

Goal 1

Protect, restore and enhance key habitats that sustain ecological health

The long-term health of Casco Bay depends on vital habitats that support the Bay's abundant wildlife and commercially valuable fish, shellfish and seaweeds. Connectivity among aquatic habitats is essential to help organisms migrate, withstand climatic extremes and sea level rise, and maintain their populations in the face of established and emerging stressors. Aquatic connectivity and the restoration of natural stream processes benefit human communities as well: rebuilding native ecosystems in rivers, streams and the Bay; decreasing flood impacts; and reducing infrastructure maintenance. Casco Bay Estuary Partnership (CBEP) is committed to fostering connectivity among aquatic habitats; conserving undeveloped shorelines; enhancing, protecting and restoring critical coastal habitats (e.g., eelgrass beds, intertidal areas and tidal mudflats); planning for future migration of tidal marshes (as sea levels rise); and helping strengthen the Bay's ecosystem functions. CBEP takes an ecosystem approach to restoration, focused on geographic sub-regions rather than isolated species or habitat types.

Strategy 1.1: Conserve significant coastal habitats and areas that protect water quality, such as riparian corridors, wetlands and forests adjoining headwater streams

The integrity of Bay ecosystems rests in large part on the persistence of coastal habitats (such as tidal flats, rocky intertidal areas, salt marshes and coastal forests) as well as inland river and stream corridors, freshwater wetlands and upland forests. Even as Casco Bay responds to climate impacts, the watershed will support fish, wildlife and birds. Through conservation projects, land trusts and local governments have made significant progress over the past two decades protecting an extensive network of coastal and inland habitats that help preserve water quality and support a healthy bay. CBEP will continue advancing these efforts in the face of increased development pressures, sea level rise and greater storm frequency and intensity.

Strategy 1.2: Restore and enhance coastal habitats and habitat connectivity that are important to sustaining the health of Casco Bay

Centuries of human impacts have compromised the ability of many coastal habitats to sustain functions that are critical to long-term ecosystem health. Where feasible and cost-effective, habitat restoration and enhancement can counter these cumulative impacts and buffer the effects of climate change. Priority targets in Casco Bay include restoring passage for diadromous fish species (that migrate between fresh and salt water), restoring tidal wetlands (principally by replacing undersized culverts or removing coastal dams), and replanting eelgrass beds. CBEP plans to support testing of emerging technologies (not yet evaluated in Casco Bay) that rely on natural processes to enhance ecosystem health (e.g., living shoreline techniques that stabilize shorelines, or oyster and seaweed cultivation that improves water quality).

Maintain Casco Bay Estuary Partnership Habitat Protection Fund

Goal 1: *Protect, restore and enhance key habitats that sustain ecological health*

Strategy 1.1: *Conserve significant coastal habitats and areas that protect water quality, such as riparian corridors, wetlands and forests adjoining headwater streams*

Purpose

Advance protection of aquatic and terrestrial habitats that support the health of Casco Bay

Timeline

Ongoing (assuming available funding)

Key Alliances

- Maine Department of Inland Fisheries and Wildlife
- Maine Coast Heritage Trust
- U.S. Fish and Wildlife Service Gulf of Maine Coastal Program

Other Cooperators

- Land trusts
- Municipalities
- Other state agencies

Description

Casco Bay Estuary Partnership (CBEP) has provided strategic financial support for habitat protection programs since 2000, committing more than \$700,000 from its Habitat Protection Fund to help conserve upwards of 10,000 acres (including coastal islands, tidal flats, wetlands and forests). Most of the properties funded allow public access.

CBEP will continue to provide land trusts, municipalities, state agencies and other conservation organizations Habitat Protection Fund grants of up to \$30,000 (depending on funding availability) to facilitate permanent habitat protection through acquisition of fee title or conservation easements. Funds can be used to leverage local, federal, or state funding; help cover transaction costs; and support strategic “high-risk, high-reward” or time-sensitive opportunities. Requests for funding will be reviewed by CBEP’s staff and Habitat Protection Committee, with representatives drawn from the land trust community and federal and state agencies.

