilitate public access to the shoreline	Office of Coastal Zone Management	some	completed	https://www.mass.gov/service-details/coast-guide-online
12.5	In collaboration with coastal municipalities, develop and implement an Access-Via-Trails program to enhance public access along the coast	Executive Office of Environmental Affairs	some	completed	directory of coastal trails

Task	Description	Lead Agency	Status* as of 1998 (new = 2003 CCMP)	Status as of 2018	Notes/documentation
13.1	Adopt and implement strict development/ redevelopment standards within FEMA A and V flood hazard zones and other areas subject to coastal flooding, erosion, and relative sea level rise	Municipalities	moderate	ongoing	new standards in negotiation among state agencies
13.2	Continue to assist communities in the development of effective Floodplain Management Regulations	Department of Conservation and Recreation	moderate	ongoing	CZM developed and promotes a model bylaw; 13 communities have surpassed those standards
14.1	Develop and implement Local Comprehensive Plans (LSPS) which: 1) direct development into areas in the community capable of absorbing the impacts of growth and its associated facilities, and 2) preserve and protect the community's important natural resources	Municipalities	substantial	ongoing	Municipalities in Massachusetts are required to have comprehensive Open Space plans as a condition for receiving state environmental funding. Further, the state passed enabling legislation, the Community Preservation Act, which incorporates this information for planning.
14.2	Adopt local bylaws and ordinances that promote open space preservation and natural resource protection	Municipalities	new	ongoing	The Community Preservation Act passed in 2000, and has been adopted by 30 of the 50 MassBays coastal municipalities
14.3	Work with the Massachusetts Highway Department and other transportation agencies to ensure that facilities and infrastructure do not endanger sensitive resource areas	Regional Planning Agencies	new	unknown	
14.4	Work with EOEA and the Massachusetts Bays Program to assist communities in creating Community Development Plans	Regional Planning Agencies	new	ongoing	build-out scenarios shared; smart growth initiative established
14.5	Work with EOEA to provide local support and expertise to communities on the Community Preservation Act and facilitate regional links and networking among neighboring communities	MassBays National Estuary Program	new	ongoing	community preservation act passed in a majority of MassBays communities (http://communitypreservation.org/content/map) but no regional links or networking evident
14.6	Provide technical assistance to municipalities to adopt and implement plans and bylaws that promote open space preservation and natural resource protection	MassBays National Estuary Program	new	ongoing	RSPs carry out this effort incidentally to MassBays initiatives
14.7	Support Conservation Commission Networks (Con Com Networks) in the coastal region by providing technical and management assistance	Office of Coastal Zone Management	new	discontinued/ deemed obsolete	This program was discontinued with a staff departure, though some regions continue to be engaged by MassBays.

Appendix D. 2005-2008 Strategic Plan Progress Report

CS: Central Staff, UNS: Upper North Shore, SS: Salem Sound, MB: Metro Boston, SoS: South Shore, CC: Cape Cod

I. Produce significant environmental results in the MBP region.	Regional and Sub-regional Progress to Date						Yearly Goals Achieved	
	CS	U NS	SS	M B	So S	CC	Total Possible	Progress to Date
Goal 1: Protect and Enhance Shellfish Resources (from Action Plan 2)								
1.a. Provide update on shellfish landings indicator in 2009 State of the Bays report								
1.b. Provide assistance as required by the Division of Marine Fisheries to communicate red tide information to the public and partner organizations	X							X
1.b. With MIT Sea Grant, coordinate an HAB regional workshop	X							X
Subtotal	2	0	0	0	0	0	3	2
Goal 2: Protect and Enhance Coastal Habitat (from Action Plan 3)								
2.a. Target five towns each year for technical and grant-writing assistance to complete an Open Space Plan, local Wetlands Bylaw and other habitat protection tools. (O)	X	X	X		X	X		X
2.b. Update the Wetlands Health Assessment Toolbox manual (December 2008). (I)								
2.b. Maintain the number of trained volunteers and local officials each year in the Wetlands Health Assessment Toolbox program; apply for funding to expand WHAT into another sub-region; gather data and contribute to the Gulf of Maine database. (O)	X	X	X			X		X
2.c. Initiate three wetlands restoration priority efforts based on inventory of tidally restricted wetlands. (I)	X	X			X	X		X
2.d. Develop and complete one ACEC Management Plan in Mass. Bays region. (I, C)		X				X		X
2.f. Develop standard procedures for emerging phragmites data gathering and management. (O)		X				X		X
2.f. Initiate an inventory of restoration opportunities of degraded habitat/emerging phragmites in another subregion (Upper North Shore inventory already under way) (O)			X					X
2.g. Initiate five anadromous fish/river restoration and/or monitoring projects. (I)		X	X		X	X		X
2.h. Develop indicators to measure river restoration success. (I)	X							X
2.h. Ensure Massachusetts Gulf of Maine Program grantees with successful implementation of funded projects. (O)	X					X		X
2.j. Continue field testing and verification for bioindicators project.								
Subtotal	5	6	4	0	3	7	11	9

I. Produce significant environmental results in the MBP region.	Regional and Sub-regional Progress to Date						Yearly Goals Achieved	
	CS	UNS	SS	M B	So S	CC	Total Possible	Progress to Date
Goal 3: Reduce and Prevent Stormwater Pollution (from Action Plan 4)								
3.a. Target ten municipalities each year to provide technical assistance and grant writing support for implementing the stormwater policy, Phase II requirements, and resource protection efforts, including ensuring stormwater mitigation in development and redevelopment plans. (O)		X	X		X	X		X
3.b. Provide workshops or other technical assistance to train local officials on the implementation of the DEP Stormwater Policy and on Stormwater Phase II requirements. (O)			X			X		X
3.c. Facilitate feasibility analysis for stormwater utility, create information exchange, and develop a model bylaw. (I)		X				X		X
3.e. Assist in grant writing to fund environmental analyses and stormwater projects. (O)						X		X
3.f. Revise and update the stormwater policy (June 2006). (I)	X							X
3.h. Complete series of stormwater print ads; create a Think Blue website; create a Think Blue pitchkit for funders and partners; develop point-of-purchase displays (POP's). (O)	X	X			X			X
3.i. Initiate a local television weather forecaster partnership to communicate stormwater information and tips to viewers. (I)	X							X
3.i. Organize and hold a Think Blue kickoff event (May 2006); organize local community Think Blue events (to create support for stormwater utilities); and complete a follow-up telephone survey after year one of campaign. (O)	X		X		X	X		X
3.j. Assist two towns with GIS mapping of their storm drain systems.	X							X
3.k. Develop Greenscapes outreach materials, pilot demonstration sites, provide training and workshops, and draft model bylaws. (O)		X	X		X			X
3.l. Expand Greenscapes program to one additional MBP region (C)		X	X					X
Subtotal	5	5	5	0	4	5	11	11

I. Produce significant environmental results in the MBP region.	Regional and Sub-regional Progress to Date						Yearly Goals Achieved	
	CS	UN S	SS	M B	So S	CC	Total Possible	Progress to Date
Goal 4: Manage Municipal Wastewater (from Action Plan 7):								
4.b. Provide technical assistance to local officials toward development of wastewater management plans. (O)						X		X
4.c. Provide workshops and technical assistance to local Boards of Health, health agents, systems engineers/installers, and homeowners regarding on-site wastewater challenges. (O)						X		X
4.e. Designate two No Discharge Zones within the Mass. Bays region.			X		X	X		X
Subtotal	0	0	1	0	1	3	3	3
Goal 5: Manage Local Land Use and Growth (from Action Plan 14):								
5.a. Hold regular workshops and provide networking opportunities to municipalities regarding locally implementable smart growth tools, including bylaws. (O)		X	X		X	X		X
5.c. Hold, attend regular meetings of existing North Shore, Urban, South Shore, and Cape Cod municipal networks (Conservation Commission Networks, DPWs, Boards of Health, CPC). (O)		X	X		X	X		X
Subtotal	0	2	2	0	2	2	2	2
Goal 6: Prevent Marine Invasive Species (from Action Plan 16)								
6.a. Seek funding to develop a monitoring strategy and conduct a rapid assessment in coastal resource areas for the presence of invasive species. (First assessment held in 2003, next in July 2007) (C)	X				X	X		X
6.b. Support a monitoring strategy for new and existing vectors within water-based industries (2003). (O)	X							X
6.c. Develop and distribute public education material on invasive species (completed and ongoing). (O,C)			X			X		X
6.d. Manage data collected by volunteers; maintain number of invasive species monitoring volunteers. (O)	X		X		X	X		X
Subtotal	3	0	2	0	2	3	4	4

I. Produce significant environmental results in the MBP region.	Regional and Sub-regional Progress to Date						Yearly Goals Achieved	
	CS	UN S	SS	M B	So S	CC	Total Possible	Progress to Date
Goal 7: Monitor Marine Waters (from Action Plan 17):								
7.a. Identify and hold gatherings of coastal partners to develop a state marine waters monitoring plan (O)	X					X		X
7.a. Provide a summary of NPDES data – flow and nutrients synthesis report.								
7.b. Review and revise indicator list and publish in a second State of the Bays report (To be completed in 2009) (I)	X					X		X
7.c. Work with EPA, CZM and New England NEPs to conduct research on coastal condition indicators; Produce white papers on research of coastal condition indicators (I)	X							X
7.d. Develop embayment monitoring process and implement in two embayments. (I)	X				X			X
7.e. Submit recommendations to EPA to refine the Coastal Conditions report. (C)	X							X
7.g. Complete a white paper on public health and environmental quality links with assessment and options.								
Subtotal	5	0	0	0	1	2	7	5
Total							40	36

II. Build organizational sustainability for the Massachusetts Bays Program.	Regional and Sub-regional Progress to Date						Yearly Goals Achieved	
	C	U	SS	M	SoS	CC	Total Possible	Progress to Date
	S	NS		B				
Goal 1: Strengthen the identity and influence of the MBP.								
1.a. Begin preparations for 2009 State of the Bays symposium and report by preparing updates on indicators. (I)	X					X		X
1.b. Explore feasibility and structure of regional coastal protection workshops by 2008.	X							X
1.c. Develop clear, simple "messages" and promote through projects described in an annual Communications and Outreach Plan. (I, O)	X							X
1.d. Continue to develop and distribute a current, appealing portfolio of outreach materials. (O, I)	X	X	X		X	X		X
1.d. Continue to update the MBP constituency mailing list. (O)	X					X		X
1.e. Announce recipient of Stephen Gersh award every two years in appreciation of a local volunteer (2006 and 2008). (O)	X							X
Subtotal	6	1	1	0	1	3	6	6
Goal 2: Identify and pursue alternative funding.								
2.a. Partner with at least two non-EPA funding sources for MBP Strategic Focus and Funding Zone areas annually. (O)	X	X	X	X	X	X		X
2.a. In 2006, work with MBEA in seeking non-EPA sources to maintain funding for MBP Strategic Focus and Funding Zone areas. (O)	X							X
2.c. Develop MBEA strategic plan and MOU with Mass. Bays Program (C)	X							X
Subtotal	3	1	1	1	1	1	3	3
Goal 3: Ensure effectiveness of MBP structure for managing implementation.								
3.a. Restructure to three Management Committee meetings per year (one for regional accomplishments/issues; one for MBEA and annual planning; and one for a pressing Mass. Bays issue). (C)	X							X
3.b. Continue to identify changes needed to move from planning to management of implementation. (O)						X		X
3.b. Continue to develop proposed improvements to structure to strengthen local implementation efforts. (O)	X					X		X
Subtotal	2	0	0	0	0	2	3	3
Total							12	12

Appendix E. Results of Regional Meetings



Massachusetts Bays Program

251 Causeway Street, Suite 800, Boston, MA 02114

(617) 626-1230 / Fax (617) 626-1240

www.massbays.org

Dear Mass Bays Partners:

October 2013

This past June and July, Mass Bays staff and regional coordinators were fortunate to meet with you to hear your priorities and needs for our coastal natural resources. Since then, we've been compiling results of our conversations and drawing parallels and distinctions among the five sub-regions that make up the Massachusetts Bays National Estuary Program. This letter is to summarize what we heard in individual meetings, as well as the take-away messages repeated from meeting to meeting. Skip to the end of this letter to see our next steps, informed by your important comments.

Cross-region themes

- Mass Bays' mission and vision are not specific enough to provide direction to the work. *We have draft vision and mission statements based in part on your input. While our vision is shared with many of you and other coastal organizations, our mission describes how the Mass Bays Program, uniquely, works toward that vision.*

Vision: We envision a network of healthy and resilient estuaries, sustainable ecosystems that support the life and communities dependent upon them.

Mission: The Massachusetts Bays Program is an EPA National Estuary Program dedicated to protecting, restoring, and enhancing the estuarine ecosystems of Massachusetts and Cape Cod Bays. We facilitate partnerships to prompt local, state, and federal action and stewardship, convening stakeholders on the local and regional level, providing scientific basis for management decisions, and educating decisionmakers about problems and solutions.

- Mass Bays' strength lies in convening stakeholders and facilitating partnerships. That work should continue.
- Estuarine natural resources – salt marshes, beaches, sea grass, shellfish beds – are variously and often inconsistently managed on the local level.
- Education and outreach about the role of estuarine resources in resilient coastal systems – their ecosystem values – are still needed for multiple audiences.
- Coastal communities need concrete advice for practical, ready-to-implement adaptations to climate change and sea level rise.

Cross-cutting needs

At each regional network meeting (and in the Cape Cod regional survey), we asked partners and stakeholders to highlight their primary concerns for their region, drawing from a list of past CCMP priorities, everything from expanding coastal monitoring to restoring benthic habitat. The interconnected nature of these issues was evident as stakeholders expressed difficulty in choosing just one topic as their primary concern. Suggestions for action that will have cascading benefits to estuarine systems, applicable across the Mass Bays planning area, include:

- Implement improved stormwater management – especially through municipal utilities and MS4 plans – that will reduce impervious surface and prevent nutrient and bacterial loading at the source. Reduced inputs will enhance and restore marshes, benthic habitat, eelgrass beds, and shellfish beds, and support diadromous and anadromous fish runs.

- Encourage regional collaboration for planning and implementing climate change adaptation responses, for example providing practical guidance and technical support to plan for sea level rise with regard to stormwater infrastructure.
- Encourage cross-agency cooperation and planning for restoration projects, tying individual projects to the larger ecosystem's health and facilitating early input to project plans from local stakeholders.
- Determine/compile the state-of-knowledge of the benefits provided by coastal habitats – e.g., shellfish for nutrient and bacteria removal, salt marshes for flood mitigation – and make the case to local decisionmakers for protecting, restoring, and enhancing those resources.

Habitat-specific actions

Discussions reinforced the fact that while Mass Bays' sub-regions have unique characteristics and needs. However, estuarine habitats across the planning area would benefit from specific actions, for example:

- Remove all traditional moorings from eelgrass beds.
- Restore shellfish beds, taking into consideration the impacts of ocean acidification.
- Encourage beach management plans that consider habitat value.
- Model potential for marsh migration in response to sea level rise.

Each of these actions require groundwork to determine which agencies have existing authority and policies, compile maps, collect and compile monitoring data, and coordinated planning and implementation that take into account the cross-cutting needs identified above. Mass Bays' role going forward will be informed by our mission, with fluid prioritization of efforts that reflect current scientific understanding, political readiness, and availability of resources.

Next steps

Your contributions over this past summer have moved us a good way toward meeting our first two goals. This document is not the end point of our work, and we continue to process your and others' input as we look for opportunities to add to, rather than duplicate, efforts already underway or planned. Meanwhile, our next steps include:

- Soliciting additional input from stakeholders not already at the table, including academia, local elected officials, water-based industry, and region-wide nonprofits.
- Convening partners at the state and regional level to determine how Mass Bays can contribute most effectively to a common vision of resilient coastal ecosystems.
- Identifying ways to measure Mass Bays' impact at multiple scales.
- Drafting a CCMP for stakeholder and EPA review.

Thank you again for your commitment to Massachusetts and Cape Cod Bays. The Mass Bays National Estuary Program is only as strong as your continuing support of our mission. Please be sure to sign up for our e-newsletter (<http://www.mass.gov/eea/agencies/mass-bays-program/whats-new/>), stay in touch with your regional coordinator listed below, and keep your eyes on our website (www.massbays.org) for updates on how you can take part.

Sincerely,

Pam DiBona
Executive Director

Appendix F. Results of Stakeholder Interviews

Memo

To: Pam DiBona & Prassede Vella

From: Joshua Wrigley

Date: May 5, 2014

Re: Stakeholder Scoping Initiative

Purpose & Background

This memo contains the results of the 2014 winter scoping exercise that sought to gather individual perspectives from stakeholders in the five regions of the Massachusetts Bays NEP (MassBays). In preparation for redrafting the Comprehensive Conservation and Management Plan (CCMP), MassBays convened stakeholder meetings during June and July of 2013 on the Upper North Shore, Salem Sound, Metro Boston, and the South Shore. Additionally, feedback from Cape Cod was gathered through a survey. During that time, stakeholders involved in coastal and watershed conservation lent their views regarding a list of top priority concerns that included storm water, wastewater, invasive species, water monitoring, and other associated topics.

Desiring to sift the regions for perspectives that may have been missed in the meetings of already-engaged stakeholders, the 2014 follow-up scoping effort focused on personal interviews with professionals and citizens (“narrators”) otherwise involved in local decision making around coastal natural resources. In many cases, these interviews have bolstered the 2013 findings and have helped in further determining the unique characteristics of individual locations whose issues fall under the broader penumbrae of previously articulated concerns. The findings in this round of outreach included highly specific regional observations that spoke to the uniqueness of given areas and their individual environmental, regulatory, economic, and sometimes geomorphological characteristics. These scoping interviews convey the personal perspectives of each narrator in a manner that identifies their specific concerns and subjective views regarding the state of their coastal resources.

For a complete list of participating agencies and organizations, see Appendix I.

Background

Objective: The current CCMP, revised in 2003, contains seventeen action plans and corresponding Action Items. As MassBays revises the document in 2014, there is a significant need for stakeholder input that accurately reflects the state of the MassBays estuarine environment and the challenges that it faces. The process of revision has been guided by the following Outputs and Short-term Outcomes:

CCMP Revision Process Outputs & Short-term Outcomes

- MassBays vision to inform program and regional priorities
- Identified target audiences for MassBays education and outreach
- In all regions, re-engaged existing partners; new partners recruited
- Specific regional and region-wide priorities
- Up-to-date understanding of Massachusetts Bay, resources, and complementary programs

- CCMP scope focused on priorities, informed by capacity
- Education and outreach to target audiences
- Dynamic, realistic, performance-based guidance re: MassBays issues
- Time-bound (5-8 years), strategic CCMP

In support of these goals, the 2014 scoping interviews have sought to “conduct a...fact-finding mission to identify and compile data on issues of concern that have not already been voiced by currently engaged participants.” In this second phase, one of MassBays’ priorities now is to attain an up-to-date understanding of the Massachusetts Bays region and of its communities. By interviewing community leaders who by extension of their office or personal interest could offer an informed perspective on the coastal environment, the interviews have tried to establish a relationship between place and environmental issue. In addition to the purpose of data collection for the CCMP, this scoping campaign has intended to establish a base of information that may inform future collaborative considerations as MassBays continues to forge partnerships with neighboring agencies, nonprofits, research institutions, and municipalities.

The scoping interviews are especially useful for designing pathways toward process outcomes that are responsive to constituent needs. As a supplement to the outreach work already in progress by MassBays’ Regional Coordinators, this scoping campaign has intended to enlarge the existing base of knowledge by establishing a rich repository of background information useful for gauging the general concerns of future potential partners.

Previous Findings

Results of 2013 Scoping Meetings (Issues Ranked by Priority Highest to Lowest)

North Shore	Salem Sound	Metro Boston	South Shore	Cape Cod
Invasive Species	Monitoring	Storm water	Climate Change	Storm water
Land Use	Storm water	Nutrient Loading	Sea Level Rise	Wastewater
Sea-level Rise	Climate Change/Sea Level Rise	Wastewater	Nutrient Loading	Salt Marshes
Outreach	Outreach	Land Use Planning	Seagrass	SLR/CC
Climate Change	Land Use Planning	Shellfish	Saltmarsh	Storm water
Salt Marshes	Shellfish	Monitoring	Shellfish	Shellfish
Sedimentation	Eelgrass	Salt Marshes	Land Use Planning	Land Use Planning
Nutrient Loading	Wastewater	Benthic	Anadromous Fish	Benthic Monitoring
Storm Water	Salt Marshes	Climate Change/Sea Level Rise	Wastewater	Eelgrass
Holistic Restoration	Reducing Bacteria	Eelgrass	PR	Anadromous Fish
	Anadromous Fish	Anadromous Fish	Storm water	Sediment Budgets
	Invasive Species			
	Nutrient Loading			
	Working with other Organizations			

Methodology

The scoping process followed a stepwise methodology:

- a. Generate questions suggested by the literature review and report produced by the Urban Harbors Institute. E.g., What specific contributions can MassBays offer, and where? In what arenas/topics would MassBays' efforts be most helpful?
- b. Create a list of possible participants and interviewees, prioritize the list by region, schedule in-person and phone meetings, in cooperation with MassBays Regional Service Providers.
- c. Compile existing outreach materials (repackage as necessary) about MassBays' CCMP process to send out to stakeholders who may not know about MassBays and our mission.
- d. Manage discussions with MassBays abilities and priorities in mind to identify areas of potential impact.
- e. Conduct conversations across the region and collect notes in a central spreadsheet.

Through consultation with MassBays' Regional Coordinators, the 2014 scoping initiative began with the establishment of a list of potential contacts that included individuals from town governments, restoration specialists, advocates, business owners, and others who are engaged directly or peripherally with the coastal resources of the MassBays region.

The design of this scoping attempt has relied on the relative nature of personal opinions insofar that they can supply a strong contextual background for consideration of MassBays' own mission and goals. Using a semi-structured approach, the interviewer asked open ended questions that sought to explore themes central to the CCMP revision process. Three elements contributed to the interview structure including (1) the establishment of occupational background, (2) the avoidance of leading inquiries, and (3) the use of follow-up questions to pursue topic areas in greater depth. Additional questions centered around interviewees' current work as well as their present and past priorities. This was necessary to assess individual perspectives on the unique challenges of different offices, perceived drivers of environmental change, and the role that MassBays can play as a facilitator of coordinated action.

Supplementing the results from the 2013 group meetings, these interviews construct a mosaic of testimonies that operate on two levels. As narrative accounts of *local* environmental concerns, they offer specific details applicable to the environmental challenges and regulatory climates of many areas. At the same time, they remain connected to the *regional* priority lists. Such range allows for scalar analysis that embraces unique particulars as well as the commonalities that link regions together. In this way we can maintain continuity between regions, while allowing for broad-based, cross-region approaches to problem solving.

Challenges to Methodology

For an interview-based project reliant on stakeholder perspectives, there are certain challenges to its conception and execution. For one, the Massachusetts Bays coastline, stretching from Salisbury on the North Shore to Provincetown on Cape Cod includes fifty different communities including Boston. To collect testimonies from this diverse geographic and population demographic is to encounter a wide breadth of information concerning vastly different communities. No community is the same in terms of its resources. With such heterogeneity, the details of each location - the individual vagaries of place, occupation, topography, and geomorphology – simultaneously accentuate differences and commonalities. Even two

narrators from the same location may have different perspectives on the condition of their resources and what they perceive to be drivers of change.

Further complicating matters is the difficulty for both the interviewee and interviewer in parsing out relevant from irrelevant information. As was frequently emphasized by respondents, coastal and watershed concerns are not always connected to obvious pollution sources but *are* frequently related to society's physical infrastructure wrought from concrete, asphalt, and steel that was designed to make the coast impervious to the elements. In doing so, these structures - the roads, bridges, and buildings that form the sinews of our modern world - facilitate the movement of organic and inorganic contaminants into coastal environments. Unlike environmental issues with relatively easy explanation (and straightforward responses), coastal health is influenced by wastewater, storm water, invasive species, and climate effects that in many cases are less pronounced to the naked eye and certainly more difficult to communicate via public discussion. Water, as a necessary element of everyday life remains for many a phenomenon that (as one observer noted) begins at the tap and ends at the drain. The challenge of articulating the breadth and urgency of these problems with stakeholders not already engaged in the discussion is particularly daunting.

Other Challenges

The Definitive Perspective:

- One of the first objections voiced by participants was the assumption that the interview must be looking for a "definitive perspective" on a set of issues. To gather good information, the interviewer was compelled to discuss with participants the relative validity of individual perspectives even if the connection between those perspectives and the work that MassBays undertakes is not always readily apparent. This also included validating participants' voices in a manner that allowed them to see their own role in the scoping process as a cumulative effort. Reassuring interviewees about the validity of their empirical testimonies helped them to divulge personal perspectives.

Relevance

- The relevance of the outreach was a challenge to participants who in some cases were disillusioned with the system at large and in other cases had conceptual difficulty envisioning how they fit into the process or what they could contribute to the overall endeavor. Because watershed conservation and restoration work encompass so many different stakeholder communities, articulating the purpose of the outreach program in an inclusive manner proved important.

A Stake in the Outcomes

- Another barrier to gaining the participation of new stakeholders was some individuals' perception that they do not have a stake in the outcomes. Unfortunately, as an interviewee's perception of his or her stake in the outcomes diminishes, the individual's willingness to engage in discussion also decreases. For future scoping attempts, drawing these stakeholders into discussion will require innovative methods of approach that can further solidify the linkage between coastal health and a potential stakeholder's conception of his or her official duties and responsibilities. Close attention to an individual's particular frame of reference may be necessary. One solution may be to activate them by directly appealing to their concerns in language that is familiar to them.

Post-Scoping Findings

The scoping interviews collected input from thirty-three individuals from the Upper North Shore, Salem Sound, Metro Boston, South Shore, and the Cape Cod regions. The views expressed in the interviews included a range of priorities, concerns, needs, ambitions, resource perspectives, ideas of progress, faults in the state system, environmental necessities, limitations of office, reference to area-specific duties, perspectives on constituent/mission conflicts, virtues and limitations of legal and state apparatuses, projections for the future, and overall descriptions of area environmental patterns.

Interviewees provided candid assessments of their areas in terms of environmental health and town efforts to address environmental issues. Views on resource quality tended to differ according to narrator especially if the office concerned was not primarily conservation oriented or there was a specific goal of which they were in pursuit. Some articulated similar modes of improving resource health by acting in collaboration with other towns. They frequently noted the difficulty in doing so.

Knowing the concerns and individual perspectives of diverse stakeholders provides us with an advantage in conceiving of the region as a whole instead of a set of atomized perspectives. This tapestry of viewpoints yields small truths when its component testimonies are considered in relation to one another.

Coastal Issues & Solutions

Key: The format below lists the concerns of each individual as “issue + issue, etc.” In italics are plans or thoughts regarding how those challenges may be addressed.

Example:

1. Issue + Issue + Issue (Participant Name, Office, Affiliation)
 - a. *Strategies for addressing concerns.*

Upper North Shore

1. Sea Level Rise + Climate Change + Stormwater Improvement + Beach Erosion + Identification of High-Risk Locations (Ray Faucher, District Manager, DCR)
 - a. *Work with MassBays on land acquisition, public education initiatives, develop individual management strategies for individual places that take into account their geographic nuances while also maintaining a concept of how they fit into the entire coastal matrix.*
2. Sea Level Rise + Public Health from Mosquito Infestations + *Phragmites* + (Emily Sullivan, District Manager, NEMMC)
 - a. *Smart infrastructural improvements, better community management, stormwater design improvements, public education.*
3. Storm damage + Sea Level Rise + Site Specific Concerns for Road Maintenance & Redevelopment (Gerri Falco, Conservation Administrator, Rockport & Tim Olson, Highway Superintendent, Rockport)
 - a. *Improving stone revetments, and hard coastal infrastructure, increased coordination between MassBays and town ConsComms that gives the CCMP greater visibility*
4. Water Quality from Merrimack River Sewage Discharge + Invasive Green Crabs (Paul Hogg, Shellfish Constable & Harbormaster, Newburyport)

- a. *Conversations between municipalities about sewage treatment, coalition-based efforts to combat green crabs, MassBays should emphasize oyster restoration in its North Shore work*
- 5. Invasive Green Crabs prey on shellfish beds + Shellfish Seeding Efforts + Climate Effects (John Gundstrom, Shellfish Constable, Rowley)
 - a. *Cooperation by North Shore towns to address crab issue by locating markets*
- 6. Invasive Green Crabs preying on softshell clam population + Law Enforcement Issues + Climate Change + Warming Patterns (Scott LaPreste, Shellfish Constable, Ipswich)
 - a. *Working with state legislators to find market solutions to crab issue, considering the crab's ecological effect on other inshore species including eelgrass,*
- 7. *Phragmites* + Beach Erosion + Sea Level Rise + Climate Change + Water Quality + Dam Removal + Septic Remediation (Doug Packer, Conservation Agent, Newbury)
 - a. *Cooperating with MVPC on coastal initiatives, MassBays could act as convener for inter-regional stakeholder conversations regarding wastewater/storm water solutions.*

Salem Sound

- 1. *Phragmites* Infestation + Marsh Drainage + Community Investment + Wetland Use (Geoff Lubbock, Goldthwait Marsh Trustee, Marblehead)
 - a. *Phragmites eradication by spraying, cooperation between town ConsComm and NE Mosquito Control, maintain drainage trenches in marsh, community education regarding proper marsh uses and care*
- 2. Public Safety + Law Enforcement + Potential Effect of Power Plant Construction on Harbor + Environmentally Friendly Moorings + Channel Dredging + Waterfront Development (Dan McPherson, Harbormaster, Beverly)
 - a. *Continuing to pursue partnerships with local and state agencies to secure funding, in terms of environmental conservation focusing on public willingness to respect impact on the environment if incentivized properly*
- 3. Impervious Surfaces + Urban Development + Limitation of ConsComm Authority + Redevelopment of Pre-Existing Infrastructure + Renovation of LNG Power Plant + Sea Level Rise & Overall Effects of Climate Change (Tom Devine, Conservation Agent, Salem)
 - a. *Maintain Salem's strong network of stakeholder bodies and the flow of information between them, land acquisition, focus on climate change and development concerns*
- 4. Storm Water + Wastewater Discharges (Devon Winkler, Aquatic Biologist, Salem)
 - a. *Grassroots activism, identification of community concerns, translation of concern into political priority for the state, change public mentalities that see environmental declension as unalterable, maintain awareness of individual stakeholder perspectives on resources, maintenance of physical infrastructure*
- 5. Building Yacht Club Business + Regulatory Compliance + Customer Retention (Dan Delorenzo, Yacht Club owner, Danversport)
 - a. *Diversifying services, improving customer care, promoting eco-friendly boat practices for receptive clientele, more dissemination of practical information*

Metro Boston

- 1. Teacher Training + Professional Development + Education for the Under Served + Empowering Individuals Through Knowledge + Catalyzing Action & Investment from Knowledge (Carole McCauley, Outreach Coordinator, Northeastern Marine Science Center)

