

NATURAL RESOURCES CHAPTER

INTRODUCTION

Why Natural Resources Matter

The Town of Barnstable is rich in natural resources which center around water, water-dependent resources, and habitat. High-quality natural resources are part of the Town’s attraction for residents and visitors, but they are also susceptible to pollution from various land uses and activities and are increasingly vulnerable to changes in climate. Barnstable residents’ and visitors’ continued appreciation of natural resources requires active stewardship, protection, and restoration of clean water and ecosystems.

Natural resource planning is critical for ensuring:

- **Quality of life for humans**, including clean air, clean water, and the ability to enjoy the outdoors
- **Healthy ecosystems** for animals and plants to thrive
- **Climate change resiliency**, including storm surge protection, marsh migration, carbon sequestration, and myriad other benefits

For all these reasons and more, the protection of water, wetlands, open space, forests, and other natural habitats is critical for Barnstable’s future.

Please see Section 3: Natural Systems of the Existing Conditions Report for more detailed information on groundwater, marine waters, freshwater lakes and ponds, wetland resources, open space, and habitat.

DATA SHEET

[Insert Data Sheet Graphics]

Natural Resource Actions Since 2010

The Town of Barnstable last adopted its LCP in 2010. A great deal of work was put into the development of that plan, and it has been actively implemented over the past fourteen years. Below is a high-level overview of some notable implementation achievements related to Natural Resources.

Plans

The 2010 LCP called for the creation and adoption of several new or updated plans, many of which have been addressed since then.

Lake Wequaquet Management Plan (2013)

Provides an analysis of phosphorous loading to the five basins in Lake Wequaquet and includes a management plan as well as recommendations for further studies.

Floodplain Management Report (2015)

Identifies floodplain management and climate adaptation actions to reduce and avoid flood-related damage and disruption to the community.

Comprehensive Dredge Plan (2017)

Identifies Town-wide dredging needs and priorities and establishes a long-term dredging plan for the future.

Open Space and Recreation Plan (OSRP) (2018)

Provides a blueprint to guide the Town's plans, investments, policies and regulations in support of protecting and enhancing open space and recreation resources.

Stormwater Management Program Plan (2019, updated 2022)

Describes and details activities and measures to be implemented in order to meet the terms and conditions of the municipal separate storm sewer systems (MS4) permit.

Illicit Discharge Detection and Elimination Plan (2019, updated 2022)

Identifies sources of non-stormwater discharges impacting the Town's municipal separate storm sewer system and provides recommendations for removing illicit sources.

Massachusetts Piping Plover Habitat Conservation Plan Certificate of Inclusion Request 2020 Sandy Neck Beach Park (2020)

Proposed management plan related to recreational activity in proximity of piping plover habitat at Sandy Neck Beach Park.

Comprehensive Wastewater Management Plan (CWMP) (2020)

Provides a town-wide, state approved, science-based approach to protecting Barnstable's coastal waters, ponds, and drinking water by managing nutrient pollution from wastewater. The plan calls for an expansion of the Town's wastewater infrastructure (sewers) as well as other innovative and nature-based approaches such as inlet dredging, cranberry bog conversions, and the use of nitrogen removing septic systems. Through its CWMP, the Town has begun a town-wide Nutrient Management Plan. This plan includes an assessment process to establish wastewater alternatives to restore and protect coastal waters.

Hazard Mitigation Plan (2022)

Identifies the town's risk and vulnerability to potential natural hazards and recommends mitigation strategies and actions aimed at reducing the loss of or damage to life, property, infrastructure, and natural, cultural, and economic resources. Specifically, this plan assesses the potential impacts of hurricanes, winter storms, shoreline change/coastal erosion, earthquakes, drought/wildfire, and dam failure and identifies properties, resources, and critical facilities which may be impacted by these hazard events.

Long Pond Marstons Mills Management Plan (2022)

Provides a diagnostic assessment of nutrient inputs to Long Pond, quantifies phosphorus inputs to Long Pond, and recommends a management plan to address those inputs and improve Long Pond water quality.

Shubael Pond Management Plan (2022)

Provides a diagnostic assessment of nutrient inputs to Shubael Pond, quantifies phosphorus inputs to Shubael Pond, and recommends a management plan to address those inputs and improve Shubael Pond water quality.

Projects & Initiatives

The 2010 LCP called for many strategies and actions for the Town to pursue related to Natural Resources. Below is a summary of some of these key achievements.