To be eligible, the proposed conservation acquisition must benefit aquatic ecosystems in the Casco Bay watershed. Areas of particular interest include the Bay’s shoreline, intertidal habitats, and islands; river riparian areas and floodplains; freshwater wetlands; and forested areas near headwater streams. Natural areas that could accommodate tidal wetland migration (as sea levels rise) or that would protect or enhance sediment supply to tidal wetlands will be considered. Priorities identified within regional conservation plans that have been endorsed by CBEP are also eligible for funding.

Resources

To support 1–3 projects each year would require an annual commitment of CBEP funds on the order of \$25,000–\$40,000. Limited CBEP staff time is needed to issue Request for Proposals, convene the Habitat Protection Committee, administer grants, and collect project data.

Outputs

- 1–3 habitat conservation grants annually

Outcomes

- Short-term
 - Habitat conservation projects completed
- Medium-term
 - Protection of coastal habitat, wetlands, forests, floodplains, and other areas that contribute to Bay water quality
- Long-term
 - Improvements to Bay’s habitats, water quality, ecosystem function and integrity

Metrics and Targets

<i>Metric</i>	<i>Target</i>
Percentage of land area among the lower 16 municipalities within the Casco Bay watershed permanently protected by 2020	10%
New habitat acres protected by 2020	1,500
New acres of coastal habitat protected by 2020	200
Number of projects funded per year	2

Assist Habitat Protection Efforts

Goal 1: *Protect, restore and enhance key habitats that sustain ecological health*

Strategy 1.1: *Conserve significant coastal habitats and areas that protect water quality, such as riparian corridors, wetlands and forests adjoining headwater streams*

Purpose

Provide technical assistance to facilitate permanent protection of aquatic and terrestrial habitats that support the health of Casco Bay

Timeline

Ongoing

Key Alliances

- U.S. Fish & Wildlife Service Gulf of Maine Coastal Program
- Maine Coast Heritage Trust

Other Cooperators

- Local land trusts
- Maine Land Trust Network
- State and federal habitat funding programs

Description

Casco Bay Estuary Partnership (CBEP) will continue to provide support for a regional GIS (Geographic Information Systems) Service Center which has been housed for more than a decade at the U.S. Fish & Wildlife Service Gulf of Maine Coastal Program office (USFWS GOMCP). Providing habitat analysis and other GIS services, the Service Center provides technical support for 8-12 habitat protection projects each year. It also supports strategic planning by conservation organizations and can assist local entities in building in-house GIS capacity.

The Center continues to meet key regional needs. While some conservation professionals and many consultants now have GIS expertise, numerous regional land trusts have minimal staffing and lack funds to hire GIS consultants.

This Action will be led primarily by organizations central to regional habitat protection such as Maine Coast Heritage Trust and the USFWS GOMCP. In a supporting role, CBEP staff members may help address ongoing training and technical assistance needs such as the mapping, habitat analysis, proposal drafting, grant management and reporting needed to secure federal and state habitat grants (e.g., North American Wetlands Conservation Act, Land for Maine's Future Program, Maine Outdoor Heritage Fund and Maine Natural Resource Conservation Program).

CBEP also may provide direct financial support through its Habitat Protection Fund according to CBEP protection priorities (as articulated in Action 1.1.A and Action 4.2.A).

Resources

This Action requires CBEP funding to maintain the USFWS GOMCP GIS Service Center (\$7,500-10,000 annually), as well as staff time to manage related contracts and provide project support. Staff time would be allocated primarily to assist municipalities, land trusts and other organizations with work on specific high-value projects.