- a. *Networking with science-based institutions to solidify institutional support, employ innovative strategies for bridging gaps between regulatory and scientific communities, increase education beyond technical assistance, tailoring education to specific audience frames of reference, establish reciprocity between academic research and government*
2. Maintaining herring runs + Eutrophication of Herring Spawning Ponds + Invasive Plant Species + Dredging Herring Pools + Public Water Supply Withdrawal + Flood Control Barriers + Salt marsh Restoration + Tidal Restriction Work + Seawall Reconstruction + Beach Nourishment (Mary Ellen Schloss, Conservation Administrator, Weymouth)
 - a. *State technical assistance, increased services and resources from MassBays*
3. Water Quality Improvement + Storm Water Outflow Control + CSOs + Contaminated Sediments + Phosphorus Inputs + Invasive Plant Species + Developing Green Corridor Along River + Public River Access + Herring Runs + Nurturing Holistic Vision of River Ecology and Management (Ek Ong Kar Singh Khalsa, Mystic River Watershed Association, Arlington)
 - a. *Aid from MassBays in articulating the river's problems as products of an urban/natural interface responsive to human/nature systems, CCMP as educational tool that impresses upon readers the link between land-based processes and riverine impacts, effective communication that tells the river's story in a manner that fosters public investment and understanding, use of education to activate a public will*
4. Water Quality + Monitoring Efforts + Invasive Plant Species + Fore River Access + River Cleanups + Fishway Restoration + Storm Water Runoff + Impermeable Surfaces + Climate Change + Impediments to Restoration Efforts (Kelly Phelan, Conservation Planner, Braintree)
 - a. *More public support and volunteer strength, a central repository of regulatory information, collaborative support for environmental efforts*
5. ConsComm Limitations + Plover Conservation + Dune Erosion + Beach Nourishment + Flood Map Designations + Shoreside Structural Improvements + Lack of Funding & Maintenance + Storm Water Permitting + Short Timeframes for Sewer Repair (Andrew DeSantis, Revere Conservation Commission & Chelsea DPW, Revere & Chelsea)
 - a. *Dune grass restoration, control of public access to ecologically vulnerable areas, nonprofit partnerships for green infrastructure, storm water education and outreach*
6. State Mentalities Toward Restoration Work + Intellectual and Methodological Divides Between Academic and Applied Science + Maintaining Stakeholder Engagement on an Issue Basis + Public Antipathy Towards Shorebird Conservation (Susannah Corona, National Park Service, Boston Harbor Islands)
 - a. *Reconsidering approaches to restoration work and definitions of success, restoration work should be conducted in a manner that allows for consideration of both the limitations and flexibility of an ecosystem, which is often not the case.*
7. Climate Change + Sea Level Rise + Storm Damage + Coastal Erosion + Flood Damage + Beach Management (Anne Herbst, Conservation Administrator, Hull)
 - a. *Educate and plan for effects of sea level rise, ConsComm is becoming more active as a vehicle for outreach and public education, improve coastal infrastructure so that it is more resilient*
8. Invasive Plant Species + Climate Change Effects + Public Knowledge of Invasive Species Eradication Techniques (Lou Wagner, Regional Scientist, MassAudubon)
 - a. *Community outreach to ConsComms, relaying accurate information about current environmental threats to municipal offices, public/technical education regarding eradication efforts*

South Shore

1. Water Quality Control + Beach Management + Sewer Renovation + Tide Gate Scheduling + Harbor Dredging + Phragmites + Pond Drainage + Culvert Widening/Fishway Restoration + Funding Shortages +

Improving Green Infrastructure + Finishing Sewer Repairs + Nutrient Loading + Storm Water (Paul Shea, Conservation Agent, Cohasset)

- a. *Ongoing sewer work and rain gardens that have improved water quality of Little Harbor, consideration of Cohasset's geology in storm water planning, continuation of storm water mitigation projects, MassBays outreach and education on projects*
2. Public Safety + Proper Resource Use + Marking Navigational Hazards + Marsh Erosion + Educating Recreational Boaters (Ron Mott, Harbormaster, Norwell)
 - a. *Outreach and education to harbormasters, topical seminars*
3. Estuary Sodium Chloride Levels + Water Withdrawal + Impervious Surface Impacts on Groundwater Recharging + Private Well Regulation + Nonpoint Source Pollution + Evaluating Impacts of Impervious Surfaces (Peter Dillon, Water Commission, Norwell)
 - a. *Addressing storm water mitigation on a watershed basis, MassBays can help implement/communicate a vision of the South Shore's issues on a watershed/holistic basis, organize educational forums, shift focus away from water supply and withdrawal toward impervious surface mitigation*
4. Public Safety + Proper Marsh Use + License and Code Enforcement + Silt Accretion (Dennis Carvalho, Harbormaster & Shellfish Constable, Kingston)
 - a. *Continued care for shellfish resources & river channel dredging proposal*
5. Anadromous Fish Passage Restoration + Shellfish + Post-Restoration Monitoring + Sewer Outfall + Barrier Beach Protection + Wastewater + Sea Level Rise (David Gould, Director of Marine Affairs, Plymouth)
 - a. *Town/academic partnerships for monitoring and restoration work, wastewater improvement projects, MassBays stakeholder coordination for wastewater management issues, comprehensive data collection for municipal use*
6. Beach Nourishment + Conservation Land Management Plans for Protected Species + Shorebird Nesting + Climate Change + Storm Effects (Jorge Ayub, Coastal Ecologist, DCR)
 - a. *Dune reinforcement projects, indigenous plant restoration, habitat restoration for shorebird nesting*

Cape Cod

1. Adapting to Climate Change + Shellfish Aquaculture + Dune Restoration/Natural Resilience + Cranberry Bogs Abutting Wetlands + High Turnover Rates for Homeownership that Impede Social/Environmental Investment + Benthic Communities in Upper Cape Ponds + Storm Water + Dredging + Nitrogen Loading (Coastal Resources Committee, Barnstable)
 - a. *Public education regarding storm and wastewater, outreach efforts about shellfish that counteract sensational media representations, acquiring federal/grant funding to pursue projects*
2. Progress on Fishway Restoration Projects + Expanding Herring Monitoring Efforts + Water Quality for Shellfish and Herring + Funding Constraints + Private Land Owner Conflicts + *Vibrio* + Continuing Data Collection + Municipal Shellfish Propagation Program + Collection of Northeast Specific Nitrogen Data + Storm Water + Wastewater + Potential Opening of Herring Rivers to Harvest + Expanding Offshore Aquaculture (Abigail Franklin & Diane Murphy, Cape Cod Cooperative Extension, Barnstable)
 - a. *MassBays support to DMF for ongoing work qualifying rivers as sustainable, grant money for projects, continued research efforts and environmental monitoring*
3. Property Acquisition + Habitat Restoration Efforts on Sandy Neck + Protecting Coastal Infrastructure + Storm Damage + Sea Level Rise + Beach Erosion + Sand Retention + (Rob Gatewood, Conservation Administrator, Barnstable)
 - a. *Use of coconut envelopes to prevent erosion, advancing land acquisition goals and ongoing restoration efforts, finding ways to reinforce current infrastructure*
4. Erosion + Coastal Protection + Beach Nourishment + (Jim Gallagher, Conservation Agent, Brewster)

- a. *Continued use of drift fence and identification of better erosion solutions without use of hard structures, use of coconut envelopes*
- 5. Update to Section 208 Water Quality Plan + Storm Water Mitigation + Continued Development + Nitrogen Loading (Heather McElroy, Cape Cod Commission, Barnstable)
 - a. *Watershed-scale solutions to wastewater and storm water, constructed wetlands, fertigation wells, eco-toilets, rain gardens, bioremediation, storm water filtration mechanisms, vulnerability analysis for expansion of salt marsh restoration efforts, closer coordination with Americorps, MassBays could bring stakeholders up to speed on available resources and best practices, continue to foster conversations between stakeholders*
- 6. Coastal Erosion + Permitting for Home Development + Dune Restoration + Sea Level Rise + Difficult Issues to Articulate to Public (Pat Pajaron, Conservation Agent, Truro)
 - a. *Public education regarding home improvements and permitting process, limitations on development by Wetlands Protection Act, how to make property repairs in a lawful manner, MassBays initiation of public outreach program on sea level rise effects and property rights/wetland protection*

Table of 2014 Scoping Issues (Issues Ranked by Frequency Highest to Lowest)

Key: Purple=5, Red=4, Blue=3, Green=2, Black=1

North Shore	Salem Sound	Metro Boston	South Shore	Cape Cod
Climate Change	Power Plant Construction	Invasive Species	Beach Erosion	Beach Erosion
Invasive Species	Invasive Species	Storm Water	Wastewater	Climate Change
Shellfish	Climate Change	Education	Harbor Dredging	Storm Water
Beach Erosion	Community Investment	Herring	Herring	Shellfish
Water Quality	Wetland Use	Beach Erosion	Public Safety	Nitrogen Loading
Identification of High-Risk Locations	Public Safety	Climate Change	Proper Resource Use	Wastewater
Public Health	Law Enforcement	Flood Control	Climate Change	Protecting Coastal Infrastructure
Storm Damage	Environmentally Friendly Moorings	Water Quality	Water Quality	Education
Stormwater	Channel Dredging	Public Access to Rivers	Tide Gates	Permitting for Home Development
Law Enforcement	Waterfront Development	Shorebird Conservation	Invasive Species	Storm Damage
Dam Removal	Impervious Surfaces	Shoreside Structural Improvements	Pond Drainage	Habitat Restoration
Septic Remediation	Urban Development	Flood Maps	Green Infrastructure	Property Acquisition
	Limitation of ConsComm Authority	Limitations of ConsComm Authority	Nutrient Loading	Expanding Offshore Aquaculture
	Redevelopment of Existing Infrastructure	River Cleanups	Storm Water	Land Owner Conflicts
	Storm Water	Monitoring	Marking Navigational Hazards	Data Collection
	Wastewater	Holistic Vision	Marsh Erosion	Water Quality
	Maintaining Business Profits	Developing Riverine Green Corridors	Education	Herring
	Regulatory Compliance	Phosphorus	Sodium Chloride Loading	Dredging
	Customer Retention	Contaminated Sediments	Water Withdrawal	Benthic Communities

		Wastewater	Impervious Surface Impacts on Groundwater	High Homeowner Turnover
		Seawall Reconstruction	Private Well Regulation	Cranberry Bogs Abutting Wetlands
		Tidal Restrictions	Nonpoint Source Pollution	
		Marsh Restoration	Law Enforcement	
		Water Supply Withdrawal	Shellfish	
		Storm Damage	Monitoring	
			Conservation Land Management	
			Shorebird Conservation	

Thematic Elements

Several broader themes offer cohesion to the site-specific concerns that interviewees expressed during the scoping. These themes in some cases reflect continuity between the previous scoping efforts and in other cases prompt new consideration of the relationship between communities and their coastal environments.

Knowledge & Action: For many individuals, coastal issues can be difficult to conceptualize due to the often systemic nature of those problems. Knowledge of coastal environments and ecology can provide the educational base necessary for public engagement with environmental issues. However, education is only the first step toward action and investment. Activating meaningful public engagement around environmental concerns remains a challenge.

Advancing a Watershed Perspective: Coastal watersheds encompass vast areas that frequently cross town, county, and state boundaries. To visualize watershed areas as zones of connectivity requires an engagement with hydrologic and policy perspectives in relation to their socio-political boundaries. One narrator expressed appreciation for the City of Portland, Maine’s active embrace of problem-solving strategies on a watershed basis. Another emphasized the importance of recognizing the relationship between urban and natural environments in the development of a watershed perspective.

Coastal Adaptation: As climate change effects force towns to adapt, coastal managers are rethinking the nature of coastal infrastructure. Emphasis on coastal resilience is evolving to embrace innovative methods for protecting existing structures and habitats. One of the greatest challenges for planners is using natural systems to create dynamic and responsive contingencies for coastal events while maintaining habitable community spaces.

Outreach & Education: Interviewees articulated a general acknowledgement that public engagement rests upon effective communication of environmental issues. Stakeholders discussed education as an issue in both technical/regulatory settings and general outreach. Interviewees suggest that outreach on general coastal issues must resonate with citizens’ everyday lives and local concerns. As general outreach takes place, discussion may also help identify commonalities that stimulate coordination among towns.

Scoping Results 2013—2014: Cross-Cutting Needs & Habitat Action Matching

Many of the views solicited during the secondary scoping campaign aligned with the issues that dominated the previous season’s discussions. Below are the scoping conclusions from those meetings paired with their corresponding inputs from the second round of interviews.

Cross-Cutting Needs

2013 Scoping Results	2014 Scoping Results
Implementation of Improved Storm Water Management	<i>Storm water management remains a high priority consideration for towns interested in compliance with the MS4 storm water permits. Shifts in regulatory regimes between the North Shore and Cape Cod demonstrate different approaches to mitigating a universal problem. Organizations on the Cape are considering bioremediation and other methods of improving filtration.</i>
Encourage regional collaboration for planning and implementing climate change adaptation responses	<i>Climate Change concerns loom for towns that are threatened with beach loss and residential impacts from rising water levels. Solutions range from short-term measures that replace sand and bolster soft infrastructure to state land acquisition efforts. Recognition of climate change has been manifested by landowner challenges to flood maps, locating markets for undesirable marine species, adaptation to rising sea levels, and continued efforts to eradicate invasive species.</i>
Encourage cross-agency cooperation and planning for restoration projects	<i>Restoration work by the DER, NRCS, and DMF currently pertains to storm water, marsh restoration, and fishway/shellfish restoration. Concerted effort between nonprofits, towns, and the state remains essential to progress and legal compliance.</i>
Determine/compile the state-of-knowledge of the benefits provided by coastal habitats	<i>Ecosystem services along the MassBays coast are of great value to industries such as tourism and fishing. As evidenced by the Urban Harbors Institute’s recent survey of academic and grey literature pertaining to the state’s coastal environment, the base of knowledge is increasing. Especially as climate change concerns continue to drive conservation perspectives, this will continue. There is a significant need to bridge gaps between scientific/academic and regulatory/policy communities to facilitate the transfer of knowledge. Challenges include gaps in monitoring and the changing nature of coastal ecosystem inputs and outputs.</i>

Habitat Specific Actions

2013 Scoping Results	2014 Scoping Results
<p>Remove all traditional moorings from eelgrass beds</p>	<p><i>Several respondents noted that the public is often ready to learn and respond to conservation initiatives regarding areas of recreational concern. Accessible information is important for the continued education of pleasure boaters. The introduction of eco-friendly moorings can be prohibitively expensive. There may be a challenge in broaching this topic with harbor masters who have placed their faith in traditional moorings and who view their office as primarily oriented toward public safety. Harbor outreach may be useful in establishing a connection between public safety and environmental health. Also, to note, green crabs have been blamed for degrading eelgrass habitat as well.</i></p>
<p>Restore shellfish beds, taking into consideration the impacts of ocean acidification</p>	<p><i>The challenges facing shellfish populations vary widely across the regions and are highly site-specific owing to their sedentary nature. Factors affecting shellfish health include municipal wastewater systems, downstream impacts from sewage and nonpoint source pollution, invasive species such as green crabs, land use conflicts, and Vibrio. Because shellfish fall under multiple regulatory jurisdictions, an open dialogue between the state, towns, and growers may facilitate ease of propagation.</i></p>
<p>Encourage beach management plans that consider habitat value</p>	<p><i>Beach management challenges include the balance between habitat enhancement and public access. Plover populations in several areas have drawn public ire for the space that is devoted to their conservation. A significant aspect of habitat-based beach management may be outreach related in order to communicate the fragility of that balance. Conventional measures for dune erosion are not working which has prompted some progressive individuals to look at the issue not as a matter of keeping sand in one place but of improving the natural absorbency of coastal habitats.</i></p>
<p>Model potential for marsh migration in response to sea level rise</p>	<p><i>Sea level rise impacts are broad. Newly inundated areas may be more susceptible to mosquito and Phragmites infestation as salinity levels change. GIS modeling similar to MVPC efforts on the Great Marsh and MassAudubon's public school mapping lessons may provide guidance for mitigating marsh habitat variability.</i></p>

Conclusions & Recommendations

During this scoping campaign, thirty-three stakeholders with backgrounds including those of municipal officials, restoration specialists, business owners, state officials, harbor masters, shellfish constables, and academics lent their input. The thoughts that they expressed reflected their highly individual perspectives on the challenges facing their regions and even more importantly on the nature of their relationships with their coastal resources. They communicated an intimate familiarity with communities and coastal ecosystems. Gathered through a suite of open-ended questions, these perspectives sought not to lead participants but instead allow them to express their thoughts on various coastal concerns. Most importantly, the opinions expressed in these interviews reflect the nature of the tripartite relationship between individual, office, and resource.

The views that they expressed are not uniform. In this manner, they are a truthful representation of the breadth of concern that presently exists within the Massachusetts Bays watershed area. We have at hand the reality that issues are perceived differently according to location because each town's resources, needs, and priorities are uniquely their own. Encapsulated within this are themes that do speak to the commonalities linking towns and regions together. What emerges is a matrix of information that accurately reflects the current conditions of coastal areas from the Upper North Shore to the Outer Cape.

This sampling of perspectives is not an exhaustive study in that it only reached those who were most willing to take part in the process. Missing from these perspectives are the voices of municipal officials who perhaps had difficulty envisioning their stake in the outcomes of MassBays' work. Helping to facilitate that connection will be a challenge for future outreach endeavors that hope to engage those stakeholders.

In general, the findings of this scoping attempt are closely aligned with the results of last year's stakeholder meetings. Like last year, a persistent concern for climate change effects and sea level rise seemed to drive many secondary priorities such as beach erosion and flood control. Along with that, individuals reiterated that MassBays can work well as a facilitator and convener of partners. Education and outreach also remain important for the continuation of restoration work and especially for introducing homeowners to the nature of sea level rise.

In conclusion, the information gained from this scoping campaign is useful on a broad level. It supplements the concerns stated during the initial scoping efforts in 2013 and it may act as a reservoir of useful information as MassBays presses ahead in the building of coalitions and collaborative partnerships.

FINAL RECOMMENDATIONS BASED ON SCOPING PERSPECTIVES

- Continue grant program
- Increase outreach efforts with emphasis on roles guiding, advising, educating, and connecting, particularly to towns whose ConsComms lack resources
- Emphasize technical and community education
- Consider expanding name recognition and branding
- Continue facilitating local/state conversations and use leverage as state organization to bring stakeholders into collaborative discussion
- Emphasize adaptive responses to climate change and sea level rise
- Facilitate bridging between academic and regulatory communities
- Behave as resource coordinator for coastal Conservation Commissions interested in informational resources
- Support DMF in its evaluation of herring

Appendix G. Agenda and Results of Interagency Information-sharing Sessions



Massachusetts Bays National Estuary Program Information Exchange Session

100 Cambridge Street
9th floor legal conference room

October 2, 2014 Participants

Sam Cleaves/MAPC, Tim Dexter/DOT, Hunt Durey/DER, Kathryn Ford/DMF,
Heather McElroy/Cape Cod Commission, Regina Lyons/EPA

October 8, 2014 Participants

Michael Celona/DPH, Joe Cosgrove/MVPC, Lealdon Langley/DEP, Regina Lyons/EPA,
Robbin Peach/MassPort, Vandana Rao/EEA, Betsy Reilly/MWRA, Brad Washburn/CZM

Meeting Objective

Exchange information about programs and activities underway and planned by state agencies and RPAs in Massachusetts Bay and Cape Cod Bay, to identify opportunities for MassBays contributions.

Agenda

10am Gather, introductions

10:10 Background:
Comprehensive Conservation and Management Planning
Goals and Strategies
Proposed action items, and an example

10:20 Existing and planned agency programs and initiatives
Consider the following:

- In what areas (geographically and topically) can MassBays complement your agency's work?
- What specific information is needed to advance habitat protection and restoration in Massachusetts Bay and Cape Cod Bay? What data gaps can we help fill?
- How can MassBays magnify and augment your agency's impact?

11:30 Opportunities for collaboration
Compile topics and activities for potential collaboration among agencies, both with MassBays and others.
Identify potential funding sources or cost-sharing opportunities for collaboration on specific projects.

12pm Adjourn

Re: Strategy 1a. Make data available, attendees suggested that MassBays:

- * Document impact of “green” approaches.
- * Conduct rainfall-water quality modeling.
- * Support eelgrass delineation and mapping.
- * Support citizen monitoring and management efforts.
- * Delineate mean high water in salt marshes.
- * Identify and address knowledge gaps.
- * Review studies of climate change impact on restoration and management activities.

Re Strategy 2a, Conduct outreach and training regarding the value of estuaries, attendees suggested that MassBays:

- * Promote timely implementation of living shorelines for long-term habitat protection.
- * Address perception of eelgrass as a nuisance species.
- * Address Rivers Protection Act implementation in the coastal zone.
- * Promote model restorations and practices that have proven successful.

Re: Strategy 2b, Prompt local decisionmaking based on research findings and trends data, attendees suggested that MassBays:

- * Make the wealth of climate change information useful for municipal planning.
- * Use tide gate inventory outputs to prompt adoption of sound management practices.
- * Provide guidance to communities re: responding to harmful algal blooms.
- * Share information about economic tools for habitat protection and restoration.

Re: Strategy 3a, Establish embayment-specific targets for improvement, attendees suggested that MassBays:

- * Identify indicators and metrics for multiple embayment “types.”
- * Establish a methodology for comparisons across embayments in similar settings.
- * Tie municipal-level MS4 permit compliance to embayment-specific water quality targets.
- * Utilize Gulf of Maine sentinel monitoring recommendations to detect climate change impacts.
- * Examine the potential to bring stormwater treatment component to DOT Complete Streets program.

Appendix H. Roadmap to a Revised CCMP for MassBays

EPA Guidance	MassBays proposed response, 7/17/17
<p>Scope of CCMPs – All CCMP action plans must be consistent with and tie back to CWA Section 320. Action plans must identify the needed resources and sources of resources expected to be secured. It is especially important to distinguish between actions funded under Section 320 and those to be implemented with other sources.</p>	<p><i>MassBays' CCMP will include explicit reference to the provisions of CWA Section 320. The CCMP will include actions anticipated to be funded by §320 funds; where supplemental funding is needed it will be clearly noted.</i></p>
<p>CCMP Revisions versus Updates – The Funding Guidance describes when a CCMP Revision or an Update would apply. Revisions involve a significant change. For example, a CCMP Revision could be driven by: 1) new CCMP goals, as directed by the Management Conference, 2) new information obtained through monitoring that would require revisiting and changing the actions in a CCMP; or 3) an expansion of the study area. A Revision would also be necessary in cases where original CCMPs have not yet been revised. Minor changes to action plans or insertion of a few new actions would be considered an Update. Reformatting, streamlining or reorganizing core actions to reflect new ways of accomplishing original CCMP goals would also be considered an Update.</p>	<p><i>MassBays is preparing a CCMP Revision, with a 10-year timeline. The revision is driven by the following: 1) the Management Committee identified new programmatic and organizational goals in 2015; 2) the current CCMP was published in 1996, and many conditions have changed in the interceding 20 years.</i></p>

EPA Guidance	MassBays proposed response, 7/17/17
<p>Review Process – The Region is in the lead with respect to CCMP Revisions and Updates. The Region will work in concert with HQ, using the CCMP Content Checklist and the NEP Funding Guidance as a basis for engaging in the concurrence process. Regional Coordinators will work with the NEP Director and Management Conference to follow the checklist so that the set of content requirements are reflected in the final CCMP and associated documents. ¶ To ensure a common understanding and level of support for the final CCMP, this process assumes that the HQ and Regional Coordinators are regularly communicating and collaborating as needed throughout the process. The Regional Coordinator is responsible for timely communication and for managing the overall review schedule. EPA expects that the NEP will make the changes necessary to the CCMP and associated documents to reflect the Content Checklist. HQ Coordinators will need to honor the CCMP review schedule, while Regional Coordinators need to share documents to allow adequate time for review.</p>	<p><i>MassBays has worked closely with our EPA Regional Coordinator to scope out this roadmap for completing the CCMP revision. We are committed to working with EPA Region 1 and Headquarters to finalize a CCMP that both reflects the Management Committee’s goals and meets EPA’s needs under this guidance.</i></p>
<p>Program Evaluations – To ensure the seamless integration among key NEP products, EPA expects that the Program Evaluations will consider the need, if any, for revisions or updates to the CCMP. EPA also expects that State of the Bay Reports will inform any CCMP Revisions and Updates.</p>	<p><i>MassBays’ Revised CCMP will include a section on plans and methods for incorporating State of the Bays into CCMP implementation and performance measurement. MassBays will prepare two versions of the revised CCMP:</i></p> <ol style="list-style-type: none"> <i>1) A web-based, official version, which will be assembled on a webpage dedicated to the CCMP with links, maps, and graphics. The webpage will include official, dated statements of approval from the Management Committee and EPA. This format will allow us to provide ready access to background materials and cut down on physical resources needed to share the document with stakeholders and partners. All will be offered in alternative formats for universal accessibility.</i> <i>2) A printed summary suitable for sharing with multiple audiences at public venues and meetings which includes prompts for accessing the online documentation.</i>

EPA Guidance	MassBays proposed response, 7/17/17
<p>Identify clearly if there are any changes between the existing and draft CCMP so that reviewers and the public can easily determine what has changed and why. These changes include program priorities and goals; any new information that suggests more promising approaches or currently unaddressed issues, etc.</p>	<p><i>MassBays will include a background section describing the requirements under §320 to prepare a CCMP, and the need for a revision for our planning area. While the content and approach of the 1996 CCMP makes it difficult to definitively document that specific actions have been “completed,” we will provide reporting on status for each 1996 action, e.g. obsolete—revised—reassigned—ongoing. This will be a simple spreadsheet report-out included in the background section.</i></p>
<p>Describe how the NEP has contributed to or supported activities that helped develop new information, if applicable, when highlighting major changes due to new information. Major changes could be informed by Status and Trends or State of the Estuary Reports, Indicator Reports, and associated monitoring programs where adequate monitoring data are available. This is where a discussion of climate change assessments and adaptation strategies should appear.</p>	<p><i>MassBays' investments in research and monitoring have been instrumental in the improvements observed since 1996, in Boston Harbor in particular. The Revised CCMP will highlight those investments. Beyond Boston Harbor, however, there is much to be done, and MassBays' CCMP will address new challenges and impacts posed by climate change, including acidification, more frequent and more intense storms, and expansion of invasive species.</i></p>
<p>Include a map of the study area. If there are any boundary changes, provide the reasons for those changes. Any NEP study area boundary changes should be based on sound science with the support and approval of the NEP’s Management Conference in a transparent and open process.</p>	<p><i>We are not proposing any boundary changes. A map will be included on the CCMP landing page and prominently in the hard-copy materials.</i></p>

EPA Guidance	MassBays proposed response, 7/17/17
Describe the NEP's Management Conference and membership with any proposed changes and explain how the structure will support the NEP's ability to oversee and promote CCMP implementation. This would include a discussion about the NEP's approach to achieving financial sustainability and for involving the public and stakeholders in its programs.	<i>MassBays' unusual organizational structure will be described via an organizational chart, as well as a decision tree that illustrates how yearly workplans are developed in alignment with the CCMP.</i>
Discuss changes to existing CCMP action plans, and new action plans, including their relationship to previously stated goals and priority problems; the probable causes and sources they address; and measurable objectives, where appropriate, to attain the goal. Each CCMP Action must identify the key activities expected to be implemented to address the priority problem. It would be very helpful to include a table comparing the old completed or deemed obsolete actions, and new, revised, or on-going actions in the CCMP. This could appear upfront in the document, or within each chapter.	<i>A table compiling the status of the 1996 CCMP activities will be provided as described above. As this first revised CCMP is being developed in a significantly changed environment, few of the specific activities will be carried forward. We expect that this checklist item in the guidance will be more relevant in future revisions, if only for the fact that they should be prepared more frequently (every 10 years instead of 20). In this revised CCMP, we will provide the following:</i>
CCMP Actions encompass environmental goals, metrics, and milestones that the NEP strives to achieve over time as implemented through annual workplans. They need to be clear, understandable, and plainly link to CWA § 320 (See 4 th bullet under Purpose of Conference). They should:	<i>Goals will be described with specific reference to their importance to meeting CWA goals.</i>
a) describe each action and what is proposed;	<i>Programmatic and organizationally oriented Actions will be introduced, with context regarding need and expected outcomes.</i>
b) identify key activities to implement the action, including affected habitat types, or resource(s) if appropriate; some activities may take place system-wide or involve policy changes rather than in-the-ground projects.	<i>Activities/Strategies for executing proposed actions will be described. These will form the basis for future tasks in MassBays' yearly workplans.</i>
c) identify proposed action plan responsibilities, including likely lead parties if known, along with any implementing partners;	<i>Only Activities to be led by MassBays are to be included in the CCMP; anticipated partners will be listed.</i>

EPA Guidance	MassBays proposed response, 7/17/17
d) include a timeframe, and where appropriate, key milestones for completion (or indicate on-going);	<i>A 10-year timeline will be described, with milestones for each Activity.</i>
e) estimate the range of potential costs of the overall action and identify the possible sources of funding; and	<i>Beyond the S.320 funds required to maintain MassBays' work, expected contributions of cash and in-kind support from partners will be estimated for each Activity.</i>
f) include performance measures (quantitative measures and intended environmental results wherever possible).	<i>MassBays is committed to providing quantitative performance measures for each Activity. These will feed directly into our monitoring program and STATE OF THE BAYS reporting.</i>
Those CCMP Actions eligible for CWA §320 funding (and as stated in your EPA Assistance Agreement) will be spelled out and included in the NEP workplan submitted to EPA. CCMP Actions not funded by Section 320 should be clearly identified along with the other potential funding source.	<i>Only activities to be funded at least in part by S.320 funds will be included in the CCMP.</i>

EPA Guidance	MassBays proposed response, 7/17/17
<p>CCMPs are living documents and as such should be re-examined and revised on a regular basis. EPA recognizes that CCMPs are also critical components of the NEP model of adaptive management as it facilitates a continual process of integrating new data and results. EPA expects that revised CCMPs will discuss the relevance and applicability of the: 1) monitoring, 2) habitat, 3) finance, and 4) outreach component strategies, including any needed substantive changes. If such changes are not discussed in the revised CCMP as language within a chapter or as a separate Action Plan, they should be described in a separate document and completed within 3 years of the final Revised CCMP.</p>	<p><i>The revised CCMP will have a habitat focus. It will include a Monitoring Framework and Financial Strategy as attachments. A Communications Plan, developed once the CCMP is complete, will be tied directly to the final CCMP and its goals.</i></p>
<p>Include a Monitoring approach to track and detect changes and/or improvements within the study area (so change in environmental indicators can be detected over time), and effectiveness of CCMP Actions. This can be described in a separate, brief, higher level document, or chapter or action in the CCMP. The Monitoring approach should identify: a) objectives, b) data the NEP and partners are collecting for which parameters; c) the party/parties responsible for collecting the data; d) frequency of collecting and reporting the monitoring data; e) how the data are shared, reported, and used; f) data gaps; and g) additional funding needed for monitoring activities and filling data gaps. This section should explain how monitoring has/will change as a result of new/modified actions and priorities, and any new environmental indicators. Monitoring should be tied to the State of the Bay Report which has similar components. Please note: A Quality Management Plan or Quality Assurance Project Plan can supplement the Monitoring Plan, but does not in and of itself meet this requirement.</p>	<p><i>A monitoring framework developed by MassBays' Science and Technology Advisory Subcommittee and endorsed by the Management Committee will be included as an attachment.</i></p>