Community Preservation Act (CPA) Open Space & Recreation Efforts

Funds raised through the CPA have been used by the Town to expand open space and recreation resources. These funds have been used to acquire lands or conservation restrictions for open space, conduct studies needed to finance recreation projects, and repair and improve existing recreational facilities, among other things. *A full list of CPA projects can be found in the Existing Conditions Report under Section 3. Natural Systems (pages 24-25).*

Land Protected in Perpetuity

The Town has made progress in expanding the amount of permanently protected land in Barnstable since 2010. The amount of open space in Barnstable that is protected in perpetuity is 11,469 acres as of 2022. This is an increase of 524 acres, or nearly five percent, from 2010 to 2022. *A full breakdown of conservation lands by type and by owner can be found in the Existing Conditions Report under Section 3. Natural Systems (pages 25-27).*

Habitat Restoration & Fire Protection

Improvements that have taken place since 2010 include controlled prescribed burns for wildlife habitat restoration and forest fire fuel reduction, removal of dead pines on Old Stage Road, maintaining 33 acres of fields for habitat protection, and fire prevention at Seabury Farms Conservation Area, West Barnstable Conservation Area, and Bridge Creek Conservation Area. Cleared two additional acres, grassland restoration project Bridge Creek Conservation Area FY2012. Fire management improvements Old Jail Lane Conservation Area FY2012. Completed improvements to fire access road in West Barnstable Conservation Area for emergency response. FY2014. Fire plan and controlled burn at Crocker Neck Conservation Area – Wildlife habitat restoration and forest fire fuel reduction FY2016 and FY2017. Control burn West Barnstable Conservation Area Wildlife habitat restoration and forest fire fuel reduction FY2019 and FY2020.

Lakes & Ponds

The Town's freshwater management program includes efforts to evaluate and address elevated nutrient levels, monitor and control harmful algae (cyanobacteria) and other ecological impairments and manage invasive species for the purposes of promoting healthy pond ecosystems, protecting human health, and supporting recreation and enjoyment. As reflected in the section above, the Town has instituted a pond management program that evaluates ecological health and stressors for priority ponds and offers recommendations for management and restoration of these resources.

Implementation of the CWMP will have a long-term beneficial effect on fragile freshwater ecosystems; sewer installation is prioritized around Lake Wequaquet to restore the health of this 673 acre resource. Other management techniques being implemented in lakes and ponds across town include alum treatments and aerators to control harmful algae blooms, a floating wetland in Long Pond, Centerville, as well as efforts coordinated by the numerous private lake and pond associations. The Town annually manages the growth of Hydrilla and Fanwort, two invasive plants in several freshwater ponds including Mystic Lake, Middle Pond, Long Pond, and Lake Wequaquet through a combination of mechanical means (diver assisted suction harvesting and mats) and controlled application of aquatic herbicides.

Wetlands

Local and State Wetlands Regulations protect the value and function of wetlands and related watershed resources. In 2012, the Town, through its Conservation Commission, updated regulations pertaining to protective buffer zones, adding landscape requirements to filter pollutants, enhance value to wildlife, and manage flooding. Local regulations regarding private docks and piers, as well as short outhauls, have been updated or adopted to balance the recreational value and ecological fragility of wetland resources.

Stormwater Management

Stormwater management is an ongoing effort in Barnstable through multiple programs designed to assess and prioritize sites to improve operation and maintenance of existing systems and install new green stormwater infrastructure (GSI). These improvements are carried out through drainage improvements during the annual Road Program maintenance, stormwater improvements to impaired ponds Capital Improvement Plan, and grant funding. Completed in June of 2022, the Three Bays stormwater management project was achieved in collaboration with the Association to Preserve Cape Cod (APCC) and Horsley Witten Group to plan, assess, design, permit, construct, and maintain green infrastructure best management practices (BMPs) within the watershed. The project completed a watershed scale assessment to establish a comprehensive stormwater management plan that identified and prioritized sites for potential stormwater retrofits. Funding was obtained to complete nine green infrastructure BMPs including three bioretention areas, a sand filter, a gravel wetland, and four dry swales.