Outputs

Habitat protection projects initiated and grant proposals submitted with CBEP assistance

Outcomes

- Short-term
 - Grant funding for habitat protection
- Medium-term
 - Protection of coastal habitats, wetlands, forests, floodplains, and other areas that contribute to water quality
- Long-term
 - Improvements to Bay’s habitats, water quality, ecosystem function and integrity

Metrics and Targets

<i>Metric</i>	<i>Target</i>
Number of organizations accessing USFWS GOMCP GIS Service Center services	>6
Number of habitat analyses provided by USFWS GOMCP GIS Service Center in support of habitat protection efforts	8 annually

Lead Coastal Habitat Restoration Efforts

Goal 1: Protect, restore and enhance key habitats that sustain ecological health

Strategy 1.2: Restore and enhance coastal habitats and habitat connectivity that are important to sustaining the health of Casco Bay

Purpose

Implement projects that restore coastal habitats

Timeline

Ongoing

Key Alliances

- The Nature Conservancy—Maine Chapter
- U.S. Fish & Wildlife Service Gulf of Maine Coastal Program
- U.S. Geological Survey Patuxent Wildlife Research Center
- Cumberland County Soil and Water Conservation District
- Maine Coastal Program/ Department of Agriculture, Conservation and Forestry

Other Cooperators

- Land trusts
- Landowners
- Maine Department of Environmental Protection
- Municipalities
- National Oceanic and Atmospheric Administration

Description

Centuries of human impacts have compromised the ability of many coastal habitats to sustain functions critical to long-term ecosystem resilience. Where feasible and cost-effective, habitat restoration can counter these cumulative impacts and increase resilience.

Working with allied organizations, Casco Bay Estuary Partnership (CBEP) will continue providing strategic funding, technical assistance, grant writing, and project management to support habitat restoration and enhancement projects, particularly those focused on tidal wetlands and eelgrass beds. These targets align with the newly revised State Wildlife Action Plan, the Gulf of Maine Council's Habitat Restoration Program, and other regional priorities.

Habitat restoration and enhancement projects are complex, sometimes requiring years to develop from initial concept to completion. Habitat restoration targets will best be met by:

1. tracking long-term progress to achieving restoration goals;
2. developing a portfolio of restoration opportunities; and
3. working with communities, landowners and organizations to identify opportunities where barriers to completion can most readily be overcome.

Tidal Wetlands and Tidal Restrictions

Tidal wetlands, an important component of the nearshore environment, provide habitat for diverse species and have a long history of human use. Road crossings and dams along the shoreline have created many restrictions that limit or entirely block tidal flow, converting intertidal habitats into freshwater wetlands or impoundments. Where tidal wetlands remain, they are often degraded (e.g., colonized by invasive species such as *Phragmites* or no longer suitable forage areas for wading birds).

CBEP has used high-resolution elevation data and aerial photography to catalog more than 70 locations where roads (primarily), railroads, dams, or other structures restrict the reach, range and flow of tides. Restoring tidal functioning in these settings by replacing undersized culverts and removing coastal dams or dikes can strengthen wetland resilience—increasing stream connectivity and sediment transport, restoring salt marsh habitat, and fostering the capacity of wetlands to adapt as sea levels rise.

CBEP has facilitated three tidal restoration projects to date and will continue monitoring these. In the future, CBEP will restore further sites as opportunities arise that align with emerging partnerships and with related local goals (such as water quality improvement or fish passage). In addition, CBEP may consider pursuing other collaborative approaches to tidal wetland restoration (*e.g.*, invasive plant control).

Eelgrass Beds

Coverage of eelgrass beds, which provide habitat for diverse species, declined 58 percent between 2001 and 2013, with localized losses close to 100 percent. CBEP expects to provide continued funding and in-kind staff support for a pilot eelgrass transplant study begun in 2015 by the U.S. Geological Survey Patuxent Wildlife Research Center. If that study identifies successful transplant methods, the next step will be to pilot eelgrass revegetation in one or more embayments (contingent on continued partner support and external funding).

Resources

Restoration projects require a significant up-front investment (*e.g.*, for staff time to identify

prospective projects and build relationships with landowners and local officials, and up to \$10,000 per project for technical analyses and preliminary designs) before funds can be raised to cover project implementation costs. Significant CBEP staff time will be allocated to project development, and core CBEP funds will be used to leverage funding for project implementation. Significant resources from key allies and from funders are needed to support this Action.

