

A Proposal to the:
National Oceanic and Atmospheric Administration
Office for Coastal Management
2017 Coastal Management Fellowship Program

Submitted by:
Massachusetts Office of Coastal Zone Management

Project Title:
**Resilient Coastal Habitats: Maintaining Critical Ecosystem Services in the Face of
Environmental Change**

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A handwritten signature in black ink, appearing to read 'Bruce K. Carlisle', is centered on the page. The signature is fluid and stylized, with a long horizontal stroke extending to the right.

Bruce K. Carlisle
Director

Background and Introduction

From barrier beaches, dunes, rocky shores, and marshes to salt ponds, bogs, and upland forests, Massachusetts is home to wide variety of coastal habitats, each with unique characteristics, ecology, and vulnerabilities. These habitats alone or in combination provide a vast array of benefits for people and wildlife alike, generally known as ecological services. Ecological services include providing critical habitat for reproduction and growth, safe haven for migrating species, protection of homes and infrastructure from flooding, carbon storage, food resources, public recreation, and sources of freshwater.

In recognition of the crucial role these habitats serve, the Massachusetts Areas of Critical Environmental Concern (ACEC) Program was established in 1975 to identify habitat complexes of statewide significance. Projects within a designated ACEC boundary require higher environmental standards and state regulatory review for development projects. The Massachusetts Office of Coastal Zone Management (CZM) has a vested interest in coastal ACECs, serving as the lead state agency that nominated and designated 13 of the 14 coastal ACECs (there are 30 total coastal and inland ACECs), incorporating these areas in its enforceable program policies, and providing technical assistance to the Department of Conservation and Recreation, which now manages the program.

Table 1: Massachusetts Coastal Areas of Critical Environmental Concern (ACEC)

ACEC	Communities	Acreage	Year
Bourne Back River	Bourne	1,850 acres	1989
Ellisville Harbor	Plymouth	600 acres	1980
Great Marsh	Essex, Gloucester, Ipswich, Newbury, and Rowley	25,500 acres	1979
Herring River Watershed	Bourne and Plymouth	4,450 acres	1991
Inner Cape Cod Bay	Brewster, Eastham, and Orleans	2,600 acres	1985
Neponset River Estuary	Boston, Milton, and Quincy	1,300 acres	1995
Pleasant Bay	Brewster, Chatham, Harwich, and Orleans	9,240 acres	1987
Pocasset River	Bourne	160 acres	1980
Rumney Marshes	Boston, Lynn, Revere, Saugus, and Winthrop	2,800 acres	1988
Sandy Neck Barrier Beach System	Barnstable and Sandwich	9,130 acres	1978
Waquoit Bay	Falmouth and Mashpee	2,580 acres	1979
Weir River	Cohasset, Hingham, and Hull	950 acres	1986
Wellfleet Harbor	Eastham, Truro, and Wellfleet	12,480 acres	1989
Weymouth Back River	Hingham and Weymouth	800 acres	1982

While much work has been done to protect and minimize the damage to coastal habitats from anthropogenic impacts, such as filling, hydrological alterations, and point source pollution, impacts from invasive species and nonpoint source pollution continue to exert pressure on these environments. Emerging issues such as climate change threaten wholesale changes in ecological communities. Sea level rise, salt water intrusion from storm surge and groundwater, increased precipitation, and a warmer climate, in concert with invasions of non-native plants and animals, could upset the delicate balance of ecological conditions required to sustain these areas through time.

As communities manage an ever-growing population on the coast and begin to adapt to a changing climate, developmental pressures and need for interventions to protect coastal infrastructure in and adjacent to the ACEC will increase. An ACEC designation does not supersede local regulations or zoning, change or affect land ownership, or prohibit or stop land development. As shown in Table 1, the coastal ACECs were designated 20-40 years ago when climate change was a less prominent concern and coastal populations were not as dense. Without strong policies and strategies to address development and climate change impacts, the ecological integrity of critical habitats--and the ecological services they provide--will be diminished over time.