Wildlife

The Town's Natural Resources Division works at safeguarding healthy ecosystems to promote ecological balance and species protection. Biodiversity contributes to ecosystem resilience, enabling natural systems to adapt to and recover from environmental pressures and disturbances. The Natural Resources Division has been working with Mass Audubon and other stakeholders and has recently installed 15 osprey nesting platforms on Town and private property. Providing additional nesting sites for breeding osprey greatly reduces conflicts that arise when the osprey search for nesting sites and promotes biodiversity. Additionally, the town works on restoring and improving sensitive habitats for endangered species which is crucial for wildlife conservation.

The Town has worked on multiagency projects to restore sections of five herring runs. The Town is working at culvert replacement, fish ladder restoration and restoration of natural migration routes.

Coastal Resiliency & Climate Mitigation

The Town of Barnstable has been analyzing coastal resiliency solutions for protecting Sandy Neck Beach Park's public access infrastructure. To date, two alternative analyses have been conducted by private consultants which included multiple public outreach sessions. The resulting plan involves retreating infrastructure from the coastline and creating primary dune resiliency via ecological restoration. Final design and permitting will be completed in this phase of the project.

Ocean Resources

The Natural Resources Division has several projects aimed at improving river herring passage to spawning areas within the town. The implementation of fish-friendly infrastructure facilitates their migration and enhances access to critical spawning areas. These projects have shown positive impacts to river herring populations by restoring their natural migration routes and contributing to healthier aquatic ecosystems. Funding for these projects was awarded by USDA Natural Resources Conservation Service and Cape Cod Conservation District and includes improvements to water flow structures, fish ladders and wetland restoration.

The Natural Resources shellfish propagation program grows shellfish to supplement natural shellfish populations. Shellfish play pivotal roles in ecosystem health, water quality, and habitat preservation. Shellfish efficiently remove excess nutrients and sediment which in turn improve water quality. The program has tripled quahog production and doubled oyster production since 2012. The department has made concerted efforts to perform habitat assessments in sensitive marine habitats to protect and preserve these vital areas.

ISSUES & OPPORTUNITIES

The natural resources of Barnstable face a myriad of issues and opportunities that range from water quality to climate change. These challenges are not uncommon to other communities across the state. However, they are of critical importance to Barnstable to address as a town that is bounded on both the north and south sides by water and that continues to seek to balance growth and development with resource protection.

Coastal Resiliency

The impaired water quality of the Town's sensitive embayments is directly related to pollutant loading from a number of development related sources including on-site septic systems and stormwater runoff. With so much of Cape Cod's biodiversity and local economy reliant on the health of these coastal waters, ensuring their health is critical to future prosperity. The impacts of these pollutant sources may also be exacerbated by continued sea level rise. Study has shown a clear relation between rising ocean levels and rising groundwater levels far inland.¹ This has important ramifications for managing both wastewater and stormwater, potentially limiting the ability to effectively recharge and treat these pollution sources.

Barnstable has long stretches of coastline both on Nantucket Sound and Cape Cod Bay, creating considerable vulnerabilities related to natural hazards, climate change, and sea-level rise. The Town's Comprehensive Wastewater Management Plan (CWMP) clearly describes the vulnerabilities to the Town's wastewater collection system and additional efforts to address coastal hazards are underway, including retrofits to existing sewer lines and designing new lines to be more resilient to projected hazards. The Sandy Neck Barrier Beach parking area, for example, has undergone significant scenario discussion and requires relocation farther from the coast in response to patterns of erosion. Regarding roadway infrastructure, Barnstable is working with the Cape Cod Commission to develop strategies for low-lying roads that are showing increased vulnerability to coastal storms and sea level rise.

¹ Walter, D.A., McCobb, T.D., Masterson, J.P., and Fienen, M.N., 2016, Potential effects of sea-level rise on the depth to saturated sediments of the Sagamore and Monomoy flow lenses on Cape Cod, Massachusetts (ver. 1.1, October 18, 2016): U.S. Geological Survey Scientific Investigations Report 2016–5058, 55 p.