EPA Guidance	MassBays proposed response, 7/17/17
<p>Include a Finance strategy that will establish long-term financial sustainability to implement the CCMP through diverse resources and partners. The strategy can be a separate document or chapter or action in the CCMP. The strategy should discuss: a) priorities for funding; b) current funding and other support such as staff assignments, or in-kind partnering; c) short- and long-term resource needs; and d) proposed actions or strategies to maintain or garner new resources for CCMP implementation and their timeframe.</p>	<p><i>A financial framework developed by MassBays' Finance Subcommittee will be included as an attachment.</i></p>
<p>Include a Habitat Protection/Restoration strategy. The strategy should clearly tie back to habitat or ecosystem issues addressed in the CCMP, including those habitats and species prioritized for protection and or restoration efforts. Strategies can be addressed in a separate document or as an action in the CCMP and should discuss: a) relevant habitat types and key species in the study area; b) goals and measurable objectives to address them; and c) actions that reflect a climate change vulnerability assessment. The Strategy can make it easier for NEPs to plan and report on their habitat protection results under GPRA.</p>	<p><i>MassBays' revised CCMP as a whole is focused on habitat protection and restoration. All components listed here will be addressed in the core of the document.</i></p>
<p>Include a Communication/Outreach Strategy to ensure community involvement and ownership in CCMP implementation that can be represented as a stand-alone document, chapter, or a series of actions in the CCMP that includes: a) guiding principles, or goals and objectives; b) a target audience(s); c) a narrative description of activities, including any tool used such as branding and messaging, behavior change campaigns, or social media; d) implementers for those activities; e) any key deliverables, and f) a budget and timeframe for implementing the activities.</p>	<p><i>A Communications Strategy will be submitted as an Attachment; an implementation plan will be finalized within three years of CCMP submission.</i></p>
<p>NOTE: Make sure to include a public review process that extends beyond the Management Conference members. Responses to comments should be summarized and be made publicly available.</p>	<p><i>MassBays had previously published a Public Review Draft of a revised CCMP, announced at a MassBays-wide event. All comments garnered from that public release have been incorporated into the proposed Activities. This final revised CCMP will be reviewed by MassBays' regional Local Governance Committees and the Management Committee. Following this vetting, a second round of public comment will be solicited prior to final Management Committee endorsement.</i></p>

Appendix I. Results of Public Outreach, November 2018

Sources:

Boston Harbor Ecosystem Network meeting

South Shore Municipal Partners meeting

Management Committee meeting and survey

Online survey – Cape Cod responses

Online survey

Data gaps:

- Dock & pier coverage of marsh platform
- Dredged areas/dredge extent (UHI attempted to compile this)
- Historical data retrieval, including pre- and post-restoration monitoring
- Statistics re: seawall permits over time
- Consensus flood maps and other data needed for long-term planning and design
- Shellfish monitoring (DMF)
- Ecosystem dynamics, cranberry bog inputs
- integration of watershed data with regulatory work
- Routine and frequent nutrient monitoring in small embayments.
- salt marsh hydrology, status of species,
- specific populations and needs
- Water Quality
- QAPP templates.
- Analysis of all past restoration project data across the region to show overall success.
- Monitoring post-restoration beyond first year or two.
- Many anadromous fish run population estimates need more people collecting count data.
- Not using updated precipitation or flood and surge maps
- Aquatic invasive species in freshwater river herring spawning ponds
- Standardization of collected data across the estuaries, and a lack of focus on Boston Harbor.
- Presence & extent of hazardous waste contamination
- More comprehensive and timely seagrass monitoring
- Basic water quality parameters
- Outfall monitoring in all MassBays communities. Most of the North Shore communities require improved stormwater management practices to help improve water quality. Public education is key.
- Water quality, fishing quality, swimming quality, habitat quality
- Additional stormwater outfall monitoring is needed - some will be required under NPDES permit but more frequent monitoring would be more useful for analysis
- land use/local regulation assessment
- lack of an integrated one-stop-shopping compendium of WQ information.
- guidance for municipalities to evaluate and choose among adaptation measures.
- public understanding of climate change risks

Research needs:

- Document invasives species' impact on ecosystem services, as opposed to impact on native spp.
- When a neighborhood raises its elevation to prevent flooding, what happens to nearby neighbors and neighborhoods that do not?
- Response of marshes to sea level rise, adaptation that protects marsh habitat into the future
- Cape Cod Bay fisheries study
- Application of herbicides in spawning ponds for the control of AIS and how this might affect larval and juvenile river herring Exploring ways to reduce pollutants impacting habitat sustainability
- relating climate change; eutrophication and toxic chemicals to the "productive capacity" of Essential Fish Habitat
- The effects of altered hydrology, e.g., dredging, tide restrictions, on embayment water quality
- Long-term effects of pollution in estuarine environments that are changing due to climate change
- restoration models that take SLR into account
- Changes in predator-prey interactions due to climate change
- Damage & Conditions resulting from rising seas and superstorms.
- addressing migration of fish species from the Mid Atlantic into southern New England waters
- Coastal vulnerability from storms and impacts on evacuation and infrastructure
- I'd like to see more social science and evaluation research carried out so that we all have a better understanding of WHY a certain approach is working, or why specifically an approach did not work
- Impact of accelerating, intensified development
- Habitat resiliency
- Stormwater, sea level rise, coastal resiliency.
- impact of climate change on Bays community and recommended actions towns, cities, and state should take to mitigate/adapt

Education & Outreach needs:

- Visuals – especially video – to illustrate storm surge, storm damage
- Materials that highlight problems and issues – and case studies with solutions – for municipal officials. MassBays & municipal staff can use these materials to convince decisionmakers that they are not isolated in their challenges and won't be the first to take up a given response. Relevant for MS4, dam removal, resilience actions, investing Ch.90 funds for stormwater/flooding mitigation.
- Compilation of resources (links, applications) in one place online.

Management needs:

- While MVP structure is good (service providers id'd means less contract mgt), projects need to bring ecosystem concerns to the table, and there should be a route to implementation of plans.
- Regional approach (with MassDOT) to Route 3 corridor stormwater and flood management
- Cross-agency assistance to towns for storm response
- Funding for long-range infrastructure planning
- Operational support to towns hit by storms to help with ongoing response and recovery re: rebuilding above elevation, retreating, etc.

Appendix J. CCMP Development Logic Model

[11x17" layout follows, 1 page]

Inputs

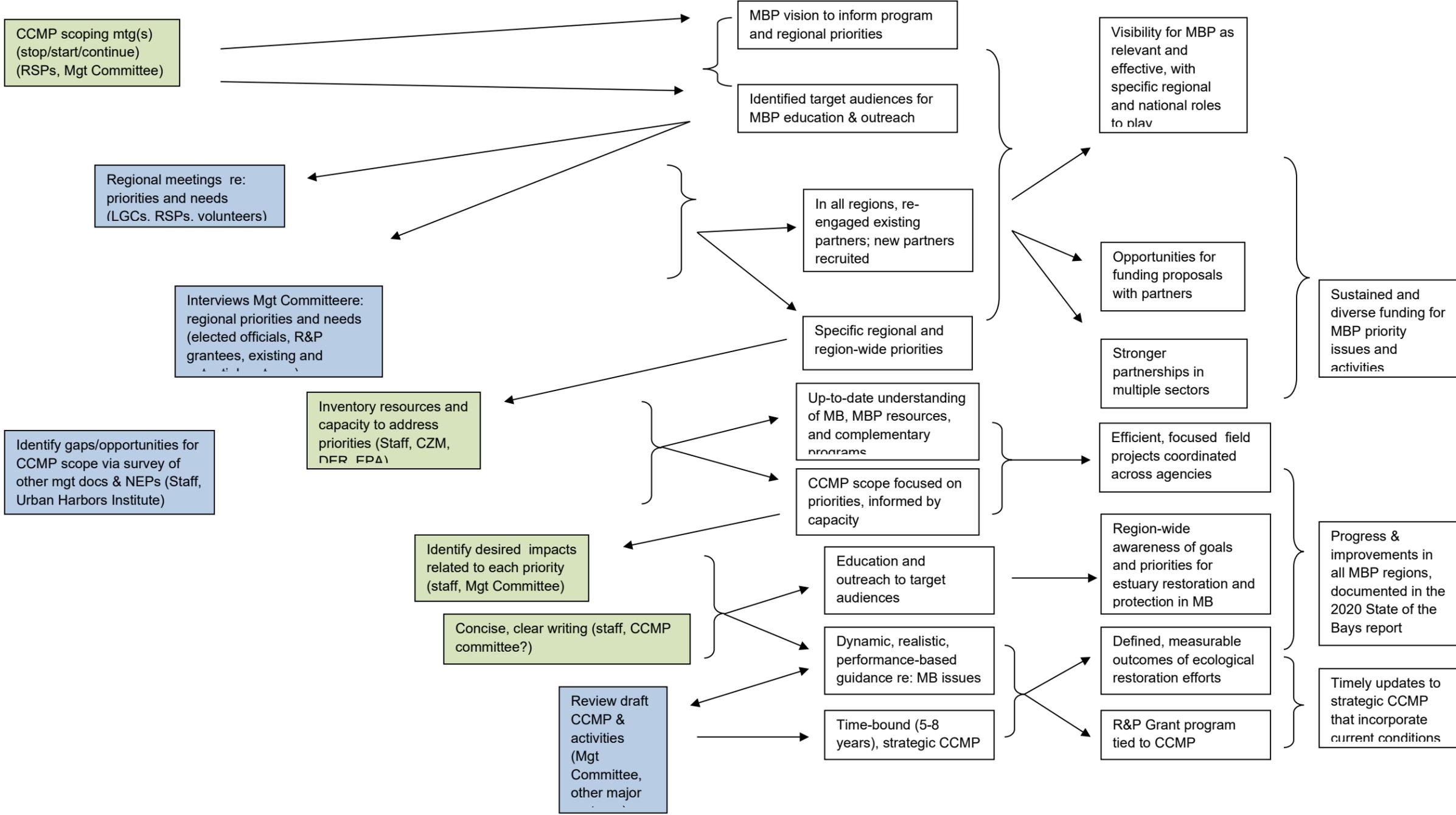
Activities (Participants) *internal*

Activities (Participants) *external*

Outputs & Short-term Outcomes

Longer-term Outcomes

- Communications tools**
- Websites & listservs
 - Comm'n networks
 - Compelling issues, both good & bad
- Content resources**
- 1996 CCMP
 - 2003 CCMP Update
 - Delineation Report
 - MBP Strategic Plans
 - State of the Bays report
 - R&P grant products
 - Complementary resource mgt plans
 - Knowledge of ecosystems
 - Desired natural resource conditions
 - Regional Service Providers
 - Local Governance Committees
 - Other NEPs
 - Previous CCMP update efforts
 - CZM
 - EPA
- Human resources**
- MBP Central Staff
 - Regional Coordinators
 - Mgt Committee



Appendix K. EPA/State Management Conference Agreement, 1990

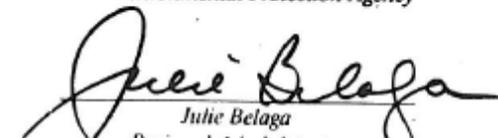
**MASSACHUSETTS BAYS
MANAGEMENT CONFERENCE AGREEMENT
FOR THE NATIONAL ESTUARY PROGRAM
UNDER THE WATER QUALITY ACT OF 1987**

WE recognize the need for a Management Conference for Massachusetts and Cape Cod Bays to better define the environmental concerns in the ecosystem; to address the extent, complexity and sources of pollutants; and to develop a comprehensive conservation and management plan for action. We further recognize that regional and local governments as well as the Executive Office of Environmental Affairs and the Environmental Protection Agency share the responsibility for management decisions and planning for the future of the Bays.

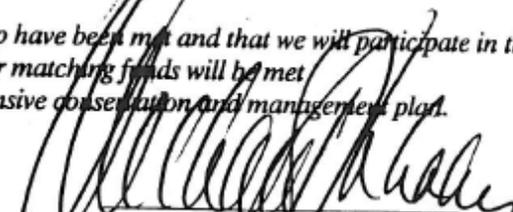
IN signing this agreement, we are committing to products and schedules in the Conference's five-year workplan to: assess trends in water quality, natural resources and uses; identify the causes of environmental problems through data collection, characterization, and analysis; evaluate point and non-point loadings and relate them to observed trends; write a comprehensive conservation and management plan which includes recommendations for priority actions; develop plans to coordinate implementation of a comprehensive plan with federal, state and local agencies; monitor the effectiveness of the management actions; and review federal financial assistance programs and federal development projects for consistency.

WE also agree that the statutory requirements for Management Conference membership have been met and that we will participate in that conference. Further, we commit that the statutory requirements for matching funds will be met to complete the characterization of priority problems and develop the comprehensive conservation and management plan.


Juana S. Wilcher
Assistant Administrator for Water
U.S. Environmental Protection Agency


Julie Belaga
Regional Administrator
U.S. Environmental Protection Agency
Region 1




Michael S. Dukakis
Governor
Commonwealth of Massachusetts


John P. DeVillars
Secretary
Massachusetts Executive
Office of Environmental Affairs

Dated this 13th day of November, 1990

Appendix L. Management Committee Membership, 2013 to 2022

Members, 2013-2015	Organization	Member Category
Julia Blatt	Massachusetts Rivers Alliance	Statewide nonprofit
Robert Buchsbaum/Rebecca Dupont-Coutu	Salem Sound Coastwatch	Regional nonprofit
Bruce Carlisle/Brad Washburn/Lisa Berry Engler	Massachusetts Office of Coastal Zone Management	Standing
Sam Cleaves/Mark Fine	Metropolitan Area Planning Council	Standing
Mel Cote/Regina Lyons	Environmental Protection Agency	Standing
Ed DeWitt/Andrew Gottlieb	Association to Preserve Cape Cod	Regional nonprofit
Tim Dexter/David Goldstein	Massachusetts Department of Transportation	Standing
Harlan Doliner/Morgan McCarthy	Marine & Oceanographic Technology Network	Industry/business
Kathryn Ford/Mark Rousseau	Division of Marine Fisheries	Standing
Jon Kachmar/Steve Kirk	The Nature Conservancy	Statewide nonprofit
Beth Lambert/Tim Purinton/Georgeann Keer	Massachusetts Department of Fish and Game	Standing
Wendy Leo/Ken Keay/Denise Ellis-Hibbett	Massachusetts Water Resources Authority	Standing
Alan Macintosh/Joe Cosgrove/Jen Hughes/Cece Gersternbacher	Merrimack Valley Planning Commission	Standing
Rebecca Newhall	NOAA Coastal Program	Federal government
Judith Pederson/Juliet Simpson	MIT Sea Grant	Research and academic
Jane Peirce/Cathy Vakalopoulos/Steve McCurdy/Lealdon Langley	Massachusetts Department of Environmental Protection	Standing
Vandana Rao	Executive Office of Energy and Environmental Affairs	Standing
Maureen Thomas	Town of Kingston	Local government
Geoff Trussell/Jon Grabowski	Northeastern University Marine Science Center	Research and academic
Jack Wiggin/Kristin Uiterwyk	Urban Harbors Institute	Research and academic
Colin Van Dyke	Anderson Krieger	Industry/business
Samantha Woods	North and South Rivers Watershed Association	Regional nonprofit

Appendix N Sample Healthy Estuaries Grant Request for Proposals



Margherita Pryor
U.S. Environmental Protection Agency, Region 1
5 Post Office Square
Boston MA 02109

July 25, 2022

Dear Margherita:

We are pleased to submit Massachusetts Bays National Estuary Partnership (MassBays') application for funding to implement our Federal Fiscal Year 2022 Section 320 Workplan. MassBays staff and regional coordinators have significant accomplishments to report from this past year. As of June 30, we have:

- ☑ Identified target extent and conditions for saltmarsh, eelgrass, and tidal mud flats in our 47 embayments.
- ☑ Completed our new online Ecohealth Tracking Tool, which will serve as our web-based State of the Bays reporting system.
- ☑ Coordinated a session at the Massachusetts Association of Conservation Commissions' Annual Meeting, with presentations from all RCs making the case for long-term monitoring of habitat restoration projects.
- ☑ Engaged volunteers across the region in herring counts, eelgrass monitoring, water sampling and beach monitoring, restoration projects, and invasive species management.
- ☑ Developed revised Risk Categories for both interpreting cyanobacteria data for the public and reporting results to health agents, which was accepted by health agents and Massachusetts DPH for the 2022 monitoring/reporting season. (Cape Cod RSP)
- ☑ Conducted in-depth monitoring in Salem Sound and Salem Harbor to inform resource management and investment in new water infrastructure. (Lower North Shore RSP)
- ☑ Served in a leadership role to develop EJ/DEI resources for the NEPs (Metro Boston RSP), and worked with the Mystic River Ambassador to identify impacted and exposed target audiences.
- ☑ In the Great Marsh, completed impact assessments of chemical treatment of Phragmites and extent of microplastics. (Upper North Shore RSP)
- ☑ Presented interim results of a long-term study to document marsh migration, thanks to the participation of private dock owners along the North and South Rivers who have been recording changes in the adjacent marsh for five years. (South Shore RSP)

MassBays' Management Committee reviewed and approved this application, and endorsed the tasks included as important steps toward implementing our CCMP. Please do not hesitate to contact us if you have any comments, suggestions, or concerns regarding the workplan.

Sincerely,

A handwritten signature in black ink that reads "Pamela DiBona".

Pam DiBona
Executive Director
Massachusetts Bays National Estuary Partnership
pamela.dibona@mass.gov
339-368-0608 (cell)

A handwritten signature in black ink that reads "Juliet Simpson".

Juliet Simpson
Management Committee Chair

cc: Bob Chen, Interim Dean, UMass Boston School for the Environment

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Attachments <i>to be provided under separate cover</i>	

Acronyms and Abbreviations

ANEP	Association of National Estuary Programs
APCC	Association to Preserve Cape Cod
BCG	Biological Condition Gradient
BHEN	Boston Harbor Ecosystem Network
BU	Boston University
CC	Cape Cod (MassBays Region)
CCC	Cape Cod Commission
CCCD	Cape Cod Conservation District
CCMP	Comprehensive Conservation and Management Plan
CCS	Center for Coastal Studies
CCWRRP	Cape Cod Water Resources Restoration Project
CPR	Coastal Pollution Remediation (CZM Grant Program)
CS	Central Staff (MassBays Boston Office)
CSA	Citizen Science Association
CSO	Coastal States Organization <i>or</i> Combined Sewer Overflow
CWA	Federal Clean Water Act
NEPCWG	National Estuary Program Coastal Watershed Grant Program
CZM	MA Office of Coastal Zone Management
DCR	MA Department of Conservation and Recreation
DEP	MA Department of Environmental Protection
DER	MA Department of Fish and Game, Division of Ecological Restoration
DMF	MA Department of Fish and Game, Division of Marine Fisheries
DPW	Department of Public Works
ED	Executive Director, MassBays
EDA	Estuary Delineation and Assessment
EJ	Environmental Justice
EPA	U.S. Environmental Protection Agency
ENHC	Essex Natural Heritage Commission
ESG	Ecosystem Services Gradient
ETT	Ecohealth Tracking Tool
FTE	Full-time Equivalent
GOMC	Gulf of Maine Council on the Marine Environment
IRWA	Ipswich River Watershed Association
ISA	Interagency Service Agreement
LGC	Local Governance Committee
LID	Low Impact Development
LNS	Lower North Shore (MassBays Region)
LOE	Level of Effort
MC	Management Committee
Mass Audubon	Massachusetts Audubon Society
MassBays	Massachusetts Bays National Estuary Partnership
MassDOT	MA Department of Transportation
MassDPH	MA Department of Public Health
MB	Metro Boston (MassBays Region)
MBL	Marine Biological Laboratory
MCCA	Massachusetts Coastal Condition Assessment
MET	Massachusetts Environmental Trust
MIT Sea Grant	MIT Sea Grant College Program
MMC	Massachusetts Marine Collective
MOP	Massachusetts Oyster Project
MOTN	Marine & Oceanographic Technology Network
MME	Massachusetts Marine Educators

Acronyms and Abbreviations, continued

MPG	Multipurpose Program Grant
MS4	Municipal Separate Storm Sewer Systems
MVP	Municipal Vulnerability Preparedness
MVPC	Merrimack Valley Planning Council
MWRA	Massachusetts Water Resources Authority
MRWC	Merrimack River Watershed Council
MyRWA	Mystic River Watershed Association
NECC	Northern Essex Community College
NEP	National Estuary Program
NEPORT	NEP On-line Reporting Tool
NERACOOS	Northeast Regional Association of Coastal and Ocean Observing Systems
NHDES	New Hampshire Department of Environmental Services
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NS	North Shore (LNS + UNS MassBays regions)
NSRWA	North and South Rivers Watershed Association
NU	Northeastern University
NUMSC	Northeastern University Marine Science Center
NWF	National Wildlife Federation
NWR	National Wildlife Refuge
O&M	Operations and Management Plan
ORD	Office of Research and Development, EPA
OST	Office of Science and Technology, EPA Headquarters
PFAS	Per- and PolyFluoroAlkyl Substances
PIE-Rivers	Parker-Ipswich-Essex Rivers Restoration Partnership
PRNWR	Parker River National Wildlife Refuge
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RC	Regional Coordinator
RCC	Restoration Coordination Center (Cape Cod)
RPA	Regional Planning Agency
RSP	Regional Service Provider
SLL	Stone Living Lab
SLR	Sea Level Rise
SS	Staff Scientist, MassBays OR South Shore (MassBays Region)
SSCW	Salem Sound Coastwatch
SSL	Sustainable Solutions Lab
SSU	Salem State University
STAC	Science and Technical Advisory Subcommittee, MassBays
TNC	The Nature Conservancy
TTOR	The Trustees of Reservations
UHI	Urban Harbors Institute
UMB	University of Massachusetts Boston
UNH	University of New Hampshire
UNS	Upper North Shore (MassBays Region)
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WAA	Watershed Action Alliance
WBNERR	Waquoit Bay National Estuarine Research Reserve
WHOI	Woods Hole Oceanographic Institution
WWTP	Wastewater Treatment Plant

A. Summary

2021-2022 Progress and Accomplishments

In our annual **NEPORT reporting** to EPA for October 2020 through September 2021, MassBays submitted documentation of 154 acres of habitat restored, as well as more than 3 miles of fish runs, and leveraged funding of more than \$2million during the NEPORT reporting period of October 1, 2020 through September 30, 2021. This translates to \$4 cash and in-kind support secured for every \$1 invested by EPA. Leveraged funds are in addition to the 1:1 non-federal resources put forward as direct match to EPA's funding under CWA §320.

Restoration targets for coastal habitat extent and condition have been finalized for eelgrass, salt marsh, and tidal flats, and are being incorporated into MassBays' Comprehensive Conservation and Management Plan (CCMP), with work underway to develop targets for diadromous fish habitat. We acknowledge the significant assistance received from EPA's Office of Research and Development (ORD) and Office of Water/Office of Science and Technology (OW) to implement the Biological Condition Gradient for this purpose.

With help from EPA OW, MassBays now has a **Data Exploration Tool**, which provides MassBays' RCs and Boston staff ready access to data compiled in the EDA, as well as the historic data sets and categorization of embayments that were prepared for the BCG process. Then, with EPA Exchange Network Grant funding (2018 award, Grant No. OS-83941701-1), this June MassBays completed a public-facing interactive data mapping tool, the **Ecohealth Tracking Tool (ETT)** available at www.MassBaysEcohealth.org.

Completed an internal program review process which resulted in identification of a new host entity for MassBays. We submit this proposed workplan as a Center within the University of Massachusetts Boston's School for the Environment, the result of a thorough and thoughtful process initiated and carried out by MassBays' MC and based on a vote of Committee members. Consideration of the transition process to date has encompassed everything from transfer of funds and projects to repositioning of staff as Research Staff at the University.

"Exploring stakeholders' ecosystem services perceptions across Massachusetts Bays using deliberative valuation" was submitted in April 2022 for publication in Environmental Management by UMass Boston researchers with MassBays staff as co-authors. This report documents the process and results MassBays used to identify ecosystem benefits provided by eelgrass, salt marshes, and tidal flats that are important to local community members.

New connections to environmental justice communities were established when MassBays became a partner on an NSF planning grant, and the ED facilitated four workshops with members of underserved communities in Plymouth and Falmouth (Herring Pond Wampanoag and Cape Verdean communities, respectively). With assistance from the Mystic River Urban Waters Ambassador, MassBays Regional Coordinators now have new tools for identifying and reaching out to local EJ communities

In Salem, the RSP assisted in expanding the urban forest through meetings with neighborhood associations, a Facebook page and introductory video, and volunteers – in the first season they planted more than 400 trees in Environmental Justice (EJ) neighborhoods. This effort, in collaboration with DCR, is a "Greening Gateway Cities" project.

Healthy Estuaries Grant Program projects were completed, including a relaunch of the Merrimack River Watershed Council's water quality and bacteria monitoring on the lower portion of the river; research to develop design standards for docks and piers in the vicinity of eelgrass, an inventory of Belle Isle Marsh, Boston's last remaining salt marsh; and monitoring in Cape Cod Bay to characterize the extent and impacts of coastal acidification.

MassBays made two successful applications for additional funding: 1) a NOAA Project of Special Merit to improve reliability and support more up-to-date mapping of eelgrass in Massachusetts waters, and 2) an EPA Exchange Network project to develop tools to help local monitoring groups improve data management practices, as well as analyze and share their data with multiple audiences. Both projects are underway.

See **Section B, Completed Major Projects**, for more detail on these and other accomplishments.

2022-2023 Proposed Work

Highlights of proposed new work for the coming year include:

- **Submitting MassBays' CCMP.** While developing the habitat targets for the final CCMP, MassBays has already implemented many actions included in the plan submitted in 2019. We will submit the final document to EPA in the first quarter of our grant award period, including updates to all sections and actions as needed, as well as planned spending under the Bipartisan Infrastructure Law (BIL, the Infrastructure Investment and Jobs Act of 2021).
- **Establishing a new Center at University of Massachusetts Boston.** Within its new host entity, MassBays will become a Center within the School for the Environment (SFE) on the Boston Harbor campus, and MassBays will become research staff at the institution. Along with this shift, MassBays will **develop an updated Finance Plan** to accompany the CCMP to incorporate new funding opportunities and partnerships enabled by our new host arrangement.
- **Final reporting on a project to increase agency confidence in eelgrass maps used for project review and ocean planning.** MassBays is leading this Project of Special Merit with funding from NOAA, and in collaboration with CZM. The goal is to facilitate comparison across remote sensing methods for eelgrass mapping.
- **Investigate aquaculture-eelgrass interactions to inform policy.** With MIT Sea Grant, MassBays will convene workshops to identify and discuss interactions between aquaculture and eelgrass.
- **Launch MassWateR.** With funding from EPA's Exchange Network Grant Program, MassBays will publish an R package which monitoring partners can use to carry out QA/QC data analysis according to DEP and EPA standards.
- **Expanding support to underserved and environmental justice communities.** All RSPs, along with Central Staff, will use information provided by the Mystic River Urban Waters Ambassador to offer direct assistance and capacity-building to facilitate community input into decision making.
- **Monitoring and restoring blue mussels at the mouth of the North and South Rivers.** The South Shore RSP will launch a multi-year shellfish restoration project in the near-subtidal and low-intertidal zones to benefit migratory shorebirds and restore a crucial hard-bottom species.
- **Monitoring for sea brook trout in Manchester-by-the-Sea.** The Lower North Shore RSP will begin a citizen monitoring program to record temperatures in Sawmill Brook and Cat Brooks and sample environmental DNA for sea brook trout, herring and rainbow smelt.
- **Incorporating socioeconomic variables into restoration planning.** The Metro Boston RSP will identify and compile data for socio-economic variables to assess relationships among stressor, resource, and socio-economic factors to inform priorities for restoration efforts in environmental justice areas.
- **Reviewing bylaws for climate resiliency.** In cooperation with Greenscapes and with funding from EEA, the Upper North Shore RSP will review and provide model bylaws for municipalities across the North Shore, encompassing stormwater, zoning, wetlands, and subdivision bylaws.

Specific proposed MassBays-wide and regional tasks are described in **Section C, New and Ongoing Projects**.

Staffing and Management

MassBays' Management Committee sets priorities for the program, and fosters partnerships for diverse engagement in our work. Committee members for the period July 1, 2021 through June 30, 2022 are listed in Attachment A.

With this workplan, MassBays begins work with a new host entity, the *University of Massachusetts Boston School for the Environment (SFE)*. This host decision is the result of a process initiated and carried out by MassBays' MC to evaluate hosting alternatives for MassBays in 2021 at the recommendation of an *ad hoc* Program Evaluation Subcommittee. The Subcommittee cited language in MassBays' Structure and Operating Procedures stating that such an evaluation would take place "periodically;" in addition, EPA's findings from previous Program Evaluations pointed out that MassBays should seek opportunities for more independent communications and diverse funding opportunities. A separate Evaluation Team led by the MC Chair was delegated by the MC to solicit Statements of Interest from potential host institutions. The seven-member team included MC representatives from business, nonprofit organizations, academia, and a state agency. Evaluation criteria were vetted by the MC, then used to carry out a transparent and objective Analytical Hierarchy Process through which those criteria were weighted in terms of importance to MassBays' operations and sustainability. EPA Region 1 provided critical input regarding considerations of host capacities, timelines, and lessons learned from similar evaluations undertaken by other NEPs. A final vote by the MC determined that MassBays should pursue hosting by UMass Boston contingent on satisfactory responses to final questions regarding program and communication autonomy, adequate office space, confirmed return on indirect, and equivalent salaries and benefits for staff.

Final terms of the agreement reached between the MC and UMass Boston include a transition to the new host to be completed by October 1, 2022 with the following confirmed and in place:

- MassBays will be a Center within SFE. As a Center, the Director has the authority to hire, evaluate, and with due process remove staff in accordance with HR procedures.
- MassBays personnel will be Professional Staff Union-represented research staff at the University, with authority as principal investigators to seek diverse funding initiate and implement funded programs.
- UMass Boston will provide the following:
 - In-kind technical, communications and outreach, and development assistance.
 - Office space for up to five staff, and meeting space.
 - Fiscal management, IT, and HR services.
 - Photocopiers and printers, computers and software, and internet and phone services.
- MassBays will apply UMass Boston's federally negotiated indirect rate (currently 52.5%) to the following line items: salaries, fringe, contracts, pieces of equipment less than \$5000, travel, and the initial \$25,000 of subawards in the first year of any multi-year agreements.
- SFE will provide 30% return on indirect costs incurred on MassBays funds to MassBays at the close of the fiscal year; these funds will be used by the program to implement the MassBays CCMP as endorsed by the MC in the annual workplans.

Executive Director Pam DiBona is responsible for the overall management of the program, including reports to EPA and other funders; staff supervision, including oversight of Regional Service Providers in line with contracts. She works closely with the Management Committee Chair to guide organizational development, including strategic planning and communications, and securing supplemental funding to implement the CCMP.

Staff Scientist Prassede Vella is MassBays' lead for all MassBays monitoring and technical reporting efforts. She coordinates the Healthy Estuaries Grant Program, staffs the Science and Technical Advisory Subcommittee to our Management Committee, and collaborates with institutional partners to generate data critical to MassBays CCMP implementation.

Coastal Data Scientist Jill Carr is a 0.8FTE staff person funded by supplemental grant awards external to the S.320 cooperative agreement for FFY22. In addition to providing technical assistance to community-based monitoring groups across the MassBays planning area with training and new tools to make more quality data available, she leads MassBays’ habitat monitoring and mapping efforts. Both are important inputs to meeting our CCMP goals.

Regional Service Providers (RSPs) connect MassBays with planning area communities organized under five regions: Upper North Shore, Lower North Shore, Metro Boston, South Shore, and Cape Cod. Under cooperative grants from MassBays, each RSP designates a Regional Coordinator, in turn responsible for identifying regional priorities consistent with the outcomes articulated in the CCMP, and implementing an annual workplan at the local level. For FFY2022, the following organizations will serve in this capacity:

- Merrimack Valley Planning Commission (MVPC)/MassBays Upper North Shore Region
- Salem Sound Coastwatch (SSCW)/MassBays Lower North Shore Region
- Northeastern University Marine Science Center (NUMSC)/MassBays Metro Boston Region
- North and South Rivers Watershed Association (NSRWA)/MassBays South Shore Region
- Association to Preserve Cape Cod (APCC)/MassBays Cape Cod Region

Finally, MassBays will administer the Urban Waters grant to Mystic River Watershed Association through a subaward pending incremental allotments from EPA.