CZM has long been a leader in developing innovative and timely programs to give stakeholders the tools they need to address challenging and complex issues in the coastal zone, connecting the public to the coast, and informing effective management of coastal resources. Recent coastal ecology projects include visualization and modeling of sea level rise impacts on wetlands, landscape-level predictions, remote sensing, on-the-ground data collection to monitor salt marshes in the present and over time, categorization and identification of critical benthic marine resources, and monitoring for new and established marine invasive species. In addition, CZM hosts a nationally recognized program to address coastal hazards to the built environment, including funding for community coastal resiliency, inundation mapping, and the StormSmart Coasts program initiated by a CZM NOAA Fellow.

In the current Coastal Management Fellowship round, CZM is seeking a Fellow to continue on this tradition of innovation and community-driven solutions to complex issues by taking a holistic look at risk and resiliency of coastal habitats, using the coastal ACEC areas as the focus. In September, Governor Baker signed Executive Order 569 *Establishing an Integrated Climate Change Strategy for the Commonwealth*, directing all state agencies to publish a plan that details the impacts of climate change on public assets (including natural assets of state significance such as the ACECs) and includes a strategy to proactively address these impacts through adaptation and resiliency measures. The Fellow will have the opportunity to develop a framework to help implement aspects of this Executive Order, a priority for the Commonwealth, by assessing coastal habitats at risk from a number of impacts and developing a menu of policy and adaptation strategies that can be used to inform future implementation efforts leading to the protection of essential ecological services over the long term.

Goal and Objectives

The goal of this Fellow project is to protect critical ecosystem services by developing and applying a methodology to prioritize habitats at risk and to develop a robust plan of policies and strategies, that, when applied, will increase the resiliency of important resource areas. The Fellow will accomplish this by:

- 1- Using a systematic approach of data and literature review, expert elicitation, and existing risk assessment tools to develop a matrix of habitats and vulnerabilities,
- 2- Developing a menu of options to maintain ecological services and improve resiliency of critical habitats within two coastal ACECs,
- 3- Providing quality outreach to engage and energize the surrounding communities and stakeholders for each priority ACEC to implement recommendations and maintain ecosystem services over the long term.

Project Description, Milestones, and Outcomes

This Fellow project will compile a risk assessment and priority matrix for the all fourteen coastal ACECs, then develop an in depth review of actions, policies, and strategies to maintain ecosystem services for two coastal ACEC complexes. This project will greatly inform the ability of the Commonwealth of Massachusetts to protect and maintain ecosystem services over the long term as well as implement actions of the recently signed Executive Order 569, *Establishing an Integrated Climate Change Strategy for the Commonwealth*. The approach will be applicable to other coastal areas and habitats in Massachusetts, further extending the utility of the project and have lasting impacts on the way coastal habitats within ACECs and beyond are managed by the state.

Task 1 – Develop Resource and Vulnerability Matrix for Coastal ACECs

Areas of Critical Environmental Concern are designated after a comprehensive environmental assessment and public review process, including resources inventories and in some cases management plans. The Fellow will review Resource Inventories and available Management Plans for each of the 14 coastal ACECs as applicable and develop a baseline matrix of habitats and ecological resources. The habitat types will be ranked and prioritized using resources such as the Massachusetts Natural Heritage Program Priority Areas List. An initial list of stressors/threats for each habitat type and ACEC will be developed.

Outcome and Milestone for Task 1: Matrix of Coastal ACEC Habitats and Stressors - *Completed by September 2017*

Task 2 – Select Two Coastal ACECs to Serve as Focus Sites

Using the matrix developed in Task 1 and input from a technical advisory committee that will be established to support this project, two ACEC areas will be selected to develop more refined vulnerability assessments. A diversity of habitats and risk factors should be represented within and between the ACECs selected.