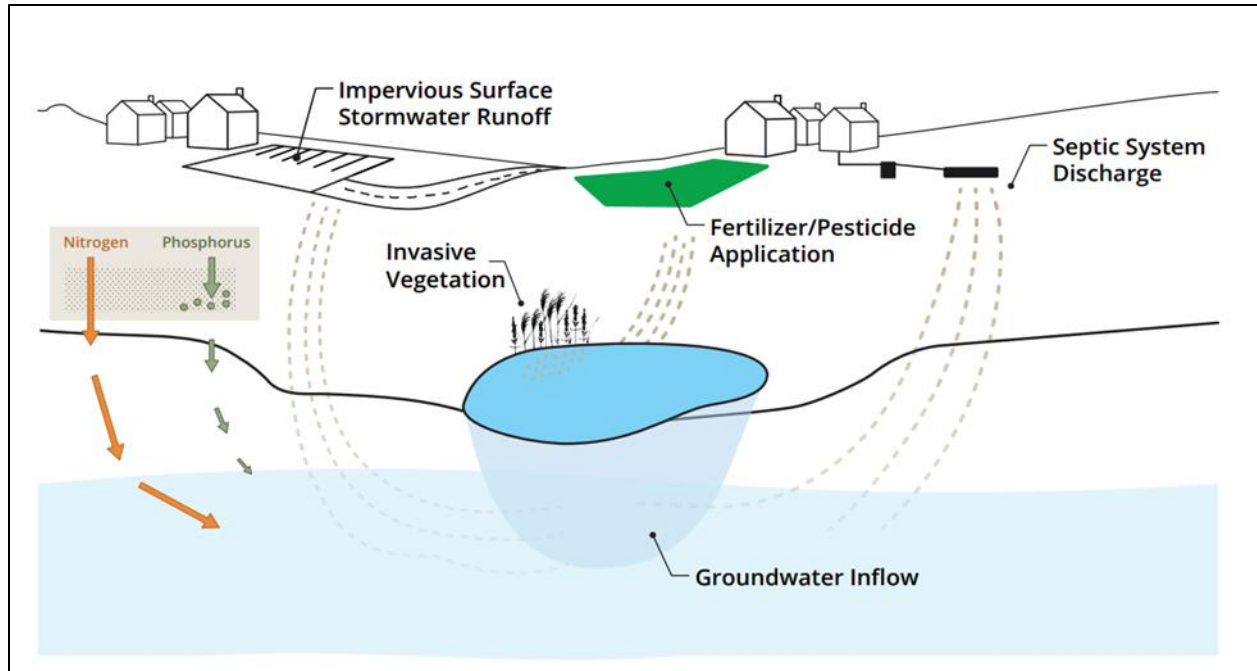


Figure 1: Threats to pond quality including presence of aquatic invasive species, contribution of nutrients from septic system discharge and fertilizer/ pesticide application, and contribution of nutrients or increased erosion and flow from impervious surfaces. Phosphorus and nitrogen are nutrients of concern and have the potential to come from any or all of these sources. Nitrogen easily flows through the soil and into groundwater, while phosphorus may be bound in the soil or pass through depending on soil type and condition.

Source: Cape Cod Ponds and Lakes Atlas, Figure 13, prepared by Cape Cod Commission, 2021, 78.

Climate Change

Climate change has the potential to impact residents’ way of life and the natural systems of Barnstable. As a community with over 170 miles of shoreline, more intense weather patterns could mean flooding, heat waves and seasonal drought threatening infrastructure, landscapes, ecological systems, and residents². Barnstable’s Community Resilience Building workshop identified low-lying infrastructure, emergency access during weather events, wastewater, and utility failures as some of the most concerning challenges. Projected sea level rise would also further impact eelgrass in Barnstable salt marshes, responsible for important ecological benefits such as nitrogen removal, carbon sequestration, and support of commercial fishing.³ Delicate environments like cranberry bogs and herring runs would also feel the impact of rising ocean waters.

² Barnstable Community Resilience Building Workshop Summary of Findings – Municipal Vulnerability Preparedness Program, 2019.

³ Cape Cod Climate Action Plan, prepared by the Cape Cod Commission, July 2021.
<https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/climate/Shared%20Documents/Climate%20Action%20Plan/Cape-Cod-Climate-Action-Plan.pdf>

Water & Ocean Resources

Groundwater

The Cape Cod aquifer is designated as a Sole Source Aquifer under the Safe Drinking Water Act by the Environmental Protection Agency (EPA), a designation that requires Federally funded projects to assess project impacts to the aquifer. The Town of Barnstable is evaluating options for developing new groundwater supplies to meet regulatory requirements and future needs for potable drinking water, both in Hyannis, which is served by the Water Supply Division of the Barnstable Department of Public Works, and throughout the rest of Barnstable, which is served by the Barnstable, Cotuit, and Centerville-Osterville-Marstons Mills Water Districts. This is complicated by the fact that the Town's groundwater system is replenished entirely by precipitation and the level of the water table fluctuates seasonally due to evaporation, precipitation, and water withdrawals. Barnstable's Community Preservation Committee (CPC) continues ongoing conversations with the Fire/Water Districts about wellhead protection and open space acquisition to ensure that no development should occur in Zone 1s (i.e. within a 400-foot radius of a future public supply well) and that lands within both the Zone I and Zone II area be acquired where possible and feasible.