FFY2022 Budget Overview

A detailed budget request and narrative are included in **Section D**; a summary is included here:

Salary & fringe	\$ 232,501
Travel	\$ 6,042
Contractual	\$ 300
Other Direct Costs	\$ 410,139
Indirect	\$ 191,018
Total Request	\$ 840,000
Non-Federal Match	\$ 846,266

B. Completed Major Projects and Activities (July 1, 2021 to June 30, 2022)

MassBays' Workplan for FFY2021 was guided by the Goals and Strategies of our Interim CCMP:

Goal 1. MassBays provides new resources to support research and management in the Bays.

Strategy 1.1 Make new data available, especially to address gaps in knowledge

Strategy 1.2 Support valid (QA/QC) data collection and use

Strategy 1.3. Analyze and present existing data in multiple formats to document baselines and trends

Goal 2. MassBays reaches all planning-area municipalities with actionable information about coastal habitats

Strategy 2.1 Support and conduct research to address gaps in knowledge and inform policy and actions regarding ecosystem conditions and functions

Strategy 2.2 Provide education, training, and technical support; share case studies (successful and not); and support collaboration and cooperation on specific topics

Strategy 2.3 Facilitate access to decision making forums, and increase influence on decision making by underserved communities

Goal 3. MassBays provides regular and locally informed State of the Bays reporting that reflects the unique characteristics of MassBays assessment units (embayments, rocky shore, barrier beach), and documents progress to inform local action and progress toward target conditions.

Strategy 3.1 Establish target (improved) water quality and habitat conditions tied to desired uses and ecosystem services, and document progress toward those targets.

Strategy 3.2 Guide local action to expand habitat and improve water quality according to targets

Strategy 3.3 Maintain MassBays' National Estuary Program status

Our work is closely aligned with the Clean Water Act Core Programs, which are:

- (1) establishing water quality standards
- (2) identifying polluted waters and developing plans to restore them (total maximum daily loads)
- (3) permitting discharges of pollutants from point sources (National Pollutant Discharge Elimination System permits)
- (4) addressing diffuse, nonpoint sources of pollution
- (5) protecting wetlands
- (6) protecting coastal waters through the National Estuary Program
- (7) protecting Large Aquatic Ecosystems.

The following list of accomplishments is organized according to the CCMP Strategies included in our 2019 Interim CCMP completed by June 30, 2021. Each project description includes the following:

Title

CWA core program: Per list (1-7) above

Objective: project-specific objective

Partners: Collaborators not directly funded by MassBays/\$320 funds

Status: as of June 2022

Accomplishments and Deliverables: completed products

Strategy 1.1 Make new data available, especially to address gaps in knowledge

Title	Implement MassBays Monitoring Plan (Central Staff)
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Compile data sets for MassBays' delineated embayments, toward the goal of comprehensive and specific State of the Bays reporting.
Partners	STAC, DEP, SSCW, SSU, CCS, CZM, ACASAK Technologies
Status	Year 2 pilot completed; contract renewed for the second monitoring year: 25 sites in the near-shore region from Cohasset to Provincetown, as well as the outer Cape Cod coast around Provincetown to the National Seashore.
Accomplishments and deliverables	
Implemented Year 2 of the MA Coastal Conditions Assessment (Year 2021)	Coordinated fieldwork including monthly survey (June-August) of Region A (Salisbury to Boston Harbor) to assess coastal conditions. During Year 2, work included water quality monitoring, sediment quality monitoring and identification of benthic macroinvertebrates from 25 sites across Massachusetts. Data have all been analyzed. Benthic infauna analysis was funded by the Massachusetts Ocean Trust Fund. Planning for Year 3 (25 sites, Region B) was initiated in the Spring in preparation for the field season.
Investigate nutrients in Salem Sound	Conducted monitoring according to approved QAPP in Danvers River and Salem Sound between July and September 2020. This built on the monitoring conducted in 2019. Gathered new baseline data for nutrients, sediment characterization, and benthic community structure in Salem Sound. A report of findings and recommendations for next steps was developed and submitted to EPA in May 2022. Results presented at Underwater Salem Series (May 18, 2022).

Title	Investigate microplastics in Ipswich Bay beach sand and water column (Upper North Shore)
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Estimate the reach and degree of microplastic pollution.
Partners	BU, UNH, NECC, SSS
Status	Developed new protocols for beach sand microplastic collection and processing. The new protocols were based on "lessons learned" from last year's effort, including for example sampling sand and wrack at the king tide wrack line.
Accomplishments and deliverables	
Recorded baseline conditions in Great Marsh beaches.	The RC sampled three of the six beach site locations (Plum Island Lot1, Plum Island North Point, and Salisbury Beach) after the fall king tide and submitted to NECC for processing as part of student thesis work.
Recorded baseline conditions in Ipswich Bay waters.	Water column microplastic samples collected in the Little River, Parker River, Rowley River, Ipswich River, and the Plum Island Sound through May 2022. Established a new partnership Triple Ring Technologies (a tech incubator) to help alpha test their prototype microplastic water column sampler.

Title	Monitor Cyanobacteria blooms (Cape Cod)
CWA Core Program	Protecting coastal waters through the National Estuary Program; Identifying polluted waters and developing plans to restore them
Objective	Collect actionable information on harmful cyanobacteria blooms for the public and decisionmakers.
Partners	EPA, towns of Brewster, Chatham, Barnstable, Dennis, Yarmouth, MA Department of Public Health, MA DEP, MET
Status	Outreach efforts have increased visibility of the problem that exists in many CC ponds as documented by volunteer monitoring.
Accomplishments and deliverables	
Revised Risk Categories accepted by local health agents and MassDPH	APCC revised Risk Categories for interpreting and reporting results to health agents and the public, to include DPH criteria and toxin testing if warranted - this was accepted by health agents and MassDPH for 2022, a major achievement - see updated webpage at https://apcc.org/our-work/science/community-science/cyanobacteria/ represents a major step forward in this program to raise public awareness of the health and ecological threats posed by cyanobacteria blooms.
Report on transport of cyanobacteria and cyanotoxins via herring	Pilot study "Pond-to-Sea" cyanobacteria-herring project and status of herring found cyanotoxins were present in juvenile herring and in stream water and pond water along two herring runs in Brewster and Mashpee.

Title	Monitor Diadromous Fish Runs (South Shore, Cape Cod)
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Provide local, state, and federal fisheries managers with population estimates of river herring at monitored runs to inform protection, restoration and management efforts. Monitoring by volunteers also supports citizen stewardship of runs.
Partners	DMF, NOAA Fisheries, Herring River Network, citizen volunteers
Status	Data submitted for 2021 runs; 2022 counting efforts were taken up by volunteers once again this year.
Accomplishments and deliverables	
2021 Herring run results reported (SS, CC)	Data submitted to DMF.
Trends report for Cape Cod runs from 2007 to 2021 completed	Plots of herring run size estimates over time indicate that for most if not all runs, the highest numbers occurred in past years (i.e., runs have not really recovered despite the ban on fishing). Some runs have declined significantly over time, while others have oscillated up and down within limits. Most runs number in the 10,000s, a few runs number in the 100,000s, and a few runs number less than 1000.
2022 counts carried out	Eight groups of volunteers were trained for CC monitoring at 16 sites; Six SS sites were monitored by trained volunteers. The South River run was also monitored using a camera system.

Title	Long-term Monitoring of Salt Marsh Vegetation Change (South Shore)
CWA Core Program	Protecting wetlands
Objective	Work with volunteers to monitor salt marsh vegetation changes through the Salt Marsh Sentinels program.
Partners	Private dock owners, volunteers
Status	2021 data and 5-year trends shared with multiple audiences
Accomplishments and deliverables	
Year 5 training, monitoring, and reporting completed	Program expanded to Cohasset, results presented to multiple audiences, including volunteers, Massachusetts' Salt Marsh Working Group, and CERF biennial meeting.

Title	Mapping Sea Level Rise-induced Marsh Platform Die-off Areas (Upper North Shore)
CWA Core Program	Protecting wetlands
Objective	Document impounded water and die-off using drone imagery and field surveys.
Partners	UNH, BU, 8TGM
Status	2021 data collected and mapped
Accomplishments and deliverables	
Previously mapped die-off areas confirmed	Marsh die-off sites were ground-truthed by drone at previously flown sites in Salisbury, Newbury, and Rowley; flight schedule determined for 2022.

Title	Marine Invasive Species Monitoring (Upper North Shore, Lower North Shore)
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Monitor established field sites for non-native species in cooperation with CZM
Partners	CZM, volunteers
Status	Monthly monitoring conducted June-October, 2021; data submitted to CZM
Accomplishments and deliverables	
Monitoring sites across MassBays' planning area	All monitoring carried out as planned, including volunteer training, and photo-documentation of the Beverly Pier settle plates. LNS trained a new volunteer coordinator to lead this effort for their region.

Title	Horseshoe Crab Spawning Surveys (South Shore)
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Conduct horseshoe crab spawning surveys in Duxbury Bay to assess the population
Partners	DMF, volunteers
Status	2021 data were submitted, 2022 surveys were conducted and data summary is in process.
Accomplishments and deliverables	
Reporting up-to-date	Data for the 2021 season were submitted to DMF.

Title	Water quality monitoring (South Shore, Lower North Shore)
CWA Core Program	Protecting coastal waters through the National Estuary Program; Identifying polluted waters and developing plans to restore them
Objective	Lead citizen monitoring in coastal waters to identify potential for remediation and source control.
Partners	EPA, MassDEP, municipalities
Status	2021 monitoring completed; plans for 2022 sampling season are in place.
Accomplishments and deliverables	
Riverwatch monitoring (SS)	Eight sampling events held over the course of the 2021 field season; sampling at 10 sites for the 2022 season began in June 2022. With SS support, the Town of Hanover received a DEP Water Quality Monitoring Grant to engage the RSP in conducting bacterial source tracking in the headwaters of the North River.
Clean Beaches & Streams and tributary monitoring (LNS)	Water samples collected biweekly from June through August 2021 at up to 18 outfalls and streams for bacterial analysis following an approved 2020 QAPP; results published on SSCW website at https://www.salemsound.org/CB&S.html . Remediation efforts taken up by municipalities in response to the findings include a new project in Sawmill Brook (Manchester), new sewer lining in Salem along Loring Ave prompted by LNS reports of algae in the Forest River, and sewer replacement along Forest River in Salem.

Title	Assess Coastal Acidification in Massachusetts (Central Staff, South Shore)
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Assess coastal acidification conditions in Duxbury Bay.
Partners	EPA, UMB, Town of Duxbury
Status	MassBays' coastal acidification monitoring system is deployed and collecting continuous data. Central Staff and RCs continue engagement with state and regional entities investigating potential impacts and responses.
Accomplishments and deliverables	
Ocean acidification monitoring system developed and deployed in Duxbury Harbor	Following testing of the system and some final troubleshooting in 2020, the system was deployed in Duxbury Harbor for the second time in July 2021. After 4 weeks of data gathering the system was flooded during a storm and had to be recovered. The system sustained extensive damage and is currently being repaired. The data gathered in 2021 provided a brief insight into pH variation across tidal cycles. However more data are needed to be able to establish causality of observed low pH data of short-time duration. A third and final attempt at deployment of the prototype was initiated in May 2022 and the system is still operating well as of June 2022.

Strategy 1.2 Support valid (QA/QC) data collection and use

Title	Support for Citizen Science Monitoring Efforts (Central Staff)
CWA Core Program	Identifying polluted waters and developing plans to restore them
Objective	Increase the value and use of citizen monitoring data for decision making across the region.
Partners	Monitoring Coordinators Network, CSA Data Quality and Metadata Working Group, MassRivers Alliance, DEP, EPA EN, EPA Region 1, Eastern Research Group, UMCES-IAN
Status	One-on-one assistance to groups continues via Zoom and in person, as well as engagement with regional and national efforts. Training, outreach and technical support continues to promote use of AquaQAPP (launched in Fall 2021) and submission of data to WQX.
Accomplishments and deliverables	
AquaQAPP outreach	Presented at local, regional and national-scale venues to demonstrate AquaQAPP and promoting its use in developing Quality Assurance Project Plans. Several NEPs and state agencies across the country have requested one-on-one demonstrations and discussions about how to use and/or adapt the tool to their area. Dozens of watershed groups in Massachusetts have interacted with the tool, and several have already used it to generate QAPPs for review by EPA and DEP in support of water quality monitoring grants.
One-on-one tech support provided	Provided technical support to 13 watershed monitoring programs, including developing appropriate monitoring methods for salt marsh and eelgrass studies, developing research goals of a new water monitoring program in Swampscott, assisting in developing a QAPP for D.O. monitoring in the Parker River, serving on a monitoring steering committee, providing custom WQX training, assisting with data formatting for import to WQX, developing a process by which to submit data from a regional database into WQX, helping strategize new citizen science opportunities, and providing connections to assist in setting up new lab equipment.
Launch of new seagrass monitoring tool	Officially launched a citizen science eelgrass monitoring app, iSeaGrass (www.iseagrass.com), which was developed in collaboration with DMF. Presentations given to various local and national audiences on its use to promote open seagrass data.
WQX custom data import configurations	In process of developing custom import configurations for three organizations (Center for Coastal Studies, MWRA, Cape Cod Commission) to help facilitate their data sharing via WQX. Once finalized, this will make the groups' data findable to the public and will allow incorporation into other data products like MassBays' ETT.
Secured EPA Exchange Network funding	In November 2021, kicked off new Exchange Network grant project, Building Technical Capacity for Data Analysis & Visualization. Project will develop a suite of R-based packages for streamlining and standardizing data QA/QC, analysis and visualizations; host beta testing and training sessions; and develop and Community of Practice. Monitoring Groups gain expanded capacity for data analysis and reporting, and more data are contributed to WQX.

Strategy 2.1 Support and conduct research to address gaps in knowledge and inform policy and actions regarding ecosystem conditions and functions

Title	2020-2021 Healthy Estuaries Grant Program
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Improve understanding and extent of data available across MassBays' planning area.
Partners	EPA, SSCW, CCS, MyRWA, MRWC
Status	All projects completed.
Accomplishments and deliverables	
Project summaries are posted on the MassBays website	MassBays administered the 3rd round of the grant (2020-2021). Technical support was provided as needed by the Regional Service Providers for projects in the respective regions. The four funded projects covered a wide variety of topics and geographic areas. All projects have been wrapped up and results are available at https://www.mass.gov/service-details/projects-funded-by-massbays-grant-programs (projects dated 2020).

Title	Increasing agency confidence in eelgrass maps used for project review and ocean planning
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Investigate eelgrass remote sensing techniques to quantify mapping and edge detection accuracy.
Partners	Massachusetts Office of Coastal Zone Management (co-PI), Massachusetts Department of Environmental Protection, Massachusetts Division of Marine Fisheries, NSRWA, SSCW, MIT Sea Grant, Northeastern University
Status	Won grant in Fall 2021 and kicked off project by convening Advisory and Steering Committees. QAPP approved. Field surveys to be completed June 2022 and analysis and reporting to be completed by April 2023.
Accomplishments and deliverables	
Project planning	Advisory Committee made up of local experts was convened on two occasions to get feedback on proposed sites, field survey methods, and analytical processes. Steering Committee comprised of project partners met to establish roles, schedules and equipment needs.
QAPP development	QAPP finalized, signed by EPA QA Officer and distributed to partners.
Data acquisition	Field surveys completed in June 2022 following protocols described in the QAPP.

Title	Assess Impacts of <i>Phragmites</i> Management Practices in the Great Marsh (Upper North Shore)
CWA Core Program	Protecting wetlands
Objective	Determine progress regarding <i>Phragmites</i> removal in the Great Marsh and investigate potential adverse impacts of repeated herbicide application.
Partners	BU
Status	Interim report completed and results presented at the February 2022 quarterly meeting of the MassBays MC
Accomplishments and deliverables	
Interim findings presented	<ul style="list-style-type: none"> • Three years of monitoring appears to be sufficient to evaluate the success of <i>Phragmites</i> die-off and native plant recovery. • Plant assemblages may continue to change as conditions stabilize and/or as sea level rises. • Maintenance treatments will most likely need to be performed every other year to fully control <i>Phragmites</i> invasion into the open, high marsh. • Rising seas flooding the marsh with higher-salinity water to a depth and with a frequency undesirable to <i>Phragmites</i> will help keep open marsh <i>Phragmites</i> colonization at bay. • <i>Phragmites</i> may be more tolerant or more adaptable to SLR than many other high marsh vegetation.
Compared treated to untreated sites	Presence/absence of <i>Phragmites</i> and status of native marsh vegetation and benthic conditions assessed at nine Presence/Absence sites and six Marsh Vegetation Recovery sites.

Title	Seagrass Seed Restoration Pilot Study (Metro Boston)
CWA Core Program	Protecting Large Aquatic Ecosystems.
Objective	Pilot a seed-based eelgrass restoration effort in areas around Boston Harbor and evaluate its effectiveness
Partners	EPA, BU, BHEN, Girls Inc.
Status	Seedlings observed in April 2022; program evaluation underway
Accomplishments and deliverables	
Seeds collected, transplanted, and monitored	In collaboration with scientists at NUMSC, EPA, and BU and engaging girls in the Beach Sisters program at Girls, Inc., seagrass seeds were planted at two sites in Winthrop MA in late September/early October using three methods. Monitoring for germination in November, and again in April; seagrass seedlings observed at both sites in April 2022.
Letter of Interest submitted under the NEP Coastal Watershed Grant Program	Proposed project submitted in September 2021, “Restoring eelgrass habitat by seed using community science in MassBays NEP” was not selected for funding.

Title	Dam Removal Implementation and Monitoring: Peterson Pond, Veterans Memorial Park, Temple Street Dams (South Shore)
CWA Core Programs	Protecting coastal waters through the National Estuary Program
Objective	Work with regional communities and other partners to assess feasibility and seek funding for removal of dams and other barriers and collect ecological data pre- and post-restoration
Partners	NOAA Fisheries, DER, Towns of Marshfield and Duxbury: dam removal project technical assistance and management
Status	Peterson Pond dam removed; progress continues on others
Accomplishments and deliverables	
Peterson Pond Dam post-removal monitoring	Progress reports provided to funding agency
Temple Street Dam (Marshfield & Duxbury) removal assessed	Permitting underway
Luddams Ford Dam (Hanover & Pembroke)	Natural Resources Damages Grant secured for feasibility study

Strategy 2.2 Provide education, training, and technical support; share case studies (successful and not); and support collaboration and cooperation on specific topics

Title	MassBays Science Walk (All regions)
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	To share information with diverse learners about research, monitoring, and restoration in the Bays, and the importance of estuaries
Partners	MIT Sea Grant, MyRWA, CCS, DMF, MOP, MRWC
Status	Seventeen vinyl banners were presented at public spaces throughout the region from June to November 2021 and shared on MassBays' website. Installation locations included Martin's Park near the Boston Children's Museum (Boston), the Cape Cod Museum of Natural History (Brewster), Rock Harbor (Orleans), the Ipswich Mills Dam (Ipswich) and along Fishermans Beach (Swampscott). (https://www.mass.gov/info-details/massbays-science-walk-2021)
Accomplishments and deliverables	
Expanded reach	Family-friendly banners presented in well-travelled public sites. Each poster included QR codes to facilitate more in-depth exploration.
Built capacity among partners	Consultant provided training and one-on-one support to leads on poster preparation, improving ability to communicate with public audiences.
Documented MassBays' contributions to work in the estuaries	The range of projects supported by MassBays was well-represented by the posters, and included two posters to bracket the walk describing MassBays and the importance of estuaries.

Title	City Nature Challenge – Boston Area (Central Staff)
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	To engage diverse learners in watershed and increase awareness of beaches as coastal habitat
Partners	Brandeis University, Zoo New England, Earthwise Aware, National Park Service, Suffolk University, UMB
Status	International annual Challenge completed May 2021. MassBays' iNaturalist project, #MassWrack, was featured in outreach materials.
Accomplishments and deliverables	
Expanded reach	MassBays' logo was included in all materials, including Boston's project page on the international City Nature Challenge website (https://www.inaturalist.org/projects/city-nature-challenge-2022-boston-area)
Supported partnerships	ED served on the steering committee, and secured outreach via REI's new retail location in North Point, Boston.
#MassWrack observations analyzed through June 2021	UMB graduate intern Shannon Hogan analyzed #MassWrack observations collected through June 2021 to catalog species utilizing this coastal habitat. She presented "What's in the wrack – and why we should protect it" to the MC September 2021. Her recommendations were to: 1) encourage communities to include wrack in their beach management plans; 2) study whether beach characteristics affect the type and variety of organisms in the wrack, 3) conduct a survey to determine the public's perception of wrack and inform outreach efforts, and 4) explore the use of less-destructive grooming techniques.

Title	Support municipal and regional actions that promote resilient coastal habitats and communities through the use of nature-based solutions (All regions)
CWA Core Programs	All
Objective	Work with partners and communities to encourage planning for climate change including stormwater management and adoption of adaptation measures that promote resilient coastal habitats, especially via nature-based solutions.
Partners	TTOR, Tufts, UNH, BU, Pew Foundation, MassAudubon, Northeast Coastal Coalition, LGCs, CCC, NOAA Restoration Center, WBNERR, CZM
Status	MassBays continues to be a key player in communication and outreach efforts, planning initiatives, and implementation of nature-based coastal management.
Accomplishments and deliverables <i>Climate resilience</i>	
Regional meetings, workshops, and lectures (All regions)	All RCs and Central Staff hosted and/or participated in events describing the impacts of climate change, especially regarding sea level rise and more frequent and severe storms. For example, the Metro Boston RC collaborated with UMass Boston’s Stone Living Lab to produce a conference for more than 150 people on October 26, 2021, with a theme of Resilient Boston Harbor, featuring lightning talks and research posters by presenters from 15 institutions, agencies, and organizations around Boston, including breakout groups for discussion and networking.
Contributed to regional planning (All regions)	All RCs and Central Staff contributed to regional plans, including The Trustees’ coastal strategy, North Shore Drought Management Committee, PIE-Rivers Steering Committee, the South Shore Climate Group, Cape Cod Conservation Agents network, etc. In October 2021 Central Staff convened a Forum on Hypoxia in Cape Cod Bay to investigate potential causes (including climate change) of low-DO events at the request of EPA Region 1. https://youtu.be/dotclCC-ypE
Implemented coastal resilience grants (LNS)	RC was a team member on an MVP project to develop a Peabody/Salem North River multi-use path, and Salem’s CZM Coastal Resilience Grant titled “Climate Deep Dive” in an EJ community.
Facilitated planting of 409 trees in Salem (LNS)	SSCW served as outreach partner for Salem’s Greening Gateway City program, which has a goal of planting 2400 trees in EJ neighborhoods. Produced a video, attended and presented at neighborhood association meetings, collaborated with Tree Commission and DCR forester. https://www.facebook.com/GGCSalem/
Conducted beach profiling (SS)	Monthly beach profiles conducted in Duxbury Beach Reservation, in collaboration with UMB.
Assisted with grant project scoping and applications (All regions)	All RSPs provided input and technical support to municipalities applying to climate change-focused grant programs, including EEA MVP, CZM Coastal Resilience, and SNEP

Title	Support municipal and regional actions that promote resilient coastal habitats and communities through the use of nature-based solutions (All regions) <i>continued</i>
Accomplishments and deliverables <i>Stormwater management</i>	
Inventory of stormwater improvement opportunities at public boat ramps completed (CC)	RSP hired an engineering firm to assess and provide conceptual stormwater BMPs for 20 public boat ramp sites, which will be used to prioritize 5 sites for 75% plans. Eleven towns are participating, including several in the Cape Cod region who have public boat ramps in the MassBays area.
Reviewed and advised on municipal bylaws for LID (LNS)	With funding from DEP's Municipal Assistance Grant Program, provided ordinance and bylaw review for LID advancement to 7 municipalities.
Completed Spanish-language LID maintenance videos (LNS)	Produced Spanish versions of six training videos previously developed by SSCW for DPW workers charged with maintenance of green infrastructure for stormwater management. Topics include rain gardens, high-performance biofiltration systems, catch basin inserts, and bioswales.
Supported municipal stormwater management actions (UNS, LNS)	LNS and UNS RSPs carried out work through the Greenscapes program, which included 24 North Shore communities this year. Completed work includes: "Keeping Water Clean" school-based program, a public program for 150 people held at the Beverly Cabot Theater, and an online LID toolkit (https://greenscapes.org/lid-toolkit/).
Accomplishments and deliverables <i>Habitat Restoration</i>	
Advised on a new living shoreline project (LNS)	Based on their experience with the Collins Cove (Salem) Living Shoreline project (final project information shared at http://salemsound.org/livingShoreline.html), the RC joined site walks and made recommendations for a new living shoreline project at Forest River Park in Salem. Shared lessons learned with MassAudubon staff, and through a public lecture to 98 participants (available at https://vimeo.com/675015566).
Runnels implemented in Essex Bay salt marshes (UNS)	Potential sites on properties owned by the Town of Essex, the Trustees, and other private property were assessed, permits obtained, and runnels implemented and mapped. Monitoring of the sites is underway.
Restoration funding secured (CC)	In April 2022 NRCS announced that the Cape Cod Water Resources Restoration Project will receive FY22 funding of \$42.5 million for 21 restoration projects on Cape Cod, including 13 on the Cape Cod Bay side. The list of funded projects was developed with assistance from APCC, and the RC which met with towns to identify their priorities for restoration, which was used to develop a comprehensive inventory of potential restoration projects.
Joint presentation to Massachusetts Conservation Commissioners (CS, All Regions)	"Successful habitat restoration requires follow-through: coastal case studies and recommendations", presented by Central Staff and all RCs to the Massachusetts Association of Conservation Commissions during their fall virtual conference on 10/20/21. https://youtu.be/zahFqdqkhMY

Title	Mystic River Urban Waters Activities (MyRWA)
CWA Core Programs	Improved water quality
Objective	Coordinate federal, regional, and local contributions and activities in the Mystic River Watershed, providing communications and outreach support to Merrimack River communities, and assisting MassBays with EJ program development.
Partners	EPA, FEMA, USGS, HUD, Dept of Homeland Security, DEP, MRWC, MassBays RSPs, municipalities
Status	Mystic River Ambassador hired and established as a key point person in the network connecting Urban Waters activities in the watershed and beyond.
Accomplishments and deliverables	
Maintained operations of the Mystic River Urban Waters Federal Partnership	Drafted agendas, meeting minutes for planning meetings of the Steering Committee, met with individual Committee members to gain insights into the perceived value of its work, produced and distributed regular email updates and alerts; maintained regular check-ins with EPA Program Officer.
Coordinated Federal input to Mystic River initiatives	Conducted fact-finding interviews with other Urban Waters sites, met with federal partners to learn about case studies and regional efforts, while sharing ideas for collaboration at the state level.
Implemented local actions related to the “Trash Free Mystic” project	Organized cleanups, published data for the Virtual Trash Free Assessment (https://mysticriver.org/news/2022/3/31/visual-trash-assessments), produced awareness videos (https://fb.watch/clqUJ1MwEZ/), installed a trash boom and developed operations and maintenance plan under a NFWF grant.
Assisted with river stewardship events	Contributed to a suite of programs for Earth Month (https://mysticriver.org/news/earth-month-2022-invest-in-our-planet , including a 100+ person clean up at DCR’s Tolbert McDonald park; investigated potential microplastics monitoring program; provided support to the Mystic River Science Forum planning team.