Outputs

- Feasibility studies, engineering designs, research plans, supplies and materials
- Site assessments, monitoring plans, monitoring data
- Grant proposals raising funds for implementation
- Permits, grant reports, landowner agreements
- Completed restoration projects

Outcomes

- Project implementation and monitoring
- Restoration of coastal habitat and watershed connectivity
- Improvements to Bay’s habitats, water quality, ecosystem function and integrity

Metrics and Targets

Metric	Target
Number of assessments of potential restoration projects or project sites completed	3 by 2021
Number of coastal restoration projects implemented, on average	1 every two years

Coordinate Efforts to Restore Aquatic Habitat Connectivity

Goal 1: Protect, restore and enhance key habitats that sustain ecological health

Strategy 1.2: Restore and enhance coastal habitats and habitat connectivity that are important to sustaining the health of Casco Bay

Purpose

Implement projects that restore aquatic habitat connectivity in the Casco Bay watershed

Timeline

Ongoing

Key Alliances

- U.S. Fish & Wildlife Service Gulf of Maine Coastal Program
- Trout Unlimited
- Cumberland County Soil and Water Conservation District

Other Cooperators

- Land trusts
- Landowners
- Maine Department of Marine Resources
- Maine Department of Transportation
- The Nature Conservancy—Maine Chapter
- Municipalities
- National Oceanic and Atmospheric Administration
- Maine Coastal Program/ Department of Agriculture, Conservation and Forestry
- Maine Stream Connectivity Workgroup

Description

Recent research highlights the importance of annual pulses of out-migrating juvenile anadromous fishes (e.g., alewives) as fodder for commercially and ecologically valuable groundfish. Restoring anadromous fish to rivers is important to reestablishing inshore populations of cod and other large predatory species. For decades, lack of these predatory fish in Casco Bay has diminished the local fisheries and reduced the Bay's health and resilience.

Well-managed projects designed to enhance diadromous fish passage can provide numerous other benefits by enhancing river continuity (the river processes and functions that enable transport of woody debris, sediment and water downstream; store floodwaters; and facilitate movement of aquatic and terrestrial organisms upstream and downstream). Projects that support these aquatic system functions further enhance the resilience of Casco Bay and its tributaries.

To help identify opportunities for increased aquatic habitat connectivity, Casco Bay Estuary Partnership (CBEP) worked with Trout Unlimited chapters and the U.S. Fish & Wildlife Service Gulf of Maine Coastal Program (USFWS GOMCP) to create a *Casco Bay Fish Passage Atlas*. The Atlas was incorporated into Maine's Stream Habitat Viewer, making the data widely available. CBEP will extend this work in the coming years through continued efforts to restore fish passage at dam and culvert sites.

Major Dams

Fish passage data confirm the impact of dams blocking riverine migration of diadromous fishes. In the Casco Bay watershed, dams block movement of anadromous fishes to entire watersheds and sub-watersheds, including hundreds of miles of streams and thousands of acres of lake habitat, sharply reducing their capacity to support coastal fisheries.

Dams diminish water quality as well. Much of the main stem of the Presumpscot River fails to meet water quality standards due largely to dams creating a series of reservoirs that are vulnerable to low oxygen conditions and can no longer support riverine fish and invertebrate communities.

CBEP will continue exploring ways to facilitate provision of effective fish passage at remaining dams on the Presumpscot, Royal and Stroudwater rivers. Ensuring fish passage at the Saccarappa and Mallison Falls dams is a priority as it would open up the entire Little River sub-watershed to anadromous fishes. Passage at the Gambo dam would allow migratory fishes access to the Pleasant River as well. Fish passage at two town-owned dams on the Royal River (located close to tidewater) would open up the watershed to diadromous fishes, and access to the Stroudwater River could be assured by passage at a small head-of-tide dam owned by the City of Portland.

Even the best fish passage facilities act as partial barriers to fish migration, and do little to reestablish other vital functions of river continuity. Dam removal is preferable for improving water quality and river health. In cases where dam removal appears to be a practical alternative, CBEP will provide technical and other assistance to help evaluate potential costs and benefits.