As the Town experiences an increase in year-round population coupled with a decrease in land area suitable for water supply development, the need to balance groundwater withdrawals with local effects on the aquifer's saltwater boundaries, wetlands, and surface water resources will require careful planning for future water supply development.

Freshwater Lakes & Ponds

Freshwater lakes and ponds in the Town of Barnstable are significant scenic, recreational, and wildlife habitat resources. The Town of Barnstable has 163 freshwater ponds, 90 of which are one acre or more. Twenty-seven ponds are greater than 10 acres and are considered "Great Ponds" under state regulations. Collectively, ponds occupy 1,912 acres within the town. Freshwater ponds are particularly sensitive to additions of phosphorus, which is associated with development and land uses close to a pond (such as wastewater, fertilizer, and stormwater sources). Buffering pond shorelines from development is an effective strategy for protecting freshwater ponds and lakes by taking advantage of the soil's ability to absorb and store phosphorus. Pond and lake stewardship in Town includes the Department of Public Works, Conservation Division and other organizations including private lake and pond associations, the Pond and Lake Stewardship (PALs) Program, the Barnstable Clean Water Coalition (BCWC), the Association to Preserve Cape Cod, and the Cape Cod Ponds Network.

Wetland Resources

Barnstable is home to over 14,300 acres of wetland resources, including ponds and lakes, marshes, beaches, wooded wetlands, and cranberry bogs. The Great Marshes area, protected by Sandy Neck, is the largest salt marsh on Cape Cod, and is a state designated Area of Critical Environmental Concern (ACEC). Protected buffers around wetland resources provide important habitat and assist in the management of pollutants, trapping or arresting nutrients and sediment before they can flow into wetlands and clog or impair them. Increasingly important, wetland buffers preserved from development will help to store increased stormwater runoff as the climate changes and will allow wetlands to migrate as changes in groundwater height and increased precipitation events occur. Barnstable is home to over three hundred isolated wetlands, many being cranberry bogs. Some cranberry bogs are an active part of the Cape Cod economy while others are abandoned or protected as open space. There are also 37 certified vernal pools in Barnstable; these small environments are unique because they can recharge local aquifers and provide for a diverse set of animals with conditions ranging from saturated, dry, or frozen.

Cranberry bog acquisition and restoration offers multifaceted benefits. First, it enhances water quality by promoting natural filtration processes at headwaters to ponds and streams. Additionally, restored cranberry bogs contribute to healthier ecosystems by supporting diverse plant and animal life. Restoration of these habitats often involves implementing water storage which can help with localized flooding during extreme weather events and can play a role in climate change mitigation. It is important that the Town has a say in the acquisition of these important resource areas.

Open Space & Recreation

Habitat

Habitats provide many benefits to humans through the ecosystem services they provide, such as recreational access, filtering of nutrients or air quality, provision of food and other needed resources, and mitigating the threats from natural hazards. BioMap, a statewide habitat mapping tool developed by MassWildlife and The Nature Conservancy, identifies 15,107 acres of Critical Natural Landscapes (CNLs) within Barnstable. There are many threats to these habitat resources.

The subdivision of large tracts of land, for example, often replaces native vegetation with impervious surfaces and lawns and fragments remaining habitat. The Town continues to enforce the Resource Protection Overlay District, which maintains a minimum lot size of two acres in most areas of Town. Increased water withdrawals from the water table are another threat to habitat, negatively impacting delicate wetlands and freshwater shorelines. Fluctuating water levels support unique species; however, lower pond levels could disturb habitats.⁴

⁴ Cape Cod Watershed Assessment and Action Plan, Executive Office of Environmental Affairs, 2004, 17.

Threats also include climate change, invasive species, and the reduction of natural disturbances. Natural disturbances, such as wildfire or severe storms, are necessary to maintain the diversity of vegetation groupings that define that area’s woodlands, heathlands, and coastal plain pond shores.⁵

Barnstable’s challenge, along with the rest of the region, is to find ways to protect remaining undeveloped lands, manage habitat to support diverse vegetation, and target invasive species incursions.