Outcome and Milestone for Task 2: Two coastal ACEC areas selected for in depth resiliency plan development - *Completed by October 2017*

Task 3 – Compile Supporting Information for Habitat Assessment

For each of the two coastal ACECs, gather information on coastal habits needed to inform habitat categorization, ranking, and prioritization. Information sources may include existing ACEC resource management plans and resource inventories, scientific and gray literature, aerial imagery, and mapped information as available. Include and update information on spatial extent using Geographic Information Systems (GIS) as applicable.

Outcome and Milestone for Task 3: Assembled resources and data needed to perform the remainder of the tasks - *Completed by February 2018*

Task 4 – Prioritize Habitats and Conduct Vulnerability Analysis and Risk Assessment

Compile information on stressors and condition for each priority habitat type, including on-the-ground data when available, utilizing sources such as the Massachusetts Bays National Estuary Program Embayment Atlas, Massachusetts GIS data, University of Massachusetts (UMass) Conservation Assessment Prioritization System (CAPS) coastal metrics, and other efforts. Using assessment tools such as the UMass Climate Action Tool and Massachusetts Natural Heritage and Endangered Species Program priority habitat factsheets, investigate vulnerabilities of each habitat type within the ACEC. Rank and prioritize coastal habits for each of the two selected ACECs in terms of ecological services and threats using information gathered in Tasks 1-3 and input from the technical advisory team. Conduct a vulnerability analysis and risk assessment for the top priority habitat types within the two coastal ACECs.

Outcome and Milestone for Task 4: Coastal habitat rankings and risk assessment for each of the top habitat types within the two coastal ACECs - *Completed by May 2018*

Task 5 – Develop Menu of Policy Options and Strategies

An in-depth review of existing regulations and policies will be conducted, including a look at state environmental regulatory frameworks, such as the Massachusetts Environmental Policy Act (MEPA), the Waterways Regulations (Chapter 91), the Wetlands Protection Act, the Solid Waste Facilities Site Assignment Regulations, and CZM policies. Local bylaws and regulations in the applicable ACEC communities will also be investigated, including an analysis of current shortcomings in protections and potential weakening of protections. Climate adaptation strategies, where available, will be investigated for each habitat type. As this is an emerging issue, specific adaptation strategies to improve ecosystem services in coastal habitats may not be available. Lessons learned from CZM Coastal Resiliency Grant projects, in addition to other implementation projects in the region will be considered to inform this aspect of the project. Potential opportunities for preservation and restoration will also be identified for each priority habitat type within the ACEC. Input from local stakeholder groups within and abutting the ACEC boundaries and the technical advisory group will be utilized to select actions, policies, and strategies that, when implemented, will maintain ecosystem services and promote resiliency of coastal habitats over time. Policies and adaptation strategies for coastal habitats in each of the two ACEC areas will be described and compiled to produce a menu of options available for future implementation. The list of policies and strategies to maintain ecosystem services will be included in the final report, Task 6.

Outcome and Milestone for Task 5: A menu of policies, actions, and strategies developed for each priority habitat within the two coastal ACECs, including opportunities for restoration, management, and climate adaptation when possible - *Completed by August 2018*

Task 6 – Compile Final Report and Conduct Outreach

A final report will be developed including the habitat prioritization matrix for all 14 coastal ACECs, and the in-depth risk assessment and policy options for two ACECs. Results of the project will be communicated at two community level meeting, and two regional/statewide meetings as applicable. The final report and supporting material will be made available on the MA CZM webpage.

Outcome and Milestone for Task 6: Final report on CZM website, community outreach - *Completed by July 2019*

Fellow Mentoring

CZM will serve as the host agency for the Coastal Management Fellow. The Fellow will work directly with a team of CZM staff members involved in coastal ecology, habitat assessment, climate resiliency, geographic information systems (GIS), and coastal hazards. The Mentor for the Fellow will be Adrienne Pappal, CZM's Coastal Habitat and Water Quality Manager. Adrienne has a strong background in coastal ecology and has led efforts in a wide variety of habitats, including marine invasive species monitoring, classification of benthic communities, salt marsh assessment, and climate adaptation. Adrienne is also an experienced mentor in NOAA Fellow Program, currently mentoring Ashley Green, CZM's 2015-2017 Fellow.