Culverts, Small Dams, and Other Barriers

USFWS GOMCP has twice analyzed Casco Bay fish passage data to produce lists of top fish passage restoration opportunities, sharing results that have helped catalyze fish passage improvement projects by Trout Unlimited,

municipalities and others. Through its Stream Smart program, Maine Audubon offers trainings for landowners, contractors and other professionals on constructing road stream crossings that maintain fish and wildlife habitat while protecting roads and public safety. These efforts provide a robust infrastructure that CBEP can help maintain and expand, encouraging and supporting projects that improve stream continuity in smaller tributaries.

CBEP will work with these organizations and others to facilitate replacement of undersized road crossing structures, giving priority to coastal streams and waterways in the lower watershed that block movement of diadromous species to freshwater habitat and that pose flooding risks. Barriers at or near head of tide are of particular interest. (The Partnership may also assist municipalities or other organizations with high-value opportunities elsewhere in the watershed.)

Resources

Replacement of undersized or impassable culverts, provision of effective fish passage at dams, and dam removal are time-consuming and expensive efforts that typically require multiple organizations and external funding. Most regional fish passage improvement projects will advance under the leadership of other organizations, but significant CBEP staff time may be needed to facilitate project completion. As with restoration projects, upfront cash outlays (typically under \$10,000) are often required to cover technical analyses or development of preliminary designs. Core CBEP funds will be used to leverage additional funds for project implementation.

Outputs

- Feasibility studies, engineering designs, site assessments
- Grant proposals raising funds for implementation
- Permits, grant reports, landowner agreements
- Completed projects

Outcomes

- Short-term
 - Project implementation and monitoring
- Medium-term
 - Restoration of watershed connectivity
- Long-term
 - Improvements to fish passage, river continuity, ecosystem function and aquatic system resilience

Metrics and Targets

Metric	Target
Number of studies or site assessments completed to support restoration	3 by 2021
Number of fish passage grant proposals for the watershed, annual average	1
Number of watershed connectivity projects implemented, annual average	1

Jrain Habitat Restoration Practitioners

Goal 1: *Protect, restore and enhance key habitats that sustain ecological health*

Strategy 1.2: *Restore and enhance coastal habitats and habitat connectivity that are important to sustaining the health of Casco Bay*

Purpose

Increase local capacity to implement habitat restoration and enhancement projects

Timeline

Begin in late 2016 or early 2017

Key Alliances

- U.S. Fish & Wildlife Service Gulf of Maine Coastal Program
- Wells National Estuarine Research Reserve

Other Cooperators

- National Oceanic and Atmospheric Administration Restoration Center
- The Nature Conservancy—Maine Chapter
- Maine Rivers
- Maine Coastal Program/ Department of Agriculture, Conservation and Forestry
- Maine Audubon Stream Smart Program

Description

Environmental restoration projects are complex efforts that often span years from initial concept to completion—requiring staffing to evaluate project opportunities, develop preliminary restoration goals, find funding for design and site evaluation, review restoration methods, write monitoring plans, develop engineering designs, supervise contractors and monitor completed projects. Few individuals or organizations in the Casco Bay region have sufficient experience or capacity to manage complex aquatic restoration projects, limiting the pace at which aquatic restoration can be completed.

The potential value of increased habitat restoration training can be judged by the success of Maine Audubon’s Stream Smart program, which trains landowners, contractors and other professionals on constructing road stream crossings that maintain fish and wildlife habitat while protecting roads and public safety.

Casco Bay Estuary Partnership (CBEP) will complement that existing effort by working with other organizations in the region, such as the U.S. Fish & Wildlife Service Gulf of Maine Coastal Program, National Oceanic and Atmospheric Administration Restoration Center, and Wells National Estuarine Research Reserve to provide opportunities for regional professionals and volunteers to develop expertise and skills related to habitat restoration project management.