Title	Presentations & Publications
CWA Core Programs	All
Objective	Share MassBays' findings, projects, and expertise with multiple audiences
Partners	multiple
Status	In spite of COVID, MassBays reached multiple audiences; because of the online nature of COVID-era conferences, we shared our work with international and national audiences previously out of reach.
Accomplishments and deliverables <i>Climate resilience</i>	
Joint output	<p><i>Presentation:</i> “Successful habitat restoration requires follow-through: Coastal case studies,” a MassBays panel and recommendations for restoration pre- and post-monitoring presented at the MACC Fall Conference (10/20/21) https://youtu.be/zahFqdqkhMY</p>
Central Staff outputs	<p><i>Presentations:</i> Panelist for “Meaningful Watershed Educational Experience” hosted by the Scituate High School to provide students with an introduction to the various local organizations, experts and citizen scientists who are currently involved in research and abatement of local impacts of global climate change (5/26/22) “Setting the Baseline for Water Quality and Benthic Communities' in Salem Sound” presented at the Underwater in Salem Sound 2022 Lecture Series (5/18/22) “Connecting environmental science & policy in Massachusetts” presented by SS and ED to an undergraduate lecture class at UMB (4/2022) “It can be done! Increasing the quality, usability and distribution of community science data” presented at the Association of National Estuary Programs (ANEP) - BASIS7 technical transfer meeting (3/1/22) “A Framework for Setting Long-term Targets for MassBays” presented at the Association of National Estuary Programs (ANEP) - BASIS7 technical transfer meeting (3/1/22) “New approaches in seagrass mapping: engaging community scientists and assessing remote sensing accuracy” presented at the Association of National Estuary Programs (ANEP) - BASIS7 technical transfer meeting (3/4/22) Presenter and panelist for “Make Your Citizen Science Project Count: Strategies to Produce Quality Data”, hosted by EPA and APHL (9/15/21) “The Connection Between Mapping Seagrass and Art Inspiration” interview with Boston artist Nedret Andre (2/22/22). “R Tools for Water Quality Data Analysis” presentation to watershed groups from across MA introducing R and new tools under development (2/22/22) “Art and Science talk with artist Nedret Andre and marine scientist Jill Carr” presentation to the Turkish Arts Festival (12/4/21) Panelist for “Water Quality in the Merrimack: A 2021 Review.” a public meeting hosted by the Merrimack River Watershed Association (3/14/22). Peer review of Estuaries and Coasts paper titled: “Stakeholder perspectives on the roles of science and citizen science in Chesapeake Bay environmental management”</p>

	<p>“Considering the Past and Future of Boston Harbor” presented to incoming graduate students in UMass Boston’s School for the Environment. (9/2021)</p> <p><i>Publications:</i> Monitoring Coordinators’ Network email newsletter published 7/2021 and 12/2021; MassBays regular e-newsletter published 7/2021, 12/2021, and 5/2022. https://www.mass.gov/service-details/massbays-newsletter</p>
Upper North Shore outputs	<p><i>Presentations:</i> “Phragmites Control and Monitoring in the Great Marsh”, ECAN, 10/29/2022 “Phragmites Monitoring Activities in the Great Marsh” to the MassBays MC, 2/16/2022 “Great Marsh Proposed Restoration Activities and Projects” to the Great Marsh legislative delegation, 3/25/2022 “Invasive Species of the Great Marsh”, podcast for Manchester Cricket, 5/6/2022 “Great Marsh Coastal Restoration”, the Afternoon Buzz radio show, WHMP, 6/23/2022</p>
Lower North Shore outputs	<p><i>Presentations:</i> “Climate Change on a Local Level” presentation at the <i>Keeping History Above Water: Preservation in a Changing Climate</i> conference hosted by SSCW (9/12 - 9/13/21) “Salem’s Industrial Heritage along a Changing Shoreline” and “Salem’s Colonial Maritime Sites and Rising Tides,” public walking tours (9/13/21) “Marblehead Municipal Light Department and Hammond Park Coastal Resilience Project” presented to the Municipal Light Department Commissioners (11/30/21) “Saving our Shoreline: Building Resilience across Salem Sound Communities” presented as part of <i>Underwater in Salem Sound</i> lecture series (1/19/22) “Marblehead Municipal Light Department and Adjoining Public Lands” presented as a series of public forums (2/7, 3/28, 6/11/22)</p>

Metro Boston outputs	<p><i>Presentations:</i> “Adventures of a (non-swimming) aquatic ecologist - From freshwater to saltwater...” presented to Girls Inc. members, Lynn MA (10/19/21) and HS students in Greenfield MA (1/20/22) “Implications of trait divergence and local advantage within seagrass meadows for conservation and restoration,” presented at CERF 2021 (11/2/21) “Not all grasses look alike: Genetic diversity in salt marshes,” presented at NUMSC to Newton MA HS students and teachers (11/10/21) “EDA 2.1: Summary of Results and Conclusions,” presented to the MassBays MC, (2/16/22)</p> <p><i>Publications:</i> DA von Staats, TC Hanley, et al. 2021. “Intra-meadow variation in seagrass flowering phenology across depths.” <i>Estuaries and Coasts</i> https://doi.org/10.1007/s12237-020-00814-0 CG Hays, TC Hanley et al. 2021. “Linking Spatial Patterns of Adult and Seed Diversity Across the Depth Gradient in the Seagrass <i>Zostera marina</i> L.” <i>Estuaries and Coasts</i> https://doi.org/10.1007/s12237-020-00813-1 “Promoting inclusive metrics of success and impact to dismantle a discriminatory reward system in science.” 2021. <i>PLOS Biology</i> https://doi.org/10.1371/journal.pbio.3001282 CG Hays, TC Hanley et al. 2021. “Local adaptation in marine foundation species at microgeographic scales.” <i>The Biological Bulletin</i> https://doi.org/10.1086/714821 TC Hanley et al. 2021. “Short-and long-term effects of nutrient enrichment on salt marsh plant production and microbial community structure.” <i>Journal of Ecology</i> https://doi.org/10.1111/1365-2745.13756 “Repeated genetic and adaptive phenotypic divergence across tidal elevation in a foundation plant species.” 2021. <i>American Naturalist</i> https://doi.org/10.1086/716512</p>
South Shore outputs	<p><i>Presentations:</i> “Salt Marsh Sentinels” presented to volunteers (10/28, 11/4/21), Massachusetts Salt Marsh Working Group (10/29/21), and CERF biennial meeting (11/2/21) “Jacobs Pond Loosestrife” presented to Norwell CPC (1/20/21) “Salt Marshes of the South Shore” presented with USFWS to participants in the NSRWA Winter Nature Challenge (2/9/21) “Population Dynamics of Horseshoe Crabs on Cape Cod” presented to the Massachusetts Horseshoe Crab Science Committee (4/1/22) “Successes and Challenges in Managing Municipal and Ecological Water Demand in a Small Coastal Watershed” presented at JASM meeting (5/20/22) “Estuarine Gradient” podcast numbers 5-8, available at https://www.nsrwa.org/news/podcasts/</p>
Cape Cod outputs	<p><i>Presentations:</i> “Climate Change and Resilience in West Barnstable: What’s happening, what will happen, and what can we do about it?” presented at Wheldon Memorial Library, West Barnstable (11/15/21)</p>

Strategy 2.3 Facilitate access to decision making forums, and increase influence on decision making by underserved communities

Title	Increasing awareness of environmental justice issues
CWA Core Program	Protecting coastal waters through the National Estuary Program
Description/Objective	Highlighting local examples of inequitable distribution of adverse and beneficial environmental impacts for multiple audiences
Partners	WAA, NOAA, Mashpee Wampanoag tribe, UMB, SSL, Wellesley College
Status	New resources produced by the Mystic River Ambassador will scaffold new initiatives in the coming year(s).
Accomplishments and deliverables	
Region-specific EJ materials produced (MyRWA)	Mystic River Ambassador worked closely with MassBays ED to develop a format and content for a series of EJ reports to inform RSP plans for community engagement. The reports combine EJ Screen, EEA EJ Maps, and demographic information, along with lists of organizations already working in the area on similar issues.
Talking Trash for Clean Oceans Teen Program (LNS)	Four high school interns to be funded by NOAA for projects focused on sustainable practices for restaurants (“CoastSmart Restaurants”), home composting (“Composting 101”), and promoting proper disposal of cigarette butts (“Butt Bins”).
Produced materials for the Diversity Committee of the <i>Evolution in Changing Seas Research Coordination Network</i> (MB)	Network-generated deliverables include: 1) Virtual Lab Meeting Training Program, which pairs mentees from historically marginalized groups with mentors in the field; 2) profiles of junior and senior members to facilitate networking and collaborations among academic and non-academic partners; 3) creating educational activities and career development pages, with the goal of having a comprehensive list of resources for educators and students; 4) organizing/facilitating discussion of diversity, equity, and inclusion in evolution and marine science for Summer 2022 Integration and Training Workshop for students and early career scientists
Engaged in national- and state-level planning and assessment of DEI/EJ efforts (MB, Central Staff)	NUMSC participated in an NEP-EPA working group for mutual support and information exchange about effective approaches and tools for increasing DEI (and EJ awareness) within NEP structures and programming. Presented options for tools and assistance to the NEPs in February 2022, including use of EPA’s EJ Screen.

Strategy 3.1 Establish target (improved) water quality and habitat conditions tied to desired uses and ecosystem services

Title	Development of a Biological Condition Gradient Framework for Estuaries in MassBays. (Central Staff)
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Use the BCG framework to set and measure progress towards targets for improvement in estuarine ecosystem conditions.
Partners	STAC, EPA Region 1, EPA ORD, EPA OST
Status	Habitat-based targets identified and endorsed by the MC, metrics proposed for tracking progress toward the targets.
Accomplishments and deliverables	
Resource-stressor categories	Following the finalization of ecotypes and long-term habitat targets, MassBays developed a list of key indicators to measure progress towards targets over time. These indicators were partly informed by the resource-stressor categories developed by the Northeastern University team in August 2021. The MassBays Monitoring Plan is being revised and updated to incorporate these tools.
Target habitat extent and conditions (“habitat goals”) shared publicly	BCG-derived targets for salt marsh, eelgrass, and tidal flats were endorsed by the MC in June 2021 and included as a specific layer with a description of the process in the ETT, completed in June 2022.

Strategy 3.2 Guide local action to expand habitat and improve water quality according to targets

Title	Application of the Ecosystem Services Gradient for MassBays CCMP implementation (Central Staff)
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	MassBays employs an ESG framework to communicate about and encourage local action towards targets for improvement in estuarine ecosystem conditions.
Partners	STAC, EPA Region 1, EPA ORD, EPA OST, UMB, Woods Hole Institute
Status	ESG components were identified by EPA and MassBays staff, and vetted by the RCs; results of stakeholder (local expert) workshops conducted by UMB are in preparation. The outcomes will inform education and outreach regarding targets devised using the BCG framework.

Accomplishments and deliverables

Facilitated workshops to determine local priorities in EJ communities	MassBays’ Director served as co-PI on a successful planning grant proposal to NSF, “Connecting Coastal Communities” under the Smart and Connected Communities program. She facilitated four workshops with two underserved communities (Herring Pond Wampanoag tribal community (Plymouth), Cape Verdean community (Falmouth) to identify priority concerns and restoration opportunities related to their local environment. This work will inform continuing efforts in those and other underserved communities.
Incorporated ESG into CCMP implementation planning	EPA continued to work with MassBays staff and RCs to identify the suite of ecosystems services that eelgrass, salt marsh, tidal flats, and diadromous fish habitat provide in MassBays’ planning area, along with associated metrics. MassBays is helping EPA identify a pilot study area for development and testing the application of the ESG to help a local NGO prioritize restoration actions in Belle Isle Marsh, Boston, MA.

Title	Development of an Ecohealth Tracking Tool (ETT) for State of the Bays reporting (Central Staff)
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	MassBays provides web-based access to water quality data as well as information about habitats relative to CCMP targets
Partners	Comprehensive Environmental, Inc. (consultant)
Status	Soft launch of the ETT on June 30, 2022 (www.MassBaysEcohealth.org)

Accomplishments and deliverables

Supporting materials produced	“Learn about” buttons lead to modal windows describing habitat goals, habitat benefits and threats, relevant water quality parameters, and access to data sources.
WQ data and habitat data presented for multiple audiences	Behind-the-scenes coding imports quality-assured data from EPA’s Water Quality Portal, and shape files produced for MassBays as part of the EDA, as well as agency-generated habitat map layers are displayed. Salt marsh, eelgrass, and tidal flat extent (area) for 44 embayments is presented relative to the BCG targets; WQ data are compared to habitat-supportive thresholds.

C. New and Ongoing Projects and Activities (July 1, 2022 to June 30, 2023)

Strategies and Outcomes

MassBays' work over the coming year will implement components of our Interim CCMP and contribute to the following Outcomes:

- A. Sustainable NEP
- B. Improved habitat continuity and restored hydrology
- C. Improved water quality
- D. Resilient coastal habitat, including nature-based coastal protection
- E. Restored natural communities
- F. Robust interagency and interdisciplinary collaboration and partnerships
- G. Well-informed, multisector input to decision making which includes underserved communities

Our proposed work with funding under Federal Fiscal Year 2022 is aligned with and driven by the following Goals and Strategies described in the CCMP:

Goal 1. MassBays provides new resources to support research and management in the Bays.

Strategy 1.1 Address data gaps

Strategy 1.2 Support valid (QA/QC) data collection and use

Goal 2. MassBays reaches all planning-area municipalities with actionable information about coastal habitats

Strategy 2.1 Support research to inform policy and actions

Strategy 2.2 Technical support and communications

Strategy 2.3 Increase influence of underserved communities on decision making

Goal 3. MassBays provides regular and locally informed State of the Bays reporting that reflects the unique characteristics of MassBays assessment units (embayments, rocky shore, barrier beach), to document progress and inform local action and progress toward target conditions.

Strategy 3.1 Establish target (improved) water quality and habitat conditions tied to desired uses and ecosystem services, and document progress toward those targets

Strategy 3.2 Guide local action for expanded habitat and improved water quality

Strategy 3.3 Maintain MassBays' National Estuary Program status

Our proposed tasks are also closely related to the Clean Water Act Core Programs, which are:

- (1) establishing water quality standards
- (2) identifying polluted waters and developing plans to restore them (total maximum daily loads)
- (3) permitting discharges of pollutants from point sources (National Pollutant Discharge Elimination System permits)
- (4) addressing diffuse, nonpoint sources of pollution
- (5) protecting wetlands
- (6) protecting coastal waters through the National Estuary Program
- (7) protecting Large Aquatic Ecosystems.

The figures below depict estimates of the Level of Effort (LOE) to be expended toward each Strategy. The division of labor between the Boston office (Central Staff) and regional partners (RSPs) is evident when the two are compared. During the coming year, Central Staff (see Figure 2) will focus on bolstering support for implementation of our CCMP – updating our Finance Plan, launching the new Ecohealth Tracking Tool, working with EPA ORD staff to develop indices for water quality that reflect habitat needs, and implementing area-wide research and monitoring to inform regional initiatives, including setting a target for diadromous fish habitat. Significant effort will also be spent on our 2023 EPA Program Evaluation. RSPs (Figure 3) are focused on local implementation and progress toward improved habitat and water quality conditions, through direct support for community-based actions. Taken together with the work planned through the separate Bipartisan Infrastructure Law (BIL) funding, MassBays is looking forward to a year in which we will see significant progress on both the MassBays-wide and regional level.

Figure 2. Central Staff (salary, fringe, and indirect charges) expenditures predicted for FFY2022 through both this workplan and that of the BIL. This includes funding from the 2021 EPA Exchange Network award (Strategy 1.2) and the Project of Special Merit grant from NOAA (Strategy 2.1) to support work of the Coastal Data Scientist.

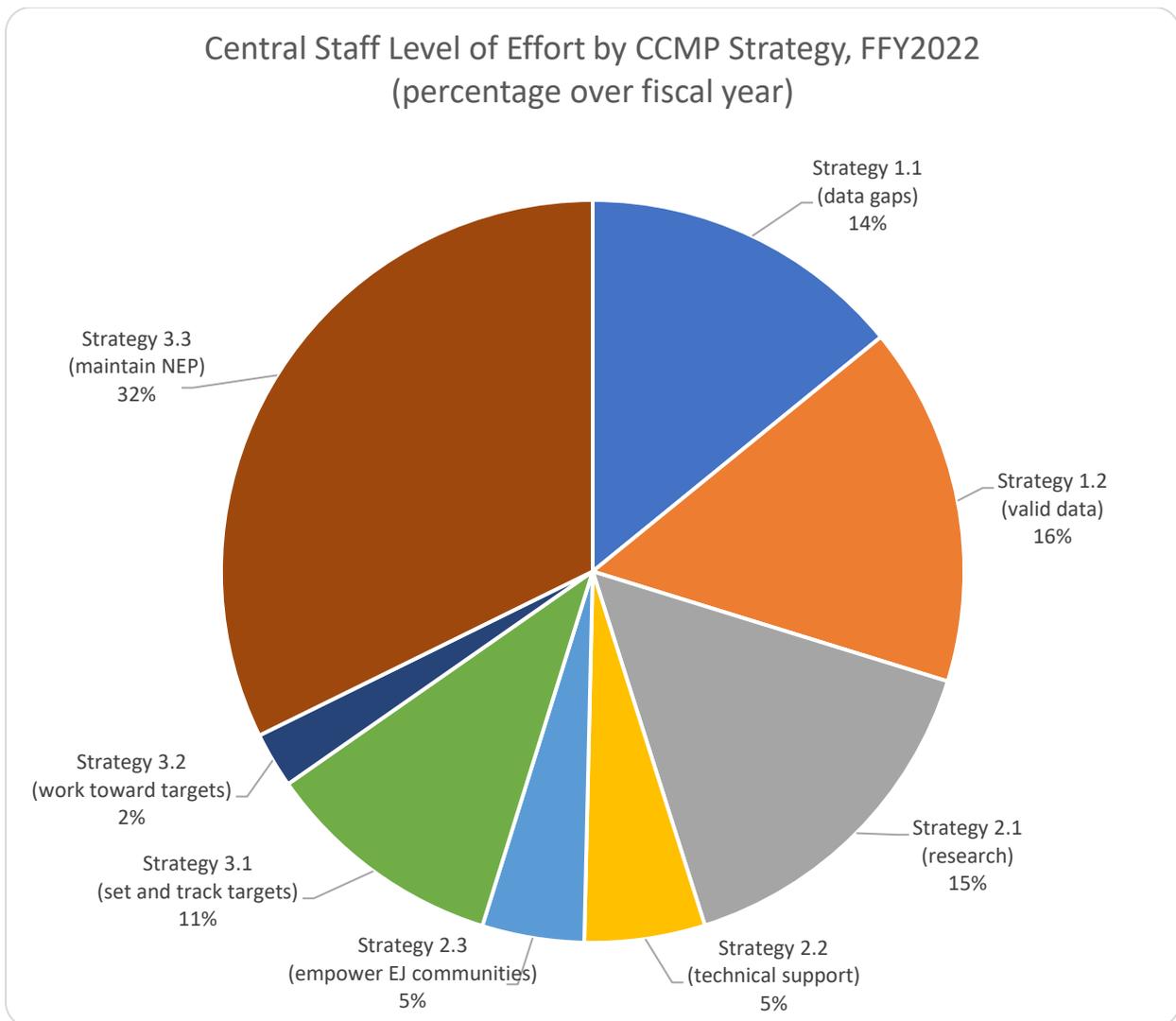
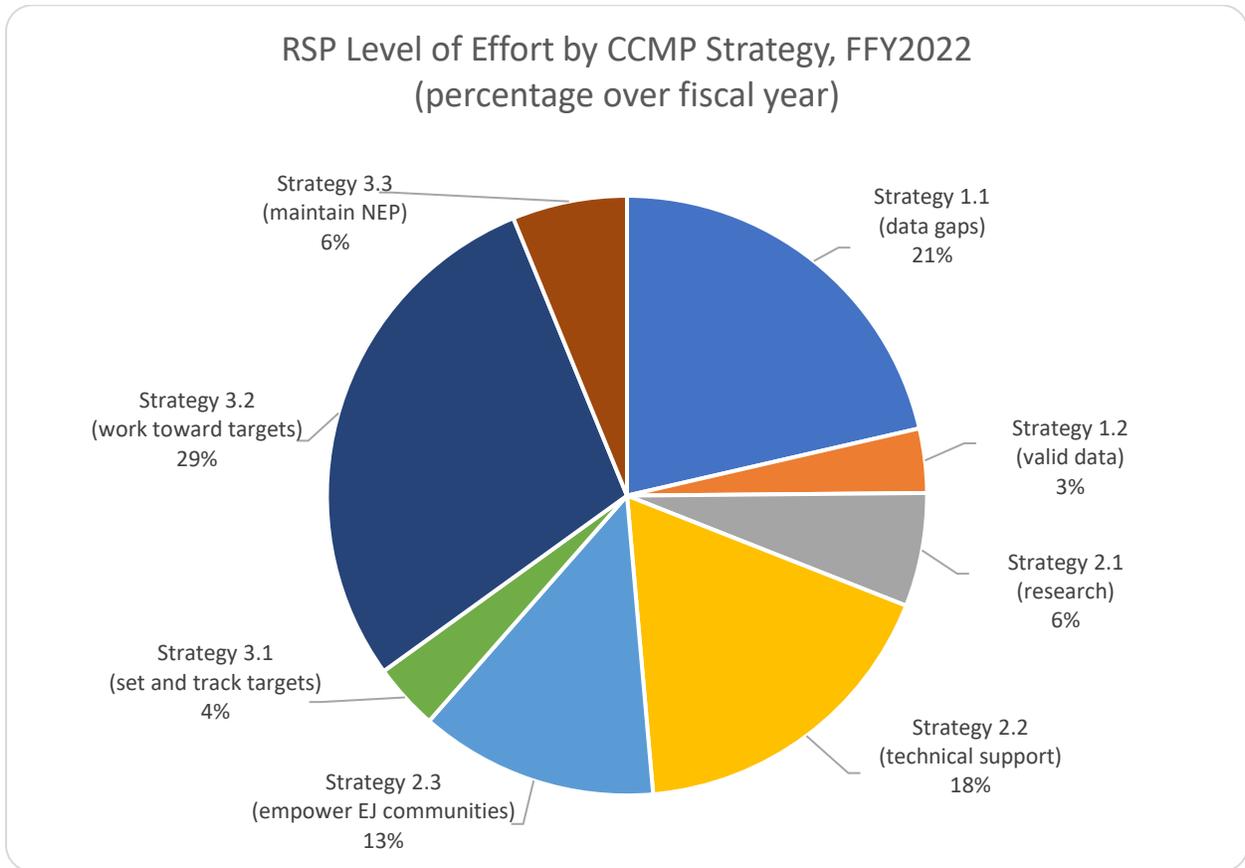


Figure 3. Regional Coordinator LOE allocated from RSP Subawards to each strategy (\$63,000 S.320 funds distributed per region).



The tables of proposed activities below, organized according to MassBays' CCMP Strategies, include the following:

Title (Region), Budget/LOE: Activity name and MassBays geographic region in which it will be carried out, and non-s.320 funding and/or LOE (hours) to be committed by Central Staff or RSP (for region-specific projects)

Description: Status (New or Ongoing), project activities and objectives

CWA Core Program: Per list (1-7) above

CCMP Outcome: Per list (A-G) above

Partners: Collaborators not directly funded by MassBays/§320 funds

Timeline & Deliverables: Product(s) expected, and the quarter (Q1-Q4) projected for their completion

Strategy 1.1: Make new data available, especially to address specific gaps in knowledge

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
<p>Monitor Cyanobacteria blooms (Cape Cod)</p> <p>\$9000 + 180h</p>	<p>Ongoing Since FY18 APCC has monitored cyanobacteria in lakes and ponds that discharge to estuaries and serve as diadromous fish spawning habitat. The goals are to collect useful actionable information on harmful cyanobacteria blooms (HCBs) in order to raise public awareness of the risks posed by HCBs and to motivate public action to improve water quality to alleviate, reduce or eliminate HCBs. Monitoring data are translated into actionable information expressed as low, moderate, or high risk. Last year over 130 ponds were monitored. With FFY22 funding, APCC’s goals are to: continue monitoring of ponds across the Cape and in all 15 towns, to partner with Barnstable County’s Department of Health and the Environment which will provide toxin testing of moderate-to-high-risk samples pre-identified by APCC, to continue supporting action by the Barnstable County Health Agents Committee and individual health agents, and to motivate action to protect and improve water quality to reduce the threat of HCBs.</p>	<p>(2) Identifying polluted waters and developing plans to restore them; (6) Protecting coastal waters through the National Estuary Program</p> <p>(C) Improved water quality</p> <p>(F) Robust interagency and interdisciplinary collaboration and partnerships</p>	<p>MET; EPA R1; UNH; Lim-tex, Inc.; Barnstable County Dept of Health and Environment; 15 Cape Cod towns; and local watershed and pond associations.</p>	<p>(Q4) List of training sessions, number of participants, training materials, Train and supervise staff and interns re: protocol, collect and analyze data, (Q1-4) Cyanobacteria Risk Communication plan; Outreach and education including updates to the APCC Cyanobacteria Monitoring Program webpage and directed outreach to underserved communities; Recommendations, plans, or other examples of actions to improve water quality to reduce the threat of HCBs (Q4) Report on 2021 pilot “Ponds to Sea” study examining transport of cyanobacteria and cyanotoxins from ponds to estuaries via juvenile herring migration along transects in Brewster and Mashpee.</p>

Strategy 1.1 continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Macro and Microplastics Sampling (Upper North Shore) \$65,000, 45h	Ongoing Conduct monitoring for micro- and macroplastics in the sand of beaches of Plum Island Sound, Essex Bay, and Annisquam River; develop a detailed sampling program for future efforts; conduct focused microplastics sampling in the waters of the Great Marsh informed by 2021 & 2022 sampling program results.	(4) Addressing diffuse, nonpoint sources of pollutants (C) Improved water quality	Seaside Sustainability, UNH, NECC, Governors Academy, 8TGM, Triple Ring Technologies	(Q1) Results of sampling at the high tide line carried out on Essex County beaches and via manta net from boat, (Q2) Results from sampling in both settings, (Q3-4) Revined sampling plan for rivers and outfalls
Marsh wrack evaluation and mapping (Upper North Shore) \$25,000 + 75h	New Determine the extent and impact of excessive wrack accumulating on the marsh in areas of upland edge, pannes, and woody vegetation causing vegetation die-off. Determine impact on marsh peat and other habitats. Develop recommendations for next steps.	(5) Protecting wetlands (B) Improved habitat continuity and restored hydrology	UNH, North Essex Mosquito Control and Wetlands District	(Q2) Map of wrack accumulation generated through field surveys; (Q3) Result of vegetation and soil condition assessments conducted beneath the wrack; (Q3) List of attendees and outcomes of a meeting to examine results and consider next steps

Strategy 1.1 continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Monitor diadromous fish runs (South Shore, Cape Cod) \$25,000 + 200h SS \$7000 + 140h CC	Ongoing Provide local, state and federal fisheries managers with population estimates of river herring at monitored runs to inform protection, restoration and management efforts. RCs will support citizen monitoring of fish runs by providing partners and volunteers with training, data management, QA/QC, reporting, and other assistance.	(6) Protecting coastal waters through the National Estuary Program (B) Improved habitat continuity and restored hydrology	DMF; NOAA; Woods Hole Sea Grant; CCCE, River Herring Network; South Shore towns; 12 Cape Cod towns; local NGOs	(Q1-4) Participate in River Herring Network annual conference and/or other events as held; (Q1) Provide input to target-setting for diadromous fish habitat, (Q2) Final data report for Spring 2022 herring counts submitted to DMF, (Q3) Outreach materials used to engage students with South River camera, (Q4) Report on volunteer training and participation in for Spring 2023 herring counts, along with outreach materials; (Q4) Synthesis report of Cape Cod herring count data for 2007-2022

Strategy 1.1 continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
<p>Lower Merrimack River Initiative (Upper North Shore)</p> <p>\$35,000 + 120h</p>	<p>Ongoing Focused assessment of a variety of conditions and restoration activities in the lower Merrimack River including:</p> <ol style="list-style-type: none"> 1. investigation of eelgrass restoration potential in Joppa Flats and Black Rock Creek and pilot site development 2. restoration of native marsh vegetation through the removal of invasive pepperweed 3. ground truthing marsh die-off as a result of SLR in marshes of the Merrimack River 4. microplastic sampling in the water column and sand of beaches in the lower Merrimack River 5. investigation into opportunities for anadromous fish restoration in the Merrimack River and its tributaries. 	<p>(2) Identifying polluted waters and developing plans to restore them</p> <p>(5) Protecting wetlands</p> <p>(B) Improved habitat continuity and restored hydrology</p>	<p>Northern Essex Community College, UNH, Mass Audubon, USFWS, MRWC, BU, 8TGM, volunteers, towns of Salisbury, Newbury, and Newburyport, and when relevant, EJ communities of the lower Merrimack River including Lawrence and Haverhill.</p>	<p>(Q1, Q2, Q4) Microplastic sampling results and recommendations, (Q3) Map of investigated locations and photos of pilot eelgrass restoration sites (Q4) Map of native vegetation recovery where treatment of invasives occurred, (Q3) Map of die-off areas and potholes identified in lower Merrimack River salt marshes, (Q2-3) convene a working group and identify anadromous fish restoration opportunities</p>
<p>Water quality monitoring (South Shore)</p> <p>\$36,700 + 175h</p>	<p>Ongoing Citizen monitoring in coastal waters to identify potential for remediation and source control, through the Riverwatch program in the North and South Rivers and the DKP Water Quality Monitoring Program; conduct bacterial source tracking in North River Headwaters with Town of Hanover.</p>	<p>(2) Identifying polluted waters and developing plans to restore them</p> <p>(C) Improved water quality</p>	<p>Volunteers; Towns of Duxbury, Kingston, Plymouth, Norwell, and Hanover; JRWA</p>	<p>(Q1) Riverwatch volunteer monitoring completed, (Q2) monitoring results</p>

Strategy 1.1 continued

<p>Bacteria Monitoring: Clean Beaches & Streams and Upstream Tributary Sampling (Lower North Shore)</p> <p>\$20,000 +52h</p>	<p>Ongoing Identify sources of pathogen pollution to Massachusetts' waters, specifically Salem Sound and its tributaries, particularly illicit sewage discharges and faulty sewer and stormwater systems, and promote their remediation. Activities include biweekly summer water testing for <i>Enterococcus</i> at outfalls and streams, and sharing data with municipal staff to prompt action.</p>	<p>(2) Identifying polluted waters and developing plans to restore them</p> <p>(C) Improved water quality</p>	<p>Manchester Coastal Stream Team, Volunteers, DMF, EPA, DEP</p>	<p>(Q1) Report on bacterial levels for 15 - 18 outfalls or streams, results published on SSCW website, (Q2) current and historic monitoring data uploaded to WQX, (Q1-4) List of remediation actions taken up by municipalities.</p>
<p>Assessing water quality and presence of sea brook trout (Lower North Shore)</p> <p>\$2500 + 52h</p>	<p>New Begin a citizen monitoring program to record temperature Sawmill Brook & Cat Brook in Manchester-by-the-Sea and sample environmental DNA for sea brook trout, herring, and rainbow smelt. Support cold water fisheries DEP efforts.</p>	<p>(2) Identifying polluted waters and developing plans to restore them</p> <p>(C) Improved water quality</p> <p>(E) Restored natural communities</p>	<p>MCST, volunteers, Sea Run Brook Trout Coalition</p>	<p>(Q1) Number of volunteers trained, sampling plan; (Q2) results of temperature monitoring; (Q3-4) summary of results and recommendations for subsequent years; data shared with DEP.</p>
<p>Coastal Acidification Monitoring and Management (Central Staff, South Shore)</p> <p>100h CS \$750 + 50h SS</p>	<p>New (postponed from FFY21) Monitor coastal acidification conditions in Duxbury Bay, a hotspot for shellfish aquaculture industry in Massachusetts. Monthly samples will be collected by SS RC and trained volunteers for analysis of TA and DIC by EPA ORD (Narragansett Lab)</p>	<p>(6) Protecting coastal waters through the National Estuary Program</p> <p>(C) Improved water quality</p>	<p>Town of Duxbury, UMB, EPA ORD, volunteers</p>	<p>(Q1) QAPP for discrete sample collection (CS); (Q1-2) Monthly discrete samples collected at low and high tide, with concurrent outreach about coastal acidification and its impacts; (Q4) Doctoral thesis data analysis by UMass Boston student and first technical report</p>

Strategy 1.1 continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Monitoring Long-term Salt Marsh Vegetation Change (South Shore) 125h	Ongoing Work with volunteers to monitor salt marsh vegetation changes through the Salt Marsh Sentinels program; participate in the Massachusetts Salt Marsh Working Group and its Sea Level Rise Subcommittee	(5) Protecting wetlands (D) Resilient coastal habitat, including nature-based coastal protection	Dock owners, UMass Amherst	(Q2) Report on findings and project participation of dock owners in collection of salt marsh data, (Q1-4) Priority action plan developed by the Working Group and Subcommittee
Map Sea Level Rise-induced marsh platform die-off areas (Upper North Shore) \$15,000 + 60h	Ongoing Increased inundation from SLR and resulting impounded water is evidenced by small vegetation die-off areas where differences in marsh elevation exist. Ground-truthing of UAV (drone) imagery will be performed where die-off has been observed.	(5) Protecting wetlands (B) Improved habitat continuity and restored hydrology	UNH, drone contractor, 8TGM	(Q1, Q2) drone imagery; (Q2, Q3) field-verified mapping of marsh die-off presumed due to inundation
Horseshoe Crab Spawning Surveys (South Shore) 60h	Ongoing Conduct horseshoe crab spawning surveys in Duxbury Bay to assess the population and inform resource management.	(7) Protecting large aquatic ecosystems (E) Restored natural communities	DMF, Town of Duxbury, Duxbury Beach Reservation Inc.	(Q1) 2022 field work completed, and data submitted to DMF; (Q4) 2023 surveys completed with volunteers

Strategy 1.1 continued

Title (Region) , Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Marsh Edge Erosion Monitoring (Upper North Shore) \$20,000 + 56h	Ongoing Determine the erosional/deposition status of marsh bank and marsh edge in the creeks and rivers of Plum Island Sound and Essex Bay to determine future living shoreline potential.	(5) Protecting wetlands (D) Resilient coastal habitat, including nature-based coastal protection	BU, 8TGM	(Q2) Map of Plum Island and Essex Bay marsh banks depicting erosion/deposition status.
Monitoring Marine and Wetland Invasive Species (North Shore and South Shore) \$1000 + 52h LNS \$1800 + 25h UNS \$7500 + 55h SS	Ongoing Monitor established field sites for non-native species in cooperation with CZM’s MIMIC program, conduct training for monthly monitoring from July to October 2022 and May to June 2023, and share results with CZM and the public. LNS also monitors settle plates at the Beverly Pier to understand fouling organisms. New SS will assist the Town of Norwell with managing purple loosestrife at Jacobs Pond.	(7) Protecting large aquatic ecosystems (E) Restored Natural Communities	CZM, volunteers	(Q1, Q4) number of volunteers trained per season (Q2) data submitted to CZM, along with photodocumentation of Beverly Pier settle plate fouling; photos and data from beetle release and monitoring in Jacobs Pond; (Q4) list of presentations and publications describing the transport, population dynamics, and impacts of invasive species.