CZM has benefited greatly from NOAA Coastal Management Fellows in the past and has a strong commitment to, and proven track record of, providing Fellows with a professional work experience and environment, integrating them into the agency, and promoting their career advancement—including work with CZM beyond their Fellow service as opportunities allow. CZM looks forward to continued success for both our agency and our Fellows with this program and this specific project.

Project Partners

To successfully accomplish the project objectives outlined above, the Fellow will work directly with CZM staff in Boston and the regions. In addition to CZM, team members include representatives from the Massachusetts Bays National Estuary Program and regional staff, Buzzards Bay National Estuary Program, Massachusetts Department of Conservation and Recreation, Massachusetts Division of Ecological Restoration, and numerous non-profit entities. Through this mix of team members, the Fellow will have direct access to professionals with a wide variety of backgrounds and gain real-world experience in managing complex coastal issues.

Cost Share Description

CZM will provide the match for the Fellow through state funds. The \$15,000 nonfederal match requirement will come from annual state capital. CZM will supply the Fellow with all workplace support necessary, including desk, phone, computer and required software, printers and plotters, field equipment, and general office supplies. CZM will ensure that the Fellow receives the guidance and training necessary to successfully implement each of the project objectives.

Strategic Focus Areas

This Fellow project is directly relevant to and will advance management efforts for all three 2017 strategic focus areas. Specifically, the project addresses the following components of these focus areas:

Healthy Coastal Ecosystems

- *Build innovative natural and social science research capacity, products, and applications that reflect user-driven science, and synthesize, visualize, communicate, and transfer research results to strengthen policies and decisions, and effectively manage coastal and ocean resources.* Characteristics and vulnerabilities of coastal habitats will be synthesized and summarized to produce risk assessments and inform policy resulting in targeted strategies to maintain critical ecological services.
- *Support coastal and ocean resource managers through cooperative funding, data, information, tools, training, technical assistance, analysis, and exchange of best practices to strengthen ecosystem policies, build capacity, and implement prioritized management efforts.* As a result of this project, coastal managers will have a wide array of new data and analysis to develop best management practices and prioritize coastal habitat protection, restoration, and adaptation activities.
- *Enable conservation and restoration of critical coastal ecosystems and habitat by integrating priorities and interests across agencies and partner organizations using geospatial applications to align interests, communicate priorities, and pool resources.* GIS resources will be used to update maps of critical habitats within the two focus ACEC areas, adding another dimension of utility of this project for resource managers.

Resilient Coastal Communities

- *Foster user-driven science and assessment efforts to enhance understanding of natural, social, and economic impacts of coastal hazards and climate change, and the approaches needed to adapt to and communicate about these threats.* The risk assessment and categorization of coastal habitats within the ACECs will enhance understanding of the threat of climate change to ecosystem services and inform and identify policy and adaptation approaches for coastal managers and other stakeholders.
- *Identify and engage partners in maximizing the understanding, visualization, and application of risk-wise strategies.* This project will pull in numerous partners—from local groups on the ground to coastal managers—and provide content and information to make choices on policies and adaptation techniques to minimize risk to priority habitats. Project recommendations will also provide a foundation for ACEC communities to apply for funding for adaptation strategies through the CZM Coastal Resilience Grants Program to protect ecosystem services, potentially leading to direct implementation of risk-wise strategies at the local level.

Vibrant and Sustainable Coastal Economies

- *Understand, quantify, visualize, and communicate ecosystem services of key natural areas along the coasts to inform decision making.* This project will directly quantify ecosystem services and risks to these services within all the coastal ACEC areas to improve decision making of coastal managers and inform policies.