Resources

CBEP anticipates working with others to organize one regional training opportunity each year. CBEP funds would be matched by contributions from other sources, with total cash outlay under \$5,000 annually. Limited CBEP staff time would be needed to coordinate trainings and provide administrative support. This Action would require other organizations to lead program delivery.

Outputs

Training events and workshops

Outcomes

- Short-term
 - Increased capacity for habitat restoration and enhancement projects
- Medium-term
 - Restoration of aquatic habitat; protection of coastal habitat; protection of wetlands, forests, floodplains, and other areas that contribute to water quality
- Long-term
 - Improvements to Bay’s habitats, water quality, ecosystem function and integrity

Metrics and Targets

<i>Metric</i>	<i>Target</i>
Number of training events and workshops by 2020	3

Study Novel Methods to Enhance Ecosystem Functioning

Goal 1: Protect, restore and enhance key habitats that sustain ecological health

Strategy 1.2: Restore and enhance coastal habitats and habitat connectivity that are important to sustaining the health of Casco Bay

Purpose

Research innovative approaches being tested elsewhere to improve ecosystem health

Timeline

Begin collecting information in 2017, with outreach materials by 2018 (and demonstration project timing dependent on cooperating organizations)

Key Alliances

- Island Institute
- SEANET research consortium
- Maine Department of Marine Resources
- Maine Department of Environmental Protection
- Maine Coastal Program/ Department of Agriculture, Conservation and Forestry
- Maine Geological Survey

Other Cooperators

- Gulf of Maine Research Institute
- Friends of Casco Bay
- Coastal towns

Description

Many creative approaches to boost the health of coastal ecosystems are being used elsewhere, yet few of these are being explored in Maine. Given the dynamic change within coastal ecosystems, these methods—still largely untested within Maine—are likely to become an increasingly important management tool.

Casco Bay Estuary Partnership (CBEP) will help explore the feasibility in the Casco Bay region of using techniques such as:

- Artificial oyster reefs or mussel beds;
- Family “oyster gardening;”
- “Living shorelines” that reduce erosion threats while improving coastal habitat;
- Aquaculture of algae or shellfish to enhance water quality; and
- Active liming of tidal flats to mitigate the effects of coastal acidification.

Living shorelines, for example, typically incorporate living plants and animals as an integral part of a multi-layered shoreline defense (e.g., construction of artificial oyster reefs or offshore bars to reduce wave energy, or planting of salt marsh vegetation along an eroding shore). In some cases, living shorelines are intended primarily to provide habitat or water quality benefits, offering a way to incorporate green infrastructure into developed shorelines.

Island Institute and SEANET research consortium scientists are already studying the potential for seaweed and shellfish aquaculture to lower nutrient concentrations, reduce excess phytoplankton numbers, and increase water clarity. Aquaculture could also provide economic benefits and diversify income sources in coastal communities dependent on marine resources.

CBEP will tap into national and regional networks to gather information on innovative approaches to share with members of the CBEP community. It will help others in the region explore use of these approaches to help address Casco Bay’s long-term challenges. With practices that appear promising, CBEP will conduct outreach to shorefront landowners, consulting engineers and others.

Resources

Minimal CBEP staff time is needed to gather information and prepare initial outreach materials (factsheet, web content or presentations) for sharing findings regionally. Additional staff effort will be needed to coordinate with other organizations to test innovative technologies in Casco Bay. Limited funding (under \$10,000) may be used to facilitate demonstration projects or to support data collection documenting project effectiveness. Involvement of other organizations will be essential to implement demonstration or test projects.

Outputs

- Outreach materials concerning regional potential for applications of innovative ecosystem technologies (including guidance on living shorelines)
- One or more projects testing suitable technologies

Outcomes

- Short-term
 - Increased local knowledge and understanding of relevant technologies and their potential application to Casco Bay
- Medium-term
 - Pilot-scale use of emerging technologies to support ecosystem function
- Long-term
 - Improvements to Bay’s water quality, ecosystem function and integrity

Metrics and Targets

Metric	Target
Projects testing novel methods to enhance ecosystem functioning in Casco Bay completed by 2021	At least 2 by CBEP or allied organizations