Strategy 1.1 continued

Title (Region) Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Water Quality and Benthic Communities Monitoring in Salem Sound (Central Staff, Lower North Shore) 240h CS 208h SS	Ongoing report on and analyze results of 2019-2020 nutrient monitoring and benthic community assessment program in Salem Sound.	(6) Protecting coastal waters through the National Estuary Program (C) Improved water quality	CZM, SSU, volunteers	(Q2) Technical report (with CS);(Q3) results of expert review and recommendations; (Q4) list of presentations and publications
Massachusetts Coastal Condition Assessment (Central Staff) \$184,000 +160h	Ongoing Coordinate water quality, sediment, and benthic monitoring survey in the nearshore of Massachusetts over the time period 2020-2023. Parameters include measures of water quality, sediment quality and benthic communities from a total of 90 sites (25 sites on the North Shore in 2021). The data serve to inform MassBays' State of the Bays reporting under CWA §320 and DEP's required reporting under CWA §109.	(2) Identifying polluted waters and developing plans to restore them (C) Improved water quality	DEP, STAC, Normandeau Consultants	(Q3) Amended contract and scope for Year 4 (2023) monitoring; (Q4) Year 3 (2022) data

Strategy 1.2 Support valid (QA/QC) data collection and use

Task Title (Region) Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Support use of AquaQAPP and data upload to WQX (Central Staff, Metro Boston, South Shore, Cape Cod) 100h CS 120h MB 20h SS 40h CC	New Increase accessibility to new and historic data generated by watershed groups by providing training and support to facilitate data upload to EPA’s WQX framework Ongoing Increase accessibility to new and historic data generated by watershed groups by providing training and support to facilitate data upload to EPA’s WQX framework	(2) Identifying polluted waters and developing plans to restore them (6) Protecting coastal waters through the National Estuary Program (C) Improved water quality	EPA Exchange Network, EPA Region 1, DEP, Citizen Science Association, Coastal Monitoring Coordinators’ Network, other ngos	(Q1-4) List of organizations that received one-on-one AquaQAPP and WQX support; (Q4) List of groups supported via training, materials; (Q3) Status report re: RSP data uploaded to WQX, (Q4) Citizen data highlighted via the State of the Bays/ETT
Build technical capacity for data analysis and visualization (Central Staff) \$110,508 (EPA Exchange Network funds)	Ongoing Launch R-based packages for data QC, analysis and visualizations; host beta testing and training sessions.	(6) Protecting coastal waters through the National Estuary Program (C) Improved water quality	EPA Exchange Network, DEP, EnviroDev, ACASAK Aquatic Monitoring Technologies	(Q1) Coordinate a beta testing workshop where the new R tools are tested by 6-8 future users. Establish online Community of Practice for technical support (Q2) publish final R packages (Q3-Q4) conduct training and outreach efforts

Strategy 2.1 Support research to inform policy and actions

Task Title (Region) Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Quantifying Phytoplankton and Turbidity in Salem Harbor (Lower North Shore) \$2000 + 40h	Ongoing Collaborate with Salem State University to interpret results of research on phytoplankton community structure funded through the Healthy Estuaries Grant Program, including forcings causing high biomass that has been documented to be responsible for increased turbidity. Share results and specific remediation strategies for water quality improvement of Salem Sound waters.	(2) Identifying polluted waters and developing plans to restore them (C) Improved water quality	SSU	(Q1-2) List of remediation alternatives and strategies, (Q3) Attendee list and outcomes of a meeting for local, state, and federal stakeholders to convey results and recommendations, (Q4) Agenda and sign-in sheet for a public lecture
Pilot thin-layer placement of sediment (Upper North Shore) \$500,000 + 90h	New (pending funding) Develop site identification criteria, site selection, monitoring plan, and investigate permitting for a pilot dredged material placement in Essex Bay and Plum Island Sound.	(5) Protecting wetlands (E) Restored Natural Communities	BU, USFWS, 8TGM	(Q1) Funding secured from MA legislature, consultant hired; (Q2) Site selection and permitting plans; (Q3) QAPP for pre- and post-placement monitoring

Strategy 2.1 continued

Task Title (Region) Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
<p>Investigating eelgrass conditions, water quality, and sediment characteristics in Duxbury-Kingston-Plymouth Bays (Central Staff, South Shore)</p> <p>240h CS \$7000 + 140h SS</p>	<p>Ongoing Implement the annual “Eelgrass Blitz” rapid assessment with citizen scientists to monitor eelgrass extent and condition, and inform efforts to determine the causes of local eelgrass loss.</p> <p>New Conduct water quality monitoring and sediment core analysis to collect information on physical conditions that may be contributing to the losses.</p>	<p>(6) Protecting coastal waters through the National Estuary Program</p> <p>(7) Protecting large aquatic ecosystems</p> <p>(E) Restored natural communities</p> <p>(C) Improved water quality</p>	<p>DMF, Duxbury Bay Maritime School, Town of Plymouth, Volunteers, EPA Region 1 (Chelmsford Lab), SSU</p>	<p>Eelgrass blitz: (Q1, Q3) List of attendees and outcomes of team meetings (CS); (Q1-2) Number of volunteers trained, training materials, photo documentation (SS), (Q2) Technical report describing findings & recommendations, (Q4) plan for 2023 assessment</p> <p>New analysis: (Q1) Conduct monthly water quality monitoring (June – August) and sediment sampling (July); Sample analysis;(Q2) Data analysis and meetings to discuss findings; (Q3) Report of findings and plan for 2023</p>
<p>Increasing agency confidence in eelgrass maps used for project review and ocean planning (Central Staff, South Shore, Metro Boston, Lower North Shore)</p> <p>\$56,837 + 90h (RSPs) + 520h (CS)</p>	<p>Ongoing Implement a project to correlate eelgrass edge-of-bed determinations generated by remote sensing methods (drone, satellite, side-scan sonar, and fixed-wing aerial mapping) with divers’ assessments to support more accurate mapping of the resource to inform policies and protective actions. Data analysis, reporting, and outreach will take place concurrent with FFY22 funding.</p>	<p>(7) Protecting large aquatic ecosystems</p> <p>(E) Restored natural communities</p>	<p>NOAA, CZM, DMF, DEP, MIT Sea Grant</p>	<p>(Q1) Train partners in image analysis techniques and oversee analysis process as detailed in project QAPP (Q2) publish final report (Q3) outreach to scientific and management communities.</p>

Strategy 2.1 continued				
Task Title (Region) Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Assessing Pesticide Impacts on Invasive Phragmites, native vegetation, and benthic communities in the Great Marsh and (Upper North Shore) \$8,000 + 60h	Ongoing Invasive Phragmites in the open marsh in east Salisbury marsh, northern Plum Island Sound, and along the marshes of the Plum Island River will be mapped to define the effectiveness of previous Phragmites management practices. Fifteen established treatment and monitoring locations will be surveyed, and a subset also assessed in terms of native marsh vegetation and benthic community response to pesticide treatment.	(5) Protecting wetlands (E) Restored Natural Communities	PRNWR, BU, NWF, 8TGM	(Q3) Final report on impact of Phragmites treatment, including: <ul style="list-style-type: none"> • photo documentation and maps of previously treated areas with current status • recommendations regarding continued pesticide application in light of effectiveness of treatment practices and impacts on the marsh ecosystem
Monitor and restore blue mussels (South Shore) \$4125 + 75h	New Initiate a multi-year restoration program for mussels in the near subtidal and low intertidal to benefit migratory shorebirds and restore a crucial hard-bottom species at the mouth of the North and South Rivers	(7) Protecting large aquatic ecosystems (E) Restored Natural Communities	MassAudubon, US Air Force (Hanscom/4 th Cliff), Texas A&M	(Q2) Maps of existing mussel beds and potential sites; (Q4) List of docks hosting mussels and owner-participants with their typical timing for dock removal; protocol for mussel transplant

Strategy 2.2 Provide education, training, and technical support; share case studies (successful and not); and support collaboration and cooperation on specific topics

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
MassBays State of the Bays planning and outreach (Central Staff) 240h	Ongoing Building on the ETT, plan and implement the State of the Bays water quality and habitat assessment, report(s), and outreach activities	All CWA core programs All CCMP outcomes	CZM, DER, DMF, DEP, MWRA, Mass Rivers Alliance, Management Committee, Towns, regional scientific and policy partners	1) State of the Bays Symposium or other public launch of the ETT, incorporating findings of the ESG
Investigating aquaculture-eelgrass interactions to inform policy (Central Staff) 30h	New Convene scientists, resource managers and aquaculturists in a series of workshops to discuss the occurrence, perception and solutions around eelgrass and aquaculture interactions. Ecosystem services provided by eelgrass, including carbon sequestration, will be presented.	(7) Protecting large aquatic ecosystems (G) Well-informed, multisector input to decision making which includes underserved communities	MIT Sea Grant, DMF, TNC	(Q1) List of workshop invitees and presenters, outline of workshop topics and discussions, (Q2 - Q3) workshops take place and meeting minutes shared with participants
Local priority program development and education and outreach, including regional conferences (Central Staff, All Regions) \$75,000 + 200h UNS \$2000 + 40h CC 100h SS 80h MB	Ongoing Partnership building and project development, funding efforts, and collaboration with environmental and other partner organizations and entities toward meeting the CCMP goals	All CWA core programs All CCMP outcomes	Municipalities, nonprofits, businesses, and government agencies	(Q1-4) Quarterly updates regarding local initiatives and progress (e.g., BHEN, WAA, BCCRS), (Q1-4) Quarterly updates as relevant regarding regional conferences (e.g., Cape Cod Coastal Conference, Great Marsh Symposium, NEERS), including copies of presentations, (Q4) List of networks and MassBays role

Strategy 2.2 continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
<p>Support municipal and regional actions that promote resilient coastal habitats and communities through the use of nature-based solutions (Upper North Shore, Lower North Shore, Cape Cod)</p> <p>\$125,000 + 200h UNS \$40,000 + 400h LNS \$1000 + 20h CC</p>	<p>Ongoing Work with partners and communities to encourage planning for climate change and adoption of municipal bylaws and adaptation measures that promote resilient coastal habitats, and use of nature-based solutions. Activities include assistance to review stormwater, wetland, zoning, and subdivision bylaws and regulations as they relate to LID, green infrastructure, and climate resiliency; secure funding via MVP and Coastal Resilience grant programs and plan and implement those projects; and share lessons learned.</p>	<p>(5) Protecting wetlands</p> <p>(6) Protecting coastal waters through the National Estuary Program</p> <p>(D) Resilient coastal habitat, including nature-based coastal protection</p>	<p>NSF, EEA, DEP, IRWA, Upper and Lower North Shore, Metro Boston, and Cape Cod municipalities, especially Marblehead and Salem</p>	<p>(Q1) Model bylaw language for climate resiliency; (Q4) List of communities assisted and the assistance provided, (Q3) MassBays newsletter article describing one case study and lessons learned (Q3-4) At least two letters of support for municipal proposals, (Q4) List of and links to presentations and publications produced</p>
<p>Greenscapes, Merrimack Valley Stormwater Collaborative (North Shore)</p> <p>\$57,500 + 120h LNS \$14,500 + 50h UNS</p>	<p>Ongoing Create and disseminate outreach information, activities, and materials on stormwater management to <i>Greenscapes</i> member communities and Stormwater Collaborative members, in support of DPW directors and stormwater coordinators.</p>	<p>(2) Identifying polluted waters and developing plans to restore them</p> <p>(C) Improved water quality</p>	<p>IRWA, more than 25 municipalities</p>	<p>(Q1) List of Greenscapes communities, (Q2-3) MS4 Outreach and Education (via webinars, lectures, personal assistance), (Q1-Q4) Stormwater Collaborative meeting agendas and attendee lists, (Q1-4) “Keeping Water Clean (KWC)” school program, list of on-demand presentations delivered (“Why Stormwater Matters,” “Greenscapes 101,” “Slow the Flow” or other agreed upon topic); Updated SW Collaborative website</p>

Strategy 2.2, continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Great Marsh Symposium and field trips (Upper North Shore) \$10,000 + 35h	Ongoing Support outreach and education of local audiences through an in-person symposium focused on road elevations and crossings in the marsh, as well as field trips in Fall 2022 and Spring 2023	(6) Protecting wetlands (G) Well-informed, multisector input to decision making which includes underserved communities	IRWA, ECGA, Parker River Clean Water Association, CZM, ENHC, MAPC, MassAudubon, Trustees	(Q1) Agenda and list of presenters, (Q2) Copy of presentation by RC, (Q3) List of field trips and number of participants
Support municipal and regional actions that promote resilient coastal habitats and communities through the use of nature-based solutions (Metro Boston) 200h MB	Ongoing Connect NU researchers and other experts to communities interested in green coastal infrastructure and living shorelines. Support and collaborate on regional projects. New (postponed from FFY21) Organize and facilitate NSF Convergence Accelerator workshops that bring together experts and leaders from academia, government, industry, and nonprofits with the goal of leveraging nature-based solutions as a framework to explore and shape co-development of convergent research that is stakeholder-driven, inclusive, and focused on implementation of sustainability solutions that promote clean, safe, smart, and equitable coastal communities	(5) Protecting wetlands (6) Protecting coastal waters through the National Estuary Program (D) Resilient coastal habitat, including nature-based coastal protection	BHEN, Metro Boston municipalities, ; Knowinnovation, ngo partners	(Q1-4) Dates and locations, number of participants for three waterfront site visits (virtual as necessary), (Q3-4) Documentation of at least two letters of support for municipal implementation proposals, (Q3) Number of participants and outcomes of Convergence Accelerator Workshops

Strategy 2.2 continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Adopt a Beach and Talking Trash for Clean Oceans (Lower North Shore) \$4000 + 40h	Ongoing Work with the public and schools to build marine debris awareness and institute behavior changes. Projects include conducting <i>Adopt a Beach</i> trainings, supporting volunteer “Beachkeepers,” hosting community service projects, and educating the public of the seriousness of plastic litter on land and in the oceans	(6) Protecting coastal waters through the National Estuary Program (E) Restored natural communities	NOAA, Volunteer Beachkeepers, Talking Trash Teens	(Q1-4) List of volunteer trainings and numbers of volunteers, (Q3) List of community service projects, (Q3) report on litter reduction projects implemented in cooperation with restaurants, (Q4) List of relevant publications and presentations
Maintain the Mystic River Urban Waters Federal Partnership and coordinate Federal input to Mystic River initiatives (Mystic River) 1040h	Ongoing Coordinate the quarterly meetings of the EPA-convened Mystic River Watershed Steering Committee, represent the partnership by participating on regular conference/video calls organized by EPA, the Urban Waters Learning Network, and/or other Federal Partners, while maintaining contact with Region 1 and Urban Waters Program re: needs New Glean case studies and lessons from other Urban Waters locations to inform a detailed Action Agenda to be developed in collaboration with Region 1 staff and Federal Partners	(2) Identifying polluted waters and developing plans to restore them (C) Improved water quality	EPA, DEP, USGS, HUD, FEMA, DHS Mystic River Watershed municipalities	(Q1-4) Agenda and sign-in sheets for quarterly meetings, quarterly updates on activities taken up in response to EPA requests, (Q2) Initial Mystic River Urban Waters workplan, to be revisited quarterly, Summary of findings from Urban Waters program interviews, etc., (Q3) convene Federal Partners to review the Partnership’s Action Agenda in light of findings from other Urban Waters programs

Strategy 2.2 continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Implement local actions to improve conditions in the Mystic River Watershed (Mystic River) 624h	Ongoing Facilitate on-the-ground projects to increase public awareness of watershed natural resources and engage residents in stewardship efforts, especially those aligned with the Trash Free Mystic project	(2) Identifying polluted waters and developing plans to restore them (C) Improved water quality (G) Well-informed, multisector input to decision making which includes underserved communities	EPA, USGS, DEP, Mystic River Watershed municipalities	(Q1-Q4) Quarterly updates on activities and outcomes associated with Trash Free Mystic programs, invasive species management, Open Space and Mystic Greenways programs (Q2) Compilation of water quality report card announcements and data from the Neponset, Charles, and Mystic Rivers provided to EPA
Provide communications and outreach support to the Mystic and Merrimack watershed communities (Mystic River, Merrimack River) 416h	Ongoing Maintain public communications platforms and watershed-specific e-newsletters	(7) Protecting large aquatic ecosystems (G) Well-informed, multisector input to decision making which includes underserved communities	EPA, FEMA, HUD, USGS, DEP, MRWC, Mystic and Merrimack River municipalities	(Q1-4) Provide content to EPA Region 1 website (www.epa.gov/mysticriver) and other relevant pages, Quarterly e-news to the Mystic River Watershed Steering Committee, Quarterly e-news to Merrimack River watershed community (Q4) Distribution lists for both e-news outputs, Agenda, and attendee list from the biennial Mystic River Watershed Initiative Science Forum

Strategy 2.3 Provide access to, and increase influence on decision making by underserved communities

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Public outreach and education about climate change, its impacts, and adaptive measures (Lower North Shore) \$25,000 + 312h	Ongoing Increase general climate change literacy and knowledge about coastal resiliency in the region, involving EJ populations wherever possible. Activities will include public lectures and art installations, teacher training on climate change, and (pending funding) implementation of two MVP grants in EJ neighborhoods.	(6) Protecting coastal waters through the National Estuary Program (G) Well-informed, multisector input to decision making which includes underserved communities	Lower North Shore towns and cities, SSCW volunteers	(Q1-2) Lecture series “Keeping History Above Water,” climate sign project, “Remembrance of Climate Futures”; (Q1-4) report on outreach to EJ communities adjacent to <i>Peabody-Salem Resilient North River Canal Corridor & Riverwalk Connection Project</i> ; (Q4) list of events, photo-documentation of wave tank and other educational resources in use; (Q2-4) Summary of activities under MVP grants as funded
Expanding DEI in the marine sciences (Metro Boston) 320h	Ongoing Engage diverse learners in watershed and coastal science literacy, bring new audiences to MassBays’ mission. Share virtual / online learning tools and experiences with diverse audiences, including students in underserved communities, for example: Seagrass Explorer, a virtual seagrass aquarium game; a Career Panel to increase awareness of paid marine science opportunities in Boston and New England; and the annual High School Science Symposium, all with the goal of making the field more equitable, inclusive, and diverse.	All CWA core programs (G) Well-informed, multisector input to decision making which includes underserved communities	NUMSC Outreach Program, BHEN, MME, MMC	(Q4) List of accommodations implemented to support new participation by underserved communities, (Q4) Demographics of participants and summary of program evaluations of the High School Science Symposium, (Q4) List of panelists, number of attendees and summary of feedback related to a BHEN Career Panel for undergraduate and graduate students

Strategy 2.3, continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Watershed and coastal science education (South Shore, Lower North Shore, Cape Cod) 75h SS \$2000 + 40h CC	Ongoing Engage diverse learners in watershed and coastal science education, bring new audiences to MassBays’ mission, participate in classroom and field professional development for teachers	(6) Protecting coastal waters through the National Estuary Program (G) Well-informed, multisector input to decision making which includes underserved communities	Marshfield Community Television, Norwell Community Television, CCSCR, MassAudubon	(Q1-4) documentation of accommodation and outreach to support new participation by underserved communities, (Q4) List of events/presentations, videos and podcasts, and publications produced about coastal topics
Advancing meaningful engagement in decision making among EJ communities (Central Staff, All Regions) 60h CS \$5000 + 100h LNS 40h UNS 80h MB 50h SS \$1000 + 20h CC	New With materials and insights provided by Mystic River Ambassador, engage EJ and other underserved communities in activities and outreach efforts, e.g., field trips, Ask-Me-Anything sessions, orientations to state agencies and their roles, and/or hands-on assistance with local habitat or water quality investigations.	(2) Identifying polluted waters and developing plans to restore them (G) Well-informed, multisector input to decision making which includes underserved communities	EPA and EEA EJ Offices, MyRWA, UMB, Local and regional ngos working with EJ and underserved communities, especially the Herring Pond Wampanoag community (Plymouth)	(Q3) results of an NSF-funded investigation into environmental priorities of the Herring Pond Wampanoag community; (Q1-4) record of meetings with EJ organizations and priority issues identified, as well as projects taken up, (Q2) record of meetings with each RC, (Q3) list of potential partners for each region, and their audiences, (Q4) examples or list of outreach materials, training, and/or other support provided to the RCs
Connecting Coastal Communities (Central Staff) 120h	Ongoing As part of the NSF Smart and Connected Communities planning grant underway with UMB, facilitate a third workshop with each of the two underserved communities (Herring Pond Wampanoag tribal community [Plymouth] and the Cape Verdean community in Falmouth), and then a fourth, joint workshop to bring both groups together.	(2) Identifying polluted waters and developing plans to restore them (G) Well-informed, multisector input to decision making which includes underserved communities	UMB, Woods Hole Institute	(Q1) outcomes from each of the 3 rd workshops, (Q2) Outcomes of the joint workshop, (Q3) Determination of whether the group (including the community members) will make a full proposal for implementation funding from NSF under the same funding program.

Strategy 3.1 Establish target (improved) water quality and habitat conditions for each embayment tied to desired uses and ecosystem services

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Develop targets for diadromous fish habitat extent and condition (Central Staff) 80h	New Establish 2050 habitat goals to support diadromous fish migration, spawning, and feeding for MassBays embayments.	(6) Protecting coastal waters through the National Estuary Program All CCMP outcomes	EPA ORD, STAC, DMF, River Herring Network, MIT Sea Grant, Comprehensive Environmental	(Q1) Final historical data analysis; (Q2) Results of a workshop to characterize the habitat(s) required to sustain migration and nursery areas for diadromous fish species (represented by herring); (Q4) Diadromous fish habitat data layer, including targets, incorporated into the ETT
Update and expand utility of EDA (Central Staff, Metro Boston) 60h CS 240h MB	New (postponed from FFY21) Disseminate results of EDA 2.1 and add new variables to support examining relationships among stressor, resource, and socio-economic factors, and identify priorities for environmental justice and restoration	(6) Protecting coastal waters through the National Estuary Program All CCMP outcomes	STAC, EPA ORD	(Q4) Manuscript submitted; (Q2) List of socioeconomic metrics and associated datasets; (Q3) Shapefiles and characterization of each by EDA assessment area for MassBays Story Map update; List of potential areas for restoration to benefit EJ communities
Ecosystem Services Gradient assessment for Estuaries in MassBays (Central Staff) 160h	New ESG-based characterization of MassBays coastal habitats to facilitate relevant education and outreach to local stakeholders	(6) Protecting coastal waters through the National Estuary Program All CCMP outcomes	STAC, EPA, UMB	(Q1) ESG implementation plan; Results of updated EPA document analysis; (Q2) report from a meeting to examine outcomes of local stakeholder workshops (FFY20) alongside new data sets; (Q3) Suggested messaging for use with communities that connects priority ecosystem services with CCMP habitat targets.

Strategy 3.1, continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Develop Habitat Potential Indices (Central Staff) 220h	<p><i>New (pending funding)</i> Develop water quality-based indices for habitat health to be incorporated into the ETT. The indices will facilitate interpretation of water quality data presented in the Tool, and provide water quality-based targets to meet the CCMP habitat goals. This project will build on previous work done to identify WQ thresholds for inclusion in the ETT</p>	(6) Protecting coastal waters through the National Estuary Program All CCMP outcomes	EPA ORD, UHI, STAC	(Q1-2) Proposal submitted for funding; (Q3-4) HPIs determined for salt marsh, eelgrass, tidal flats, and diadromous fish habitat
Merrimack River Water Quality Improvements (Upper North Shore) \$10,000 + 50h	<p><i>Ongoing</i> Establish and implement regional goals to improve water quality on the Merrimack River. Oversee and provide administrative and technical support to the MRDC and its members in collaboration with MRWC</p>	(2) Identifying polluted waters and developing plans to restore them (G) Well informed, multisector input into decision making which includes underserved communities	MWRC, Merrimack watershed communities and legislative delegation, NECC, WWTPs, Merrimack River recreational users, Planning Commissions (MA & NH)	(Q2) Results of efforts to develop a Web-based Early Alert Monitoring Tool; (Q4) Tool available online to MVPC communities via MVPC website

Strategy 3.2 Guide and assist local action to expand habitat and improve water quality according to targets

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Publish Seagrass and Oyster Restoration Story Map (Metro Boston) 320h	Ongoing Disseminate the results of a project surveying seagrass and oyster restoration and management projects in Massachusetts to inform future efforts	(7) Protecting large aquatic systems (E) Restored natural communities	SeagrassNet, BHEN, others TBD	(Q2) Summary table of survey and interview responses from oyster and seagrass restoration practitioners; (Q3) Summary of comments on draft revised Story Map provided by at least two partner networks; (Q4) List of improvements made based on user feedback; Story Map launched
Finalize Boston Harbor Habitat Atlas (Metro Boston) 160h	Ongoing Update from the beta version the online, interactive Atlas depicting locations, background educational information about the habitats, past and ongoing research efforts, and opportunities to participate in habitat protection	(6) Protecting coastal waters through the National Estuary Program All CCMP outcomes	BHEN	(Q2) Fully functioning Atlas available; (Q4) incorporate Seagrass and Oyster Restoration Story Map
Greening Gateway Cities Program (Lower North Shore) \$15,000 + 312h	Ongoing Serve as outreach partner for Salem’s Greening Gateway City program, promoting progress toward the program goal of planting 2400 trees in EJ neighborhoods.	(7) Protecting Large Aquatic Ecosystems (E) Restored natural communities	Salem Tree Commissioner, DCR	(Q1-4) Number of trees planted, mapping distribution on public and private property; (Q4) List of education & outreach actions, including via social media
Northern Great Marsh Hydrology Restoration (Upper North Shore) \$20,000 + 35h	New Assess tide-shed hydrology and proximity to creek system, identify runnel application sites, obtain permits, and implement runnels in the Hampton/ Seabrook/ Salisbury marshes. Evaluate need for dune restoration in Salisbury, Newburyport and Newbury.	(5) Protecting wetlands (B) improved habitat continuity and restored hydrology (E) Restored natural communities	UNH, NWF, Towns of Hampton, Seabrook, Salisbury, Newburyport, Newbury, NHDES, NH-based ngos	(Q1) Map of potential runnel installations and planned dune stabilization; (Q2) Permits for work in wetland resource areas, (Q4) Map of implementation sites

Strategy 3.2 continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Pepperweed Management and Control (North Shore) \$2000 + 52h LNS \$65,000 +65h UNS	Ongoing Physical pulling of pepperweed to restore native high marsh community and coastal resilience in Ipswich, Rowley, Newbury in the Great Marsh, and in Salem Sound communities	(5) Protecting wetlands (E) Restored natural communities	Volunteers, Parker River NWR, MassAudubon	(Q1, Q3) List and map of prioritized sites, (Q3) Number of trained volunteers & volumes pulled, (Q4) Map of pepperweed sites with list of areas monitored and/or treated, with status (presence-absence removal)
Eelgrass Restoration (Upper North Shore) \$60,000 + 90h	Ongoing Continue to restore pilot eelgrass site to Middle Ground in Plum Island Sound; investigate and establish pilot eelgrass sites where warranted in Northern Plum Island Sound and Salisbury waterways, using divers to re-establish eelgrass near the destroyed restoration site in Essex Bay; engage volunteers in Great Marsh eelgrass restoration effort via eelgrass seeding	(7) Protecting Large Aquatic Ecosystems (E) Restored natural communities	BU, Parker River NWR, Mass Audubon, Nantucket Land Council, volunteers	(Q1-4) Photos and interim reports documenting harvest and planting (restoring) at the Middle ground pilot site, (Q2, Q3) Report on investigations of potential new pilot sites, including number of green crabs trapped; (Q1, Q2, Q4) Monitor and report on eelgrass success in Plum Island Sound; (Q1, Q2, Q4) photo-documentation of diver restoration in Essex Bay
Taking steps to protect eelgrass from impacts of docks and recreational boating (Lower North Shore) \$2000 + 100h	New (pending funding) Enhance estuarine seagrass habitat by informing management efforts to reduce stressors impacting seagrass habitat, as well as new site-specific monitoring in Salem Sound.	(7) Protecting large aquatic ecosystems (E) Restored natural communities	Salem & Marblehead harbormasters, Conservation Commissions, private dock owners, DMF, EPA, ACOE, UNH, SSCW volunteer	(Q4) List of presentations, sample presentation materials used for outreach to describe the impact of docks and floats on eelgrass; (Q4) One-page summary report on community monitoring of eelgrass using iSeaGrass and the Eelgrass Blitz protocol

Strategy 3.2 continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Promote LID (Lower North Shore) \$20,000 + 312h	Ongoing Promote and implement LID and stormwater green infrastructure in MassBays communities, maintain Commercial Street and Winter Island rain gardens in Salem, and share lessons learned	(4) Addressing diffuse, nonpoint sources of pollution (C) Improved water quality	Greenscapes North Shore Coalition; LNS municipalities	(Q4) List of presentations and publications, as well as technical assistance and grant support provided, (Q4) documentation of one newly implemented LID approach, (Q1-4) Photo-documentation of flood/storm conditions at rain gardens; (Q2-4) Document use of LID maintenance videos (produced with FY21 CZM CPR grant funds) by local DPW departments
Identify and implement stormwater mitigation and low-impact development projects (Cape Cod) 180h (plus \$19,000 + 200h under the BIL workplan)	Ongoing Identify and implement priority projects with partners, as part of APCC's Restoration Coordination Center (RCC) activities.	(2) Identifying polluted waters and developing plans to restore them (4) Addressing diffuse, nonpoint sources of pollution (C) Improved water quality (E) Restored natural communities	Cape Cod towns, CCCD, NRCS, DER, CZM, DMF, CCC, CCCE, WHOI Sea Grant	(Q1-4) Each quarter, provide the following: <ul style="list-style-type: none"> • list of communities assisted and type of assistance provided (e.g., grantwriting assistance, monitoring, training, other) • list of outreach and training events activities and audiences

Strategy 3.2 continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
<p>State of the Waters: Cape Cod (Cape Cod)</p> <p>\$26,000 + 500h</p>	<p>Ongoing work with partners to maintain and update a comprehensive “State of the Waters: Cape Cod” program to report on the condition of the Cape’s coastal and fresh waters and their problems, causes, and possible solutions. Water quality grades will be reported via an annual report, rollout at APCC’s annual meeting, via a dedicated website, and other outreach materials. The goal is to promote action to protect and restore water quality through an Action Plan that contains recommendations for protection and restoration of water quality. Progress towards improving water quality and successes will be highlighted in the report and website. The project is intended to serve as a model for other communities</p>	<p>(6) Protecting coastal waters through the National Estuary Program</p> <p>(C) Improved water quality (F) Robust interagency and interdisciplinary collaboration and partnerships</p>	<p>CCS, Buzzards Bay Coalition, CCC, SMAST-UMass Dartmouth, WBNERR, MBL Ecosystems Center, CZM, MET, Cape Cod towns</p>	<p>(Q2) List of WQ data sources for 2021 monitoring in coastal waters, fresh water bodies, groundwater, drinking water, and other water resources, including in underserved communities (Q2) Final report for 2022 (grades up to and including 2021 as available), (Q1-4) Dates and attendees lists from Advisory Committee meetings, (Q4) Draft list of 2022 data sources in preparation for 2023 update, (Q4) Updated outreach materials, including website; List of presentations and publications; Updated Action Plan to include reports on successes and progress in protecting and improving water quality; Document engagement with SNEP and CCC to assist CS in uploading water quality data to WQX</p>
<p>Launch and support use of Ecohealth Tracking Tool (Central Staff)</p> <p>120h</p>	<p>New Announce availability and provide demonstrations of the new ETT and its utility for informing local action, including monitoring, mapping, and restoration.</p>	<p>(6) Protecting coastal waters through the National Estuary Program</p> <p>(C) Improved water quality (E) Restored natural communities</p>	<p>Mass Rivers Alliance, Coastal Monitoring Network, BHEN, Salt Marsh and Eelgrass Working Groups</p>	<p>(Q1) Announcements of ETT launch, presentations, and one-on-one demonstrations</p>

Strategy 3.3 Maintain MassBays' National Estuary Program Status

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Establish MassBays as a Center within the School for the Environment at UMass Boston (Central Staff) 400h	New MassBays will implement transition to a new host institution, creating new opportunities for diversification of our funding and communications efforts.	(6) Protecting coastal waters through the National Estuary Program All CCMP Goals	UMB	(Q1) Complete staff and files transfer to UMB, (Q2) Convert MassBays website to a new platform, (Q1-4) Explore opportunities and apply for new funding for implementing the CCMP, identify opportunities for new partnerships and research within the institution, and establish communication with legislative offices for education and outreach consistent with Federal guidelines.
Convene and support the Management Committee and Local Governance Committees for input on MassBays CCMP implementation, Prepare Program Evaluation materials and host an EPA site visit (Central Staff, All Regions) 1200h CS est. 100h/Region	Ongoing Meet the requirements of S.320 Funding Guidance provided by EPA, soliciting community stakeholder input to prioritize yearly workplans to implement the CCMP. Develop and submit proposals for funding beyond S.320 from diverse sources. Implement strategic communications to highlight successes. Prepare for and host EPA Program Evaluation in Spring 2023.	(6) Protecting coastal waters through the National Estuary Program All CCMP Goals	MC members, STAC, LGCs (8TGM, LNS LGC, BHEN Steering Committee, SS LGC, BCCRS)	Central staff: (Q1) Final CCMP submitted to EPA Region 1, including updates to all sections and actions as needed, as well as planned spending under the Bipartisan Infrastructure Law (BIL, the Infrastructure Investment and Jobs Act of 2021); Updated Monitoring Plan to reflect planned BIL investments; (Q2) Updated Finance Plan and new Communications Plan that reflects MassBays' new host situation; (Q2-3) NEPORT submissions to EPA; (Q1-4) Management Committee quarterly meeting agendas and summaries; project and activity updates for MC review and information; List of at least four submitted proposals for funding; (Q4) Annual Report published; Proposed FFY23 workplan submitted to EPA Regional Coordinators: (Q1-4) Updates on activities and progress, attendance at quarterly MC meetings; (Q2-3) NEPORT submissions to MassBays; (Q1-4) Acknowledgement of EPA/ MassBays support noted on RSP

				websites and (as relevant) outreach materials and publications; (Q4) End-of-year reports on progress and proposed ongoing and new activities for FFY23 developed with input from EJ/underserved communities, and LGCs
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Other: Partnerships

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Chair the Gulf of Maine Council for the Marine Environment (Central Staff) 100h	New Between July 1, 2022-June 30, 2023, serve as Chair of the GOMC Working Group (1 st year of a 2-year term). This position will lead the Working Group to implement the tasks under the current GOMC Action Plan (ends 2022) and oversee the drafting of the new 5-year Action Plan. Work with Council Coordinator to: convene two joint council and working group meetings (Q2, Q4); convene two working group meetings (Q1, Q3); convene monthly Secretariat meetings. Oversee organization of annual award ceremony (Q4)		Gulf of Maine Council members (states, maritime provinces, federal agencies, academia, NGOs)	Central Staff: (Q1-Q4) Meeting notes and action items from all meetings, development of agenda and meeting materials; (Q4) Final 5-year action plan (2023-2027) with goals, objectives, and strategies to guide the Council’s work for the next 5 years.

D. Budget

MassBays is requesting reimbursement of pre-award costs, up to 90 days, for the work included in this plan.

Narrative

These notes refer to **Table 2, MassBays National Estuary Program Proposed Budget, FFY2022.**

Assumptions – Section 320 funding allocation to MassBays will be \$750,000. An additional \$909,800 will be allocated through a separate cooperative agreement under the Infrastructure Investment and Jobs Act appropriation (referred to as BIL).

Proposed Spending

Salaries for two staff: Executive Director (0.8FTE), and Staff Scientist (0.65FTE). The remainder of these full-time staff salaries will be funded under BIL, as described in a separate workplan. The Coastal Data Scientist's salary, fringe, and indirect costs are covered by the NOAA Project of Special Merit Grant, the EPA Exchange Network Grant, and BIL.

Fringe benefits: Fringe benefits are negotiated annually between the Commonwealth of MA, UMB and the Department of Health and Human Services (DHHS). Fringe benefits are costs associated with employee related expenses including health plan, pension plan, and workman's compensation expenses among others. UMB has four fringe rates in accordance with the University's FY2022 Fringe Benefits and Payroll Tax Rates memorandum and NICRA.

Rate #1 General Fringe, 37.46%

Rate #2 Health and Welfare, \$33 Bi-weekly/FTE

Rate #3 Payroll Tax, 1.97%

Rate #4 Worker's Compensation Insurance, 0.26%

These rates are applied based on the personnel appointment type, benefitted/non-benefitted status, period of service and salary rates. In this case the appointment, benefits status, period of service and applicable rates are as follows:

Personnel	Appointment	Period of service	Applicable Rates
PI Pam DiBona	Professional Benefitted	Calendar	Rates 1, 2, 3, 4
Senior Scientist Prassede Vella	Professional Benefitted	Calendar	Rates 1, 2, 3, 4

Contractual

- Heroku app hosting. MassBays is supporting access to iSeaGrass, an app that allows users to provide real-time, field-based reporting about eelgrass presence/absence, condition, and other parameters. Cost is \$24.99/month.

Other Expenses

- Regional Service Providers. This year we request a total of \$315,000 to come from the \$320 base grant monies for RSP support. Budgets and justifications are included in Table 5.
- Mystic River Watershed Association/Urban Waters Program. Pending allocation of up to \$90,000 supplemental funds through EPA's Urban Waters Program, MassBays will award those funds to MyRWA to carry out activities aligned with that program, including salary for a Mystic River Ambassador to ensure alignment of MyRWA activities across Federal entities and MassBays' CCMP. Budget and justification is included in Table 6.
- Meetings and refreshment costs. MassBays will host an event to announce the revised CCMP

for an assumed 100 participants. Costs include a light lunch (\$25 per person) and room rental fees (\$2500). In addition, we will provide light refreshments (\$5.55 per person) for our 25 MC members for an annual in-person Committee meeting.

Travel (see Table 3)

We propose new funding of \$6042 for the following:

- NEP national meetings
 - Fall Technical Transfer Meeting, to take place in New Orleans in association with the Restore America’s Estuaries Conference (Central Staff/3 travelers)
 - Spring 2023 Annual Meeting, Washington DC (Director/1 traveler)
- Other Professional Development Conferences
 - Assuming limited travel expenses and registration fees for professional development and regional conferences, New England-wide
- Regional meetings, workshops, and site visits
 - CCMP implementation oversight, regional education & outreach workshops, grantee site visits, etc., MassBays-wide
- NE Regional NEP meetings
 - Visits for collaboration and joint programming discussions, New England-wide (Director and Staff Scientist)

Indirect Charges

The University of Massachusetts Boston has a Facilities and Administrative overhead rate of 52.5%, which is a federally negotiated indirect cost rate agreement between University of Massachusetts Boston and the Department of Health and Human Services effective 10/02/2020. The indirect rate is charged to expenditures relating to direct costs including the first \$25,000 of each RSP subaward and excluding equipment. UMass Boston’s threshold for equipment is \$5,000.

Matching Funds

Subgrantees. Regional partners, in their scopes of work to serve as RSPs to MassBays, identify sources of match for the program. Direct match of at least 50% is required; this year a total of \$253,125 is offered by the RSPs (Table 7). Mystic River Watershed Association will provide 100% match to their Urban Waters subaward of \$90,000.

Program Match. Several of the RSPs have also identified a substantial cash and in-kind match, detailed in Table 7. These funding sources are linked directly to the implementation of the CCMP, a total of \$697,449 (detailed in Table 8). Sources of match offered include revenue from membership, state and local grants, private foundations, etc., as well as the work of staff within these organizations on projects specifically related to our estuarine restoration and conservation efforts.

In addition, \$7234 in-kind services are anticipated from Management Committee and Subcommittee members not already accounted for in the RSP match; MassBays will receive \$150,000 state funds this fiscal year from DEP for implementation of the Massachusetts Coastal Condition Assessment. These items total \$157,234.

Total match offered is \$846,266, or 101% match, comprised of the following non-Federal categories:

State: \$150,000
Local: \$57,000
Other (including in-kind labor): \$639,266

Table 2. MassBays National Estuary Program Proposed Budget, FFY2022

FFY22 Section 320 Grant Application Massachusetts Bays National Estuary Program Proposed Expenditures	
Personnel	
Executive Director, 0.8FTE	\$96,000
Staff Scientist, 0.65FTE	\$69,550
subtotal, salaries	\$165,550
Fringe benefits	
40.48% (salaries)	\$66,951
subtotal, fringe	\$66,951
total, salaries + fringe	\$232,501
Travel	
ANEP, EPA meetings	\$6,042
subtotal, travel	\$6,042
Contractual	
Heroku app hosting service, AquaQAPP & iSeaGrass	\$300
subtotal, contractual	\$300
Other	
Regional Service Providers (5 subawards)	\$315,000
Mystic River Watershed Association	\$90,000
Participant support costs	\$5,139
subtotal, other	\$410,139
Total Direct	\$648,982
Indirect	
52.5% (salaries + fringe, travel, supplies, & contracts)	\$125,393
52.5% on RSP subawards (first \$25K each, Y1 only)	\$65,625
subtotal, indirect	\$191,018
Total Request, FFY22	\$840,000
Matching funds	
Direct match	\$403,125
Project-specific match	\$443,141
Total Match, FY22	\$846,266

Table 3. Proposed Travel spending FFY2022

destination (# travelers)	airfare	meals	ground transportation	lodging	registration
NEP national Technical Transfer meeting (New Orleans), 4nt (3 travelers)	\$ 1,200	\$100	\$ 200	\$ 2,100	\$ 450
Spring 2023 (Washington DC), 4d (1 traveler)	\$ 250	-	\$ 100	\$ 600	\$ 150
Other PD/Regional Conferences (2 attendees)		-	\$ 127		
Regional meetings and site visits for CCMP implementation, regionwide education & outreach, etc.			1 car @ \$.585/mi		
Salem x2	0	0	\$ 46.80		
Newburyport x2	0	0	\$ 93.60		
Kingston x2	0	0	\$168.48		
Wellfleet x2	0	0	\$238.68		
Worcester (DEP) x1	0	0	\$ 59.67		
Malden x2					
Haverhill x2	0	0			
NE Regional NEP meetings (2 travelers)			1 car @ \$.585/mi		
Portsmouth NH	0	0	\$ 64.35		
Narragansett RI	0	0	\$ 93.60		
subtotals	\$ 1,450	\$ 100	\$ 1,192	\$ 2,700	\$ 600
Total S.320 Travel	\$ 6,042				

Table 4. Project Match

APCC Match	Amount	Type of match (non-federal)
Direct match	\$ 35,900	indirect, etc.
Monitor cyanobacteria	\$ 90,200	Eddy grant
Monitor herring	\$ 22,832	in-kind volunteer labor
State of the Waters	\$ 2,000	APCC operating
NSRWA Match	Amount	Type of match (non-federal)
Direct match	\$32,851	salaries, indirect, travel, supplies
diadromous fish monitoring	\$25,000	in-kind
Coastal acidification monitoring	\$750	in-kind
invasive species (purple loosestrife)	\$7,500	in-kind
monitor and restore blue mussels	\$4,125	In-kind
water quality monitoring	\$36,700	In-kind
eelgrass in Duxbury-Kingston-Plymouth	\$7,000	In-kind
MVPC Match	Amount	Type of match (non-federal)
Direct match	\$100,904	MVPC operating, indirect
Implement Restoration of Eelgrass in Plum Island Sound; Investigate potential pilot eelgrass sites	\$12,000	Cash (MVPC), inkind (BU)
Marsh Die-off Assessment	\$5,000	Cash (MVPC), inkind (MADMF)
Great Marsh Phragmites Monitoring	\$6,000	Cash (MVPC), inkind (contractor)
Great Marsh Pepperweed Management & Control	\$5,000	Cash (MVPC), inkind (volunteers, MAS)
Marine Invasive Monitoring	\$1,800	Cash (MVPC), inkind (volunteers)
Marsh wrack assessment	\$5,000	Cash (MVPC, MRWC), inkind (UNH)
Marsh Edge Erosion monitoring and analysis	\$3,000	Cash (MVPC), inkind (BU)
Stormwater Management	\$14,500	Cash (MVPC)
Lower Merrimack River Initiative	\$5,000	Cash (MVPC), inkind (BU, volunteers, BU)
Microplastic Water Sampling	\$5,000	Cash (MVPC), inkind (UNH)
Upper North Shore Specific Program Development	\$10,000	Cash (MVPC)
Merrimack River District Commission	\$10,000	Cash (MVPC)
Beach Sand Microplastic Sampling	\$5,000	Cash (MVPC), inkind (volunteers, NECC)
Great Marsh Symposium	\$3,000	Cash (MVPC), inkind (volunteers)
NUMSC Match	Amount	Type of match (non-federal)
Direct match	\$35,910	indirect

Table 4. Project Match *continued*

SSCW Task	Amount	Type of match (non-federal)
Direct match	\$45,860	indirect, operating
Sawmill Brook WQ & fisheries	\$2,500	in-kind volunteer, private
Greenscapes	\$57,000	Essex County municipalities

MyRWA Task	Amount	Type of match (non-federal)
Mystic Baseline Water Quality Monitoring Program	\$56,000	in-kind staff time, laboratory services, and volunteer labor
Cyanobacteria monitoring Program	\$10,000	Unrestricted private funds
River Herring Program	\$14,000	in-kind volunteer labor, onsite and virtual
Mystic Stewardship	\$10,000	in-kind staff time, volunteer labor

Item	amount	Type of match (non-federal)
Management Committee attendance	\$7,234	in-kind (15 non-fed, non-RSP participants x 3h/mtg x 5 mtgs/y * \$32.15/h)
MassDEP MA Coastal Condition Assessment	\$150,000	state cash match

Table 5. Regional Service Providers Budget Detail

Merrimack Valley Planning Commission				
Line Item	Requested	Match	Total	Detail/Justification
Salaries	\$24,000	\$41,869	\$65,869	1400 hours Regional Coordinator, no fringe charged
Travel	\$4,200		\$4,200	standard-rate mileage, travel throughout the Upper North Shore Region
Supplies	\$960		\$960	printing photos and maps; pvc transect frames, microplastics sampling supplies
Indirect	\$33,840	\$59,035	\$92,875	141% on Salaries
Total	\$63,000	\$100,904	\$163,904	

Salem Sound Coastwatch				
Line Item	Requested	Match	Total	Detail/Justification
Salaries	\$63,000	\$25,000	\$88,000	1700 hours, no fringe incurred
Travel		\$200	\$200	standard-rate mileage, travel throughout the Lower North Shore Region
Supplies		\$3,000	\$3,000	water quality monitoring supplies
Indirect		\$19,360	\$19,360	22% on Salaries
Total	\$63,000	\$47,560	\$110,560	

North and South Rivers Watershed Association				
Line Item	Requested	Match	Total	Detail/Justification
Salaries & Fringe	\$42,806	\$24,559	\$67,365	1700 hours Regional Coordinator, 11% fringe on salaries
Intern	\$4,083	\$1,677	\$5,760	stipend
Travel	\$1,985	\$815	\$2,800	standard-rate mileage, travel throughout the South Shore Region
Supplies	\$177	\$73	\$250	field monitoring supplies, including pvc pipes, duct tape, tools
Other Direct Costs	\$532	\$218	\$750	Regional conference registration, publication fees
Indirect	\$13,417	\$5,509	\$18,926	23% on Salaries and Fringe
Total	\$63,000	\$32,851	\$95,851	

Association to Preserve Cape Cod				
Line Item	Requested	Match	Total	Detail/Justification
Salaries & Fringe	\$63,000	\$17,600	\$80,600	1600 hours Regional Coordinator, fringe rate 22% on Salaries
Other Direct Costs		\$1,500	\$1,500	software, sampling supplies
Indirect		\$16,800	\$16,800	\$12/hour
Total	\$63,000	\$35,900	\$98,900	

Northeastern University Marine Science Center				
Line Item	Requested	Match	Total	Detail/Justification
Salaries & Fringe	\$62,000		\$62,000	1600 hours Regional Coordinator, fringe rate 25.5% on Salaries
Other	\$1,000		\$1,000	participant support costs: light refreshments for quarterly BHEN meetings
Indirect		\$35,910	\$35,910	unrecovered indirect costs, 57% of direct costs
Total	\$63,000	\$35,910	\$98,910	

Table 6. Urban Waters Budget Detail

Mystic River Watershed Association				
Line Item	Requested	Match	Total	Detail/Justification
Salaries & Fringe	\$75,855	\$0	\$75,855	Mystic River Ambassador salary, fringe rate 17.2% on salaries
Travel	\$2,000	\$0	\$2,000	standard-rate mileage, travel throughout the Mystic River Watershed
Other	\$0	\$0	\$0	
Indirect	\$12,145	\$0	\$12,145	15.6% on salary
Total	\$ 90,000	\$0	\$ 90,000	<i>programmatic match provided (see Table 4)</i>

Appendix N. Sample Healthy Estuaries Grant Request for Proposal

EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS

Bethany A. Card, Secretary

Request for Responses ENV 23 CZM 03

Dated: May 19, 2022

Massachusetts Bays National Estuary Partnership

FY23 Healthy Estuaries Grants

1. GRANT OPPORTUNITY SUMMARY

A. PROPOSALS SOUGHT FOR: The Executive Office of Energy and Environmental Affairs (EEA) Massachusetts Bays National Estuary Partnership (MassBays) within the Massachusetts Office of Coastal Zone Management (CZM) is soliciting proposals under the FY23 MassBays Healthy Estuaries Grant Program for projects that will advance the implementation of the MassBays [Comprehensive Conservation and Management Plan](#) (CCMP). Through the Healthy Estuaries Grant Program, MassBays will provide funding and technical support to those working in near-shore waters and coastal communities from Salisbury to Provincetown to:

1. Characterize estuary, rocky intertidal, and beach habitats and biological communities.
2. Document the impacts of human and natural stressors on those systems.
3. Evaluate effectiveness of habitat restoration efforts already implemented.
4. Design and scope larger habitat and/or water quality restoration projects for subsequent state or federal funding, especially in underserved communities.

B. OVERVIEW AND GOALS: MassBays is a United States Environmental Protection Agency (U.S. EPA) National Estuary Partnership dedicated to protecting, restoring, and enhancing the estuarine ecosystems of Massachusetts and Cape Cod Bays. Working toward our vision of sustainable estuarine ecosystems that support the life and communities dependent upon them, MassBays grant funds are dedicated to support local progress on protecting, restoring, and enhancing estuarine habitats (e.g., seagrass beds, salt marshes, diadromous fish habitat, beaches, and rocky shores) and to inform management efforts to reduce stressors (e.g., climate change, wastewater, stormwater, habitat fragmentation) impacting these habitats.

With the FY23 Request for Response (RFR), we are seeking projects focused on knowledge gaps revealed by MassBays' ongoing efforts to characterize the great variability across the planning area (see Section 2.B). We seek information to support MassBays-wide planning, as well as local, embayment-specific priorities identified by communities. Projects must include a robust project evaluation process with measurable outcomes that will track progress toward short- and long-term project goals.

A requirement of this RFR is the submission of a pre-proposal. The pre-proposal is the first step

in which respondents will provide a brief description of the purpose and goals of the study, a summary approach, and total proposed budget. Upon selection by a Review Committee, proponents of successful pre-proposals will be invited to submit a full proposal. Guidelines for submission of both the pre-proposal and full proposal are provided in Section 3.

C. ELIGIBLE PROJECTS: Eligible projects include research, monitoring and data analysis, and planning initiatives that advance MassBays' priorities which focus on protecting, restoring, and enhancing coastal habitats, including shellfish and seagrass beds, salt marshes, diadromous fish habitat, beaches, and rocky shores and the communities that these habitats support. Topics of specific interest include identifying and documenting impacts of climate change and sea level rise on natural systems and water quality in the [68 assessment areas](#) of the MassBays region. Proponents must demonstrate that projects will inform and advance near-term estuarine and coastal management initiatives consistent with the goals of the CCMP. For more details see Section 2B.

D. ELIGIBLE APPLICANTS: This solicitation is open to Massachusetts municipalities, Massachusetts 501(c)(3) organizations, regional planning agencies, and nonprofit research institutions, and institutions of higher learning in Massachusetts. See further detail in Section 2A.

E. APPLICATION DEADLINES:

Deadline for Pre-proposal: June 10, 2022, at 12:00 pm

Deadline for Full Proposal: July 15, 2022, at 4:00 pm

(See further details on deadlines and grant program calendar in Section 4).

F. FUNDING AVAILABILITY: We anticipate up to \$145,000 in federal funds will be available through this solicitation. EEA reserves the right to change the amount of available grant funding. Final funding amounts are subject to appropriation and approval. A single applicant may request funding amounts between \$8,000 and \$30,000 per project. MassBays may make a limited number of awards to collaborative, multi-partner projects. Budgets for these projects cannot exceed \$45,000. Respondents are strongly encouraged to identify and incorporate efficiencies and cost-saving measures to reduce costs as much as possible. (See Funding Availability in Section 2C).

G. MATCH REQUIREMENT: A non-federal match (cash or in-kind) that will equal or exceed 25% of the total project cost is required. Projects that provide additional match will receive additional consideration (see Match Requirement in Section 2D). Funds from other federal sources or grants, and funds committed to match other federal grants, are not eligible to be used as matching funds.

H. ANTICIPATED DURATION OF CONTRACT(S): Contracts are anticipated to last approximately 24 months, with an anticipated start date in September 2022 and a completion date of October 31, 2024 (See further detail on Anticipated Duration of Contract[s] in Section 2E).

I. REGULATIONS, STATUTES, OR AUTHORIZATION GOVERNING THIS GRANT PROGRAM: The award of federal sub-grants is subject to the regulations in 815 CMR 2.00. This grant program is also governed by cooperative agreements between the Commonwealth of Massachusetts and the U.S. EPA in support of the Massachusetts Bays National Estuary Partnership.

J. CONTACT INFORMATION: Prassede Vella
Massachusetts Bays National Estuary Partnership
251 Causeway St., Suite 800
Boston, MA 02114
Email: Prassede.Vella@mass.gov

2. PERFORMANCE AND CONTRACT SPECIFICATIONS

A. ELIGIBLE APPLICANTS: This solicitation is open to Massachusetts municipalities, 501(c)(3) non-profit organizations, non-profit research institutions, and institutions of higher learning. Where multiple entities propose a collaborative project, a single grantee will be the recipient of funds, and partners receiving funds through the grantee will be considered subawardees. The grantee must be a Massachusetts-based entity with a tax identification number and the authority to enter into contracts with the Commonwealth of Massachusetts, but subawardees and subcontractors need not be (see Section 2.C. for definitions). Subcontractors may include for-profit organizations and state agencies. Only one grant proposal per entity will be awarded, although more than one proposal from a given entity may be submitted for funding.

B. ELIGIBLE PROJECTS/SCOPES OF WORK: MassBays seeks proposals for projects that include research and planning initiatives that advance MassBays' priorities which focus on protecting, restoring, and enhancing coastal habitats, including shellfish and seagrass beds, salt marshes, diadromous fish habitat, beaches, and rocky shores and the communities that these habitats support, especially identifying and responding to projected impacts of climate change and sea level rise on those habitats. Proponents must demonstrate that projects will inform and advance near-term estuarine and coastal management initiatives consistent with the goals of the CCMP and in MassBays' planning area (Attachment A).

Applicants are encouraged to use available resources including, for example:

- **[Ecosystem Delineation and Assessment](#)** (EDA). The EDA characterizes 68 assessment areas (including 47 embayments, rocky shores and beaches) using data for the following indicators of estuarine conditions: salt marsh, tidal flats, eelgrass, shellfish habitat, shorebird habitat and nesting sites, anadromous fish passage, land use/land cover, stormwater discharge, impervious area, population density, wastewater discharge, 303(d) impairments (bacteria, nutrients), designated shellfish area classification, tidal restriction, barriers to fish passage, and stream crossings. These data are presented in an [ArcGIS Story Map](#).
- **[2019 Comprehensive Conservation and Management Plan \(CCMP\) Goals](#)**. This document, required of all National Estuary Programs under Section 320 of the Clean Water Act, describes long-term ecosystem goals and strategies to improve water quality

and coastal habitat in the MassBays planning area. Please refer to the [Table of Strategies and Actions](#) included in the 2019 CCMP on MassBays' website; Attachment B documents Short-term Priorities developed by MassBays' Management Committee, also based on the CCMP and input provided by local stakeholders.

- [MassBays Monitoring Framework](#). This document describes MassBays' approach to collecting and analyzing data from multiple sources to assess conditions and trends across the Bays (i.e., State of the Bays reporting). The document is an attachment to the CCMP.
- [Gaining Ground: Defining Priority Research for Resilient Salt Marshes](#). MassECAN's Salt Marsh Working Group has identified salt marsh research priorities to support collaboration and research that promotes resilient salt marsh habitat now and into the future. This summary document represents outcomes of a consensus-based process to inspire coordinated, transdisciplinary discussion and action around the complex and intersecting challenges of salt marsh management and resilience.

Respondents are encouraged to refer to these materials and submit proposals which build on these products. Project descriptions must describe how their own project goals align with the needs identified and documented by MassBays.

Project work must be focused on or around one of the 68 assessment areas described in the EDA (see Attachment A). Projects may be conducted in or around more than one area or include approaches and solutions that have wider applicability if they meet the goals of the solicitation. Eligible projects include research, monitoring and data analysis, and initiatives that will: (1) generate data and information on trends and conditions of local ecosystems for the purpose of filling data gaps, (2) apply new or innovative tools and approaches to improve ecological conditions (including restoration efforts), (3) demonstrate new or innovative research approaches to assess conditions and trends, (4) assist MassBays with education and outreach specific to its CCMP, and/or (5) design and plan future on-the-ground implementation projects to improve conditions of estuarine habitats through subsequent investment. Preference will be given to approaches and results that apply to or can be transferred to multiple MassBays assessment areas.

Competitiveness of a project will depend on its ability to meet grant selection criteria described in Attachment C. Note that projects must include an evaluation plan including means and measures for tracking progress toward project goal(s).

Projects not eligible for funding under this RFR include:

1. Projects required as part of compensatory mitigation or enforcement action.
2. Lobbying or political activities.

Interested parties may submit questions to Prassede Vella at Prassede.Vella@mass.gov by **June 6, 2022, at 4 pm**. Questions and answers will be posted on [COMMBUYS](#) concurrent with direct responses to the initial inquiries up until the deadline.

This RFR includes submission of a pre-proposal as a first step in which respondents will be required to provide a description of the purpose and goals of the study, a summary approach and total proposed budget. Upon selection by a Review Committee, proponents of successful pre-proposals will be invited to submit a full proposal. Guidelines for submission of both the pre-proposal and full proposal are provided in Section 3.

C. FUNDING AVAILABILITY, BUDGETING GUIDELINES & ALLOWABLE EXPENDITURES:

We anticipate that up to \$145,000 in federal funds will be available through this solicitation. EEA reserves the right to increase or decrease the amount of available grant funding. Grant funds are awarded on a reimbursement basis upon receipt of invoices from the grantee and are subject to 10% retention until all deliverables are met.

- **Project funding:** A single applicant may request funding amounts between \$8,000 and \$30,000 per project. MassBays may make a limited number of awards to collaborative, multi-partner projects. Budgets for these projects cannot exceed \$45,000. All contracts shall be subject to available federal funding. If available funding ceases for any reason, a contract shall be deemed under suspension and contract performance must halt. A contractor will not be entitled to compensation for any performance provided during the period of contract suspension. EEA may lift the suspension if available funding is received. In the absence of foreseeable available funding, EEA may terminate the contract.
- **Subawards:** The grantee may apply on behalf of one or more partners, who will be considered subawardees. Subawardees (in contrast to subcontractors) are engaged in the planning and implementation of the project, as well as post-award maintenance or outreach efforts resulting from the joint funding.
- **Subcontracts:** The grantee may subcontract a portion of the grant award for activities deemed eligible and which are completed under a scope of work negotiated between the grantee and EEA. These costs must be identified in the proposal. Examples of such eligible costs include laboratory work, engineering or survey services, printing, etc.
- **Multiple applications:** An eligible entity may submit more than one application but only one proposal per entity may be funded. Funding through a collaborative, partnership-based application under this opportunity is considered a funded proposal for all partners.

D. MATCH REQUIREMENTS: The Grantee will provide a non-federal match that will equal or exceed 25% of the **total** project costs. The match may be cash or in-kind contributions or a combination of both¹. Funds from other federal sources or in-kind value that is currently being used to

¹ Cash contributions are those funds that will be used to purchase goods or services associated with the project. In-kind contributions represent the value of non-cash contributions provided by the applicant, e.g., in the form of charges for real property and non-expendable personal property and the value of goods and services directly benefiting and specifically identifiable to the project.

match other government programs are not eligible to be used as matching funds. Costs incurred to prepare the project proposal will not be considered as part of the match requirement. Basis for cost estimates for both cash and in-kind match should be described as part of the project budget narrative when submitting the full proposal. All in-kind and cash match must be documented and received prior to the end of the contract period.

E. ANTICIPATED DURATION OF CONTRACTS: Contracts are anticipated to last approximately 24 months, with an anticipated start date in September 2022 and a completion date of October 31, 2024. Contracts and associated scopes of work must be completed by their contract end date. Awarded contracts will be reviewed during their course, and upon written request by the grantee, may be extended, at the sole discretion of EEA and subject to constraints of the funding source. Grantees must make all extension requests no later than 60 days prior to contract expiration.

F. PROJECT TERMS: If awarded, projects will be required to abide by the [Standard Commonwealth of Massachusetts Terms and Conditions](#). A final contract is subject to successful negotiation of a Final Scope of Work. Please note that EEA does not guarantee that any contracts may result from this RFR or that any particular funding level will be awarded. Projects will commence immediately upon execution of a final contract.

Additional requirements for funded projects:

1. For projects involving data collection and analyses, a Quality Assurance Project Plan (QAPP) may be required. A QAPP is a document that outlines the components of a monitoring program including the steps taken to assure the quality of the data generated. Depending on the type of project, proponents may use [MassBays AquaQAPP tool](#) to develop a QAPP; in any case, the proposal should include reference to whether a QAPP has been or will be developed for the proposed work. All QAPPs must be approved by the U.S. EPA prior to start of work. Depending on the project and intended use of results, approval from the Massachusetts Department of Environmental Protection (DEP) may also be required.
2. The scope of work will include a delivery/reporting schedule. Summary progress reports will be required at least quarterly, describing the project status or impediments to progress. Additionally, a final report will be required, which should describe the activities completed under the contract, data, results and findings, and management recommendations.
3. Upon completion of the project, the grantee's project team will be asked to: (1) provide a one-page summary of the project for publication on the MassBays National Estuary Partnership website, (2) upload any data generated under a QAPP to EPA's Water Quality Portal; and may be invited to (3) present project outcomes and recommendations to the MassBays Management Committee at one of its quarterly meetings.

4. Grantees are required to acknowledge the funding support and contributions of the MassBays National Estuary Partnership in any published material and/or oral presentations highlighting project implementation and successes, including websites and e-newsletters.

G. INVOICING: Contract funds are awarded on a reimbursement basis for expenditures made during the period of the contract. Only those tasks/deliverables completed after the contract start date and identified in the Scope of Work are eligible for reimbursement. Expenditures made outside of the period of the executed contract cannot be reimbursed.

3. INSTRUCTIONS FOR APPLICATION SUBMISSION

A. EVALUATION CRITERIA: Application to the Healthy Estuaries Grant Program is a two-step process that includes a pre-proposal (step 1) and a full proposal (step 2). A Review Committee will be convened to evaluate all pre-proposals and full proposals on a competitive basis. The Review Committee will be composed of MassBays and EEA staff, federal agency representatives, and members of the [MassBays Management Committee](#). Subject-matter experts may be included to serve in an additional advisory role to the Committee to assist in review of the scientific validity and technical merit of the proposals. Each pre-proposal will be reviewed and ranked in a competitive process by the Review Committee.

Using the Selection Criteria described in Attachment C, the Review Committee will assign a score to each pre-proposal, and based on these scores, assign a rank order to each. The average rank score among all reviewers shall be the basis of pre-proposal selection. All respondents will receive written notification from MassBays on the ranking. Only the highest mean-ranked pre-proposals will be invited to submit a full proposal, in order of rank. The number of applicants invited will be at the discretion of the Review Committee, depending upon the amount of funding requested among the highest ranked proposals and the total number of pre-proposals received. The goal of the Review Committee is to ensure that the proponents with the highest ranked and most promising pre-proposals are invited to submit full proposals. The Review Committee reserves the right to reject any proposals that do not meet the goals and terms of this RFR.

The same competitive review process will be followed for the selection of full proposals. Only the highest mean-ranked full proposals that demonstrate clear and significant benefits to MassBays planning area and support the goals of the CCMP will receive funding. Projects will earn points for meeting the requirements of each evaluation category as described in the Scoring Sheets provided in Attachment C of this solicitation.

Note that incomplete or incorrectly submitted applications may be disqualified.

B. APPLICATION CONTENT AND FORMAT: Applications to this grant program is a two-step process. The first step requires submission of a pre-proposal by **June 10, 2022, at 12:00 pm**. Full

proposals (step two) will be invited at the recommendation of the Review Committee. Full proposals must be received by **July 15, 2022, at 4:00 pm**. Additional deadline information is provided in Section 4.

STEP 1: Pre-proposal

A complete pre-proposal should follow the format included in Attachment D, and must include: (1) Cover Sheet, (2) Pre-proposal Narrative including names and roles of primary partners, and (3) estimated total budget, including the amount requested. The Pre-proposal Narrative should be single-spaced in 11-point font and should not exceed two (2) pages, including figures and tables. Pre-proposals must list primary partners and their specific role or contribution to the proposed effort. No additional support documentation is required at this time. Details regarding submission of the pre-proposal are provided in Section C.

STEP 2: Full Proposal (by invitation from MassBays only)

Only full proposals invited by MassBays based upon Committee review and approval of a pre-proposal will be accepted. Complete proposals must include all components (cover sheet, project description, and additional materials) described in Attachment E, and must be submitted as instructed in Section C. Ancillary materials included with the proposal but not specific to this solicitation will not be reviewed. The application must contain clear and concise narrative (and supporting graphics, maps, or tables as necessary) in each of the required sections.

Full proposals must be single-spaced and should be composed in at least 11-point font. The project description may not exceed ten (10) pages, exclusive of cover sheet/letter, project summary, literature cited, budget information, resumes of proposed staff, letters of support, or other attachments.

C: APPLICATION SUBMISSION INSTRUCTIONS:

Pre-proposal: Respondents must submit a signed cover sheet and pre-proposal narrative, clearly specifying the RFR number on the cover sheet sent by email (attached as a MS Word document or PDF) to Prassede.Vella@mass.gov by **June 10, 2022, at 12:00 pm**.

Full proposal: Invited respondents must submit one signed cover sheet and full proposal, clearly specifying the RFR number on the proposal cover sheet by email (attached as a MS Word document or PDF) to Prassede.Vella@mass.gov by **July 15, 2022, at 4:00 pm**. In addition, an Original signed full proposal shall be submitted to the following address:

**Prassede Vella
RE : RFR ENV 22 CZM 03
Massachusetts Bays National Estuary Partnership
251 Causeway Street, Suite 800
Boston, MA 02114-2126**

D. ADDITIONAL REQUIRED DOCUMENTATION: If awarded and if not already on file with the Department, the respondent will be required to submit the following forms to complete a contract:

- Commonwealth Standard Contract Form, signed and dated by the Respondent
- Scope of Services and Budget Attachments
- Commonwealth W-9 Tax Information Form completed and signed by the Respondent. (A DUNS number and TIN number must be included on the W-9 Form)
- Completed Contractor Authorized Signature Verification Form.
- Electronic Funds Transfer (EFT) Authorization Form
- Prompt Payment Discount Form

Respondents are encouraged to review these forms prior to submission of a Response. Forms may be downloaded from [COMMBUYS](#) as part of this solicitation.

4. DEADLINES AND PROCUREMENT CALENDAR

A. RELEASE OF SOLICITATION: The schedule below is anticipated. Dates and times are subject to change. Respondents are responsible for checking for any updates on the [COMMBUYS](#) system.

RFR posted on COMMBUYS	May 19, 2022
1 st Question and Answer period closes	June 6, 2022
Pre-proposals due	June 10, 2022, at 12:00 pm
Full proposals invited	June 22, 2022
2 nd Question and Answer period closes	July 8, 2022
Full proposals due	July 15, 2022 at 4:00 pm
Awards announced	August 2022 (estimated)
Contracts commence	September 2022 (estimated)
Projects completed by	October 31, 2024

B. INQUIRIES ABOUT THE SOLICITATION: Questions about the solicitation will be accepted in writing by email to Prassede.Vella@mass.gov in two phases: May 19 through June 6, 2022 (pre-proposals) and June 22 through July 8, 2022 (full proposals). Questions and answers will be posted on [COMMBUYS](#) concurrent with direct responses to the initial inquiries up until the deadline. These answers are for clarification purposes only and do not constitute an amendment of the RFR unless expressly stated as such.

5. MISCELLANEOUS

A. TYPE OF PROCUREMENT: Grant

B. USE OF THIS PROCUREMENT BY SINGLE OR MULTIPLE DEPARTMENTS: This RFR is a single department procurement. All contracts awarded under this RFR will be utilized solely by EEA.

C. REQUEST FOR SINGLE OR MULTIPLE CONTRACTORS: Multiple contracts may be awarded under this RFR.

D. RFR DISTRIBUTION METHOD: This RFR is distributed electronically using the [COMMBUYS](#) system. It is the responsibility of every Respondent to check COMMBUYS for any addenda or modifications to an RFR to which they intend to respond. The Commonwealth of Massachusetts and its subdivisions accept no liability and will provide no accommodations to respondents who fail to check for amended RFRs and submit inadequate or incorrect responses. Potential Respondents are advised to check for updates on the COMMBUYS system to ensure they have the most recent RFR files.

E. LIST OF ATTACHMENTS:

- A. MassBays Planning Area (Fig. 1); MassBays Assessment Areas (Fig. 2)
- B. MassBays Short-term Priorities
- C. Sample Selection Criteria (Scoring Sheets) for Pre-proposals and Full Proposals
- D. Pre-proposal Cover Sheet and Narrative Components
- E. Full proposal Cover Sheet and Narrative Components

ATTACHMENT A

FIGURE 1: MASSBAYS PLANNING AREA

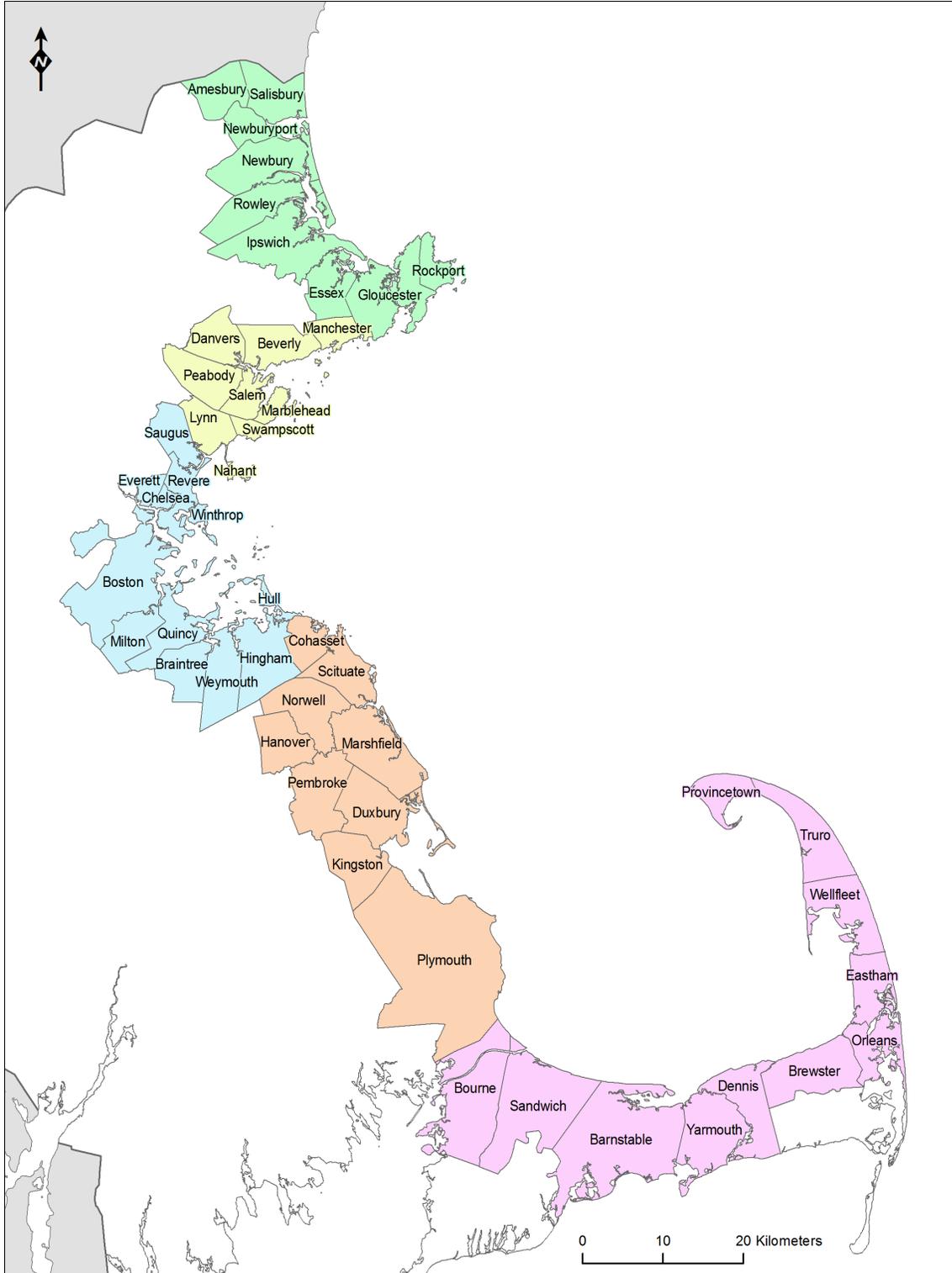
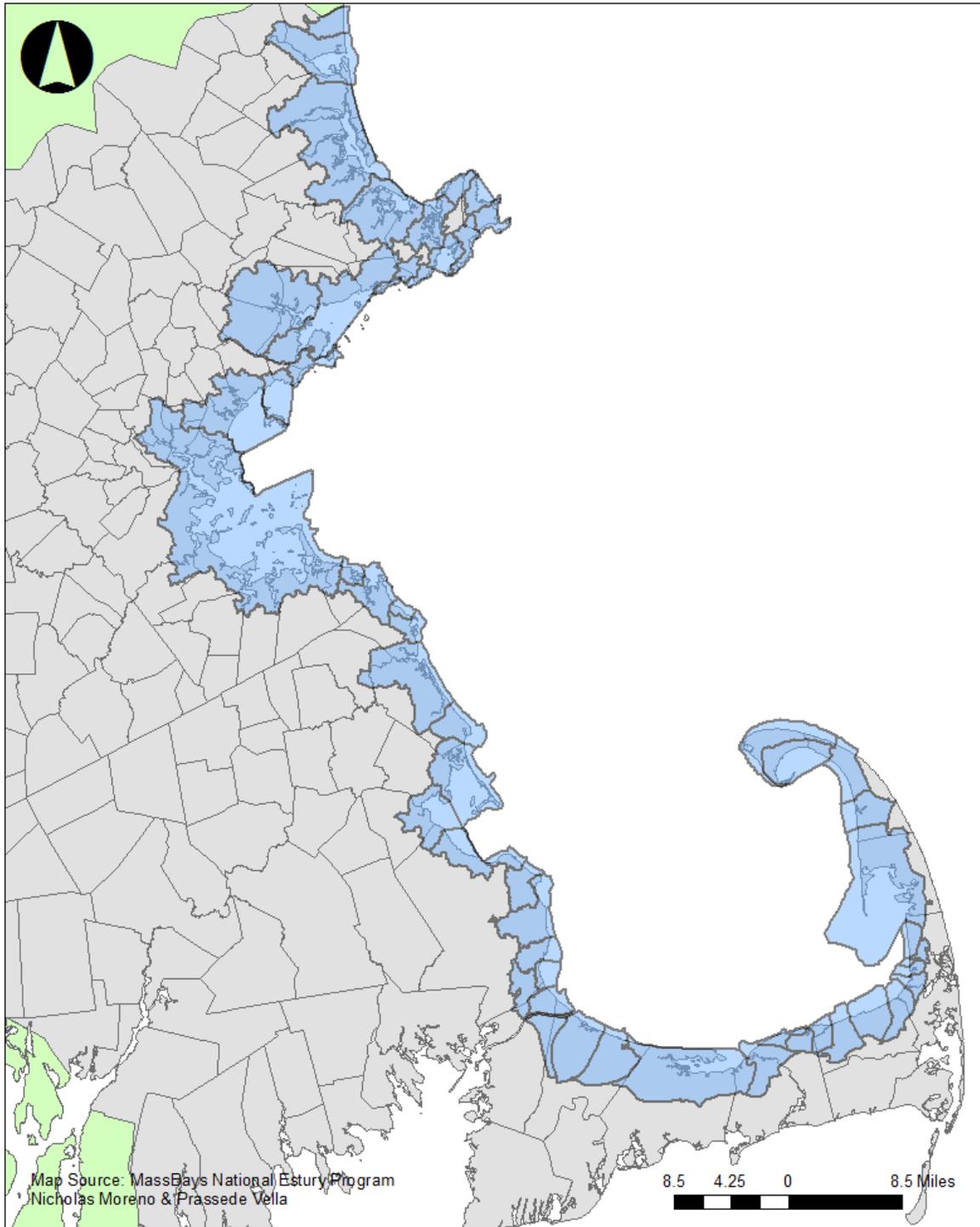


FIGURE 2

MassBays Assessment Areas (2017)



ATTACHMENT B
MASSBAYS SHORT-TERM PRIORITIES

MASSACHUSETTS BAYS NATIONAL ESTUARY PARTNERSHIP
FY23 HEALTHY ESTUARIES GRANTS

Request for Response ENV 23 CZM 03

Support policy and planning

- Prioritize, plan, or implement coastal *infrastructure projects* that result in habitat or water quality improvements.
- Conduct regional/watershed-based coastal *restoration prioritization*.
- Collect habitat and water quality data to *inform state & local condition assessments*.

Address research & data gaps

Climate change

- Influence on pollution and water quality
- Considerations for restoration of submerged aquatic vegetation and salt marsh
- Coastal acidification characterization and impacts
- Sentinel species assessments and/or documentation of population shifts
- Examine changing sediment budgets to forecast restoration needs

Water quality

- Determine water quality thresholds that optimize health of coastal habitats
- Investigate connections between water quality and habitat loss
- Expand existing freshwater monitoring programs to include estuarine systems
- Conduct marine benthic community assessments
- Assess emerging contaminants (PFAS, PPCPs)

Habitat condition

- Investigate the cause(s) of habitat deterioration and possible actions to improve conditions
- Investigate impacts of habitat loss on key ecosystem services
- Expand video-enabled diadromous fish run monitoring
- Conduct habitat restoration-related monitoring to inform future restoration efforts

Data products & analysis

- Digitize and conduct QA/QC assessments on historic data and upload to EPA's Water Quality Portal
- Analyze crowdsourced data (e.g., MassWreck, iNaturalist observations) to characterize conditions in MassBays
- Pilot innovative technologies and approaches to collecting, managing, and sharing monitoring and restoration data.

Evaluate impact

- Effectiveness of restoration, education, and outreach, and other actions that garner support from communities and stakeholders
- Qualitative and quantitative benefits of CCMP-related (including Healthy Estuaries Grant-funded) programs and projects

ATTACHMENT C
SAMPLE SELECTION CRITERIA (SCORING SHEET) FOR PRE-PROPOSALS

1) Project goal and outcomes		Score: _____ of 35 points
Assessment	maximum possible points	
Is there a clearly demonstrated need and justification for the action described in the pre-proposal (e.g., restoration, management efforts, data collection)?	10	
Are the project goal(s) and anticipated outcomes clearly articulated?	5	
Is the project relevant to the MassBays CCMP?	10	
Does the project address a priority action identified by MassBays?	10	

2) Anticipated benefits		Score: _____ of 30 points
Assessment	maximum possible points	
Does the project present a clear, logical, and achievable solution to the stated need?	10	
Does the project have a realistic potential of achieving anticipated outcomes?	10	
<i>If a planning effort is proposed, will the project set the groundwork for future implementation funding?</i>	<i>10</i>	
<i>If a research or monitoring effort is proposed, will the project provide a basis for future applied research or management action?</i>	<i>10</i>	

3) Qualifications and Budget		Score: _____ of 15 points
Assessment	maximum possible points	
Do the project lead and partners demonstrate capacity to implement the project as described?	5	
Is the budget reasonable for the work proposed?	5	
Does the project provide a match greater than 25% of total project cost?	5	

4) Transferability		Score: _____ of 20 points
Assessment	maximum possible points	
Are anticipated outcomes transferable to other regions? Can the approach be implemented in other assessment areas or regions?	10	
Are plans to share the approach and/or findings with specific target audiences adequate?	10	

ATTACHMENT C (CONTINUED)
SAMPLE SELECTION CRITERIA (SCORING SHEET) FOR FULL PROPOSALS

1) Project need, goals, and outcomes	Possible score: 25 points
<p><i>Request to applicants:</i></p> <p>Problem Description</p> <ul style="list-style-type: none"> • Describe the assessment area(s) need(s) and/or challenges that this project will address. Cite previous work to document the problem and any management needs. • Describe the location and assessment area(s) where the work will be focused and the habitats/water bodies of concern. A locus map of the project must be attached. <p>Project Goals and Anticipated Outcomes</p> <ul style="list-style-type: none"> • Describe the goals of the proposed project. Goals should be explicitly connected to desired outcomes of the project and any anticipated management activities. Connect the project to the MassBays CCMP. For example: <ul style="list-style-type: none"> ▪ Document and compare nutrient loads and habitat conditions in areas A and B. ▪ Advance activities described in the MassBays CCMP Strategy 3.2. • Describe the anticipated short-, medium-, and long-term outcomes that will result from the completion of this project. Connect project outcomes to desired CCMP outcome(s). For example: <ul style="list-style-type: none"> ▪ Short-term outcome: Data regarding embayment-specific nutrient loads are available. ▪ Medium-term outcome: Connections between nutrient loading and habitat condition inform management decisions. ▪ Long-term outcome: Changes in local nutrient loads result in improved habitat conditions. ▪ CCMP Environmental Outcome: Restored natural communities. <p><i>Evaluate whether the proposed project:</i></p> <p>___ is consistent with the strategies and advances the MassBays CCMP goals.</p> <p>___ focuses on one or more of the 68 assessment areas within the MassBays planning area.</p> <p>___ presents a clearly defined need for the project in the assessment area of interest, including specific end users.</p> <p>___ draws existing knowledge and materials, in particular the Ecosystem Delineation and Assessment (EDA), monitoring plan, and the MassBays Priority Action List</p> <p>___ builds on existing work and develops new knowledge that will inform the State of the Bays.</p> <p>___ clearly articulates the goal(s) of the project.</p> <p>___ describes outcomes that are clearly connected to desired goal(s).</p>	
<p>Reviewer Comments:</p> 	

ATTACHMENT C (CONTINUED)
SAMPLE SELECTION CRITERIA (SCORING SHEET) FOR FULL PROPOSALS

2) Project approach and evaluation plan	Possible score: 30 points
<p><i>Request to applicants:</i></p> <ul style="list-style-type: none"> • Provide a detailed description of proposed methodology and approach, including the potential for transferability to other assessment areas and ecosystem problems. • Identify project staff, partners, and subcontractors (if applicable) and describe their roles and responsibilities in the project. • Provide a Scope of Work/Tasks to be completed under grant request that includes: <ul style="list-style-type: none"> ▪ A detailed, step-by-step narrative for each task including supporting reference materials, plans, tables, or graphics, as well as an estimated cost associated with each task. ▪ If applicable, study design including methods of data collection, analyses, and QA/QC (including QAPP). ▪ Timeline and anticipated milestones, including written products and other deliverables. • List interim measures in progress toward anticipated short-term and medium-term outcomes and anticipated project benefits and describe how they will be tracked and documented. <p><i>Evaluate whether the proposed project:</i></p> <p>___ generates products or services that will result in concrete management activities or on-the-ground projects, e.g., implementation of BMPs or restoration efforts.</p> <p>___ is focused on addressing ecological functions of ecosystem resources and/or impacts of stressors</p> <p>___ addresses local priority concerns</p> <p>___ includes work in underserved communities</p> <p>___ approach, methodology, and anticipated outcomes are based on sound scientific principles.</p> <p>___ clearly aligns task-specific budgets within project scope and timeline.</p> <p>___ identifies outcome and impact measures to assess progress of the project towards anticipated goals.</p>	
Reviewer Comments:	

3) Project benefits and transferability	Possible score: 15 points
<p><i>Request to applicants:</i></p> <ul style="list-style-type: none"> • Articulate the direct benefits of the project to the local ecosystem and resource management. • Describe how the project results and findings may be applied beyond the target assessment area(s). • Identify specific target audiences for the project approach and results, and describe plans for sharing methodologies, results, conclusions, and management implications with those audiences. Include the anticipated reach of your dissemination plan (local, regional, national). <p><i>Evaluate whether the proposed project:</i></p> <p>___ has reasonable potential to benefit the local ecosystem and/or local resource management planning.</p> <p>___ will develop an approach or pilot a solution that can be applied to other assessment areas.</p> <p>___ includes a well-thought-out dissemination component that describes target audience(s), communication methods suitable for the audience(s), and anticipated reach.</p>	
Reviewer Comments:	

ATTACHMENT C (CONTINUED)
SELECTION CRITERIA (SCORING SHEET) FOR FULL PROPOSALS

4) Qualifications and partnerships	Possible score: 10 points
<p><i>Request to applicants:</i></p> <ul style="list-style-type: none"> • Describe the qualifications of the project’s lead applicant and staff. • Describe the qualifications of partners and/or subcontractors relevant to their roles. <p><i>Evaluate whether the applicant:</i></p> <p><input type="checkbox"/> demonstrates sufficient organizational capacity to administer and conduct the proposed scope of work.</p> <p><input type="checkbox"/> clearly describes partner and/or subcontractor roles and contributions.</p> <p><input type="checkbox"/> includes local stakeholders, e.g., municipal officials and underserved populations.</p> <p><input type="checkbox"/> builds on or establishes new partnerships that will improve the likelihood of success of the proposed project and future implementation projects.</p> <p><input type="checkbox"/> provided letters of support from collaborating partners.</p> <p><input type="checkbox"/> provided thoughtful letters of support from other stakeholder or interest groups.</p>	
Reviewer Comments:	

5) Project budget, match, and administration	Possible score: 20 points
<p><i>Response request:</i></p> <ul style="list-style-type: none"> • Use the template to provide a detailed, itemized budget breakdown for the funds being requested. [salaries, fringe, subcontract, other direct costs, indirect costs] • Clearly indicate the fringe benefits and indirect/direct overhead rates. Provide justification detail for travel, supplies, etc. • Describe the source of match, including both cash and in-kind contributions. <p><i>Evaluate whether:</i></p> <p><input type="checkbox"/> the proposed scope of work, timeline and budget are detailed, realistic and clear.</p> <p><input type="checkbox"/> where applicable, a strategy for acquiring permits is outlined.</p> <p><i>Evaluate whether the budget:</i></p> <p><input type="checkbox"/> includes budget breakdown.</p> <p><input type="checkbox"/> demonstrates that the project is cost-effective.</p> <p><input type="checkbox"/> each partners’ match is confirmed in their letter of support.</p> <p><input type="checkbox"/> match amount is equal to or more than 25% of the total project cost.</p> <p><input type="checkbox"/> indirect costs, if requested, are reasonable. Note: While submissions will not be disqualified because of high indirect program rates, rates of 25% or lower will be considered evidence of cost-effectiveness.</p>	
Reviewer Comments:	

ATTACHMENT D
PRE-PROPOSAL COVER SHEET AND NARRATIVE COMPONENTS

MASSACHUSETTS BAYS NATIONAL ESTUARY PARTNERSHIP
FY23 HEALTHY ESTUARIES GRANTS
Request for Response ENV 23 CZM 03

Name of Applicant: _____

Contact Information

Name: _____

Title: _____

Organization: _____

Phone: _____

Email: _____

Address: _____

Project Title: _____

Target Assessment Area(s)²: _____

Amount Requested: _____

Match Amount (at least 25% of TOTAL project cost): _____

Total Project Cost: _____

² Refer to MassBays' 2017 Ecosystem Delineation and Assessment [maps](https://www.mass.gov/lists/2017-ecosystem-delineation-and-assessment-eda-20-maps), available at <https://www.mass.gov/lists/2017-ecosystem-delineation-and-assessment-eda-20-maps>

ATTACHMENT D (Continued)
PRE-PROPOSAL COVER SHEET AND NARRATIVE COMPONENTS

The pre-proposal provides a summary of the proposed project according to the information requested below. Please limit your response to two (2) pages (single-spaced, 11-point font) including figures, tables etc.

1. Describe the project need, goal(s), anticipated outcomes, and relevance to MassBays goals and management priorities (see RFR Section 2B).
2. Describe the proposed approach, and how and with whom the approach and/or findings will be shared.
3. Provide a draft timeline for the project.
4. List project partners and their anticipated roles.

ATTACHMENT E
FULL PROPOSAL COVER SHEET AND NARRATIVE COMPONENTS

MASSACHUSETTS BAYS NATIONAL ESTUARY PARTNERSHIP
FY23 HEALTHY ESTUARIES GRANTS
Request for Response ENV 23 CZM 03

Name of Applicant: _____

Contact Information

Name: _____

Title: _____

Organization: _____

Phone: _____

Email: _____

Address: _____

Project Title: _____

Project Partners: _____

Target Assessment Area(s)³: _____

Amount Requested: _____

Match Amount (at least 25% of TOTAL project cost): _____

Total Project Cost: _____

³ Refer to MassBays' 2017 Ecosystem Delineation and Assessment maps, available at <https://www.mass.gov/lists/2017-ecosystem-delineation-and-assessment-eda-20-maps>

ATTACHMENT E (Continued)

FULL PROPOSAL COVER SHEET AND NARRATIVE COMPONENTS

Problem Description

- Describe the assessment area(s) need(s) and/or challenges that this project will address. Cite previous work to document the problem and any management needs.
- Describe the location and assessment area(s) where the work will be focused and the habitats/water bodies of concern. A locus map of the project must be attached.

Project Goals and Anticipated Outcomes

- Describe the goals of the proposed project. Goals should be explicitly connected to desired outcomes of the project and any anticipated management activities. Connect the project to the MassBays CCMP. For example:
 - Document and compare nutrient loads and habitat conditions in areas A and B.
 - Advance activities described in the MassBays CCMP Strategy 3.2.
- Describe the anticipated short-, medium-, and long-term outcomes that will result from the completion of this project. Connect project outcomes to MassBays CCMP outcome(s). For example:
 - Short-term outcome: Data on embayment-specific nutrient loads are available.
 - Medium-term outcome: Connections between nutrient loading and habitat condition inform management decisions.
 - Long-term outcome: Changes in local nutrient loads result in improved habitat conditions.
 - CCMP Environmental Outcome: Restored natural communities.

Project Approach

- Provide a detailed description of the proposed methodology and approach, including the potential for transferability to other embayments and ecosystem problems.
- Identify project staff, partners, and subcontractors (if applicable) and describe their roles and responsibilities in the project.
- Provide a Scope of Work/Tasks to be completed under grant request that includes:
 - A detailed, step-by-step narrative for each task including supporting reference materials, plans, tables, or graphics, as well as an estimated cost of each task.
 - If applicable, study design including methods of data collection, analyses, and QA/QC (including QAPP).
 - Timeline and anticipated milestones, including written products and other deliverables.

Project Measures/Outputs

- List interim measures in progress toward anticipated short-term and medium-term outcomes and anticipated project benefits and describe how they will be tracked and documented.

Project Benefits

- Articulate the direct benefits of the project to the local ecosystem and resource management scheme.
- Describe how the project results may be applied beyond the target assessment area.

ATTACHMENT E (Continued)
FULL PROPOSAL COVER SHEET AND NARRATIVE COMPONENTS

Outreach/Dissemination

- Identify specific target audiences for the project approach and results, and describe plans for sharing methodologies, results, conclusions, and management implications with those audiences. Include the anticipated reach of your dissemination plan (local, regional, national).

Qualifications

- Describe the qualifications of the project’s lead applicant and staff.
- Describe the qualifications of partners and/or subcontractors relevant to their roles.
- Resumes may be included as part of the application packet but are not required.

Project Budget

- Use the template below to provide a detailed, itemized budget breakdown for the funds being requested.
- Clearly indicate the fringe benefits and indirect/direct overhead rates. Provide justification detail for travel, supplies, etc.
- Describe the source of match, including both cash and in-kind contributions.

MASSBAYS HEALTHY ESTUARIES GRANTS BUDGET FORMAT

BUDGET ITEM			GRANT \$	MATCH \$	TOTAL \$
Salaries	Hours (#)	Hourly Rate (\$)			
[Staff name & role]					
[Staff name & role]					
Fringe	Rate (%)	Assessed against (\$)			
Contractual					
[Contractor name and role]					
Other Direct Costs					
Travel (miles at \$0.45/mile)					
Supplies (consumables)					
Indirect charges	Rate (%)	Assessed against (\$)			
TOTALS					

ATTACHMENT E (Continued)

FULL PROPOSAL COVER SHEET AND NARRATIVE COMPONENTS

Required Supporting Materials:

Project proposals must include the following supporting materials with the response. The following documents must be attached with the full proposal:

- Proof of support of the organization, such as an IRS letter of non-profit status or, in the case of municipally sponsored groups, a letter of support on letterhead by its overseeing municipal board, town manager, or mayor's office.
- Disclosure of any concurrent funding requests in support of the proposed project.
- A statement from an authorized signatory acknowledging and accepting the following:
 - The organization commits to match at least 25% of total project cost and acknowledges that funding is provided on a reimbursement basis.
 - Matching funds have been approved and/or appropriated (or are in the process of being approved) by the organization's authorized body.
- Partner letters: Statement of commitment on letterhead from each partner detailing the partner's intention to contribute to the project as described in the proposal narrative.
- Letters of support: Include up to three statements of support on letterhead and must be relevant to the proposed project. Generic letters of support will not be reviewed. Statements of support must be submitted with the response and not separately.

Suggested Supporting Materials:

Project Goals, Activities, and Outcomes may be presented in a logic model, demonstrating connections between proposed approach and anticipated impacts. Refer to the University of Wisconsin's Program Development and Evaluation website for guidance and samples:

<http://www.uwex.edu/ces/pdande/evaluation/evallogicmodel.html>.