Conservation & Recreation

Among the implications of growth is a loss of open space and associated natural resources. The need to plan for and address open space for recreation and resource protection remains one of the top priorities in Barnstable today.

Approximately 29% of the area of the town is open space protected in perpetuity (11,469 acres). This is an increase of 524 acres from 2010 to 2022. Areas held by the water districts for drinking water protection represent a large portion of the remaining undeveloped land in Barnstable. Land acquisitions along Route 6 make up the “backbone” of the Town’s conservation lands and contribute to regional green infrastructure. Conservation efforts continue to focus on smaller corridors running north-south and linking to the larger conservation greenway along the moraine. Property acquisitions along Barnstable coastlines support highly productive ecosystems, provide popular recreation opportunities, and preserve the scenic quality of the seashore.

Additional open space exists without protection or with limited protections. Opportunities to purchase land in the watersheds of sensitive or impaired water bodies, particularly as buffers between the water body and surrounding land uses, can minimize pollution threats and should be priorities for future public acquisition.

Resource management problems include illegal trash dumping, unauthorized motorized off-road vehicle use, and vandalism on conservation and other open space parcels. The cleanup and disposal of illegally dumped material is a nuisance and an added cost burden to the Town. Such activities also pose environmental hazards. Despite enforcement efforts by the Natural Resources Division and Police Department, unauthorized vehicle use is a continued problem. Agencies remain vigilant in their monitoring at sites of illegal dumping and in prosecution of violators. The Conservation Commission and Conservation Program, as well as the Property Management Division have been very proactive in protecting conservation and open space lands from unauthorized vehicular access and illegal dumping with locked gates and large boulders.

The Town’s Open Space and Recreation Plan, adopted in 2018, helps guide the maintenance and expansion of the Town’s open space and recreational resources.

⁵ Ibid.

GOALS & STRATEGIES

Groundwater

Maintaining and improving the quality and quantity of groundwater remains a major and ongoing goal for Barnstable, not only to ensure a sustainable yield of high-quality drinking water but to maintain a healthy environment. Ultimately, the Town will strive for a long-term goal of achieving a protected water supply.

- Strategy: Continue to conduct long-range land use and capital facilities planning for future provision and protection of Barnstable’s public water supply.
 - The Town will continue to collaborate with independent water districts to analyze data and implement plans to acquire future wells and associated lands before development occurs and designate Zones of Contribution and Wellhead Protection Zones for future public supply wells.

- Strategy: Continue to prioritize the public acquisition of lands within 400 feet of a future public supply well (Zone I), as well as Zone II areas most susceptible to contamination. Coordinate with adjacent communities, as applicable, when land surrounding a future public supply well expands into or abuts another town.

- Strategy: Practice water conservation measures to help ensure adequate water supply.
 - The Town’s Water Supply Division will continue to manage its Water Conservation Program, providing education and free water conservation products to the public.

- Strategy: Continue to implement the Town’s Comprehensive Wastewater Management Plan as it relates to the protection of drinking water, particularly in the identification and treatment of Contaminants of Emerging Concern (CEC) such as PFAS.

- Strategy: Continue to prioritize expansion of the public water supply where private wells are vulnerable to contamination from wastewater effluent, saltwater intrusion or other contaminants.

- Strategy: Ensure, in addition to the state’s permitting determinations, that all water supply wells, public and private, are located to avoid water withdrawal impacts on ponds, streams, coastal embayments, and wetlands.
 - Prevent groundwater mining or overdraft and ensure that withdrawals do not exceed the safe yield of the aquifer.

- Ensure that public and private supply well pumping does not cause saltwater intrusion.
- Explore feasibility of incorporating additional treatment options to water supply processes including desalinization.

Marine Waters

The unique maritime character of working harbors, coastal villages and other developed areas should be protected and, if possible, enhanced. Development in high hazard areas should be limited in order to minimize the loss of life and structures, and to reduce erosion and other environmental damage resulting from storms, natural disasters, and sea level rise. Coastal water quality and habitat must be maintained and improved to allow shellfishing and recreation as appropriate, and to protect coastal ecosystems which support shellfish, finfish, and other coastal wildlife and native coastal plants. Manage the competing uses of marine waters, including fishing, fowling, boating, swimming, and public access to the shore.

- Strategy: Control erosion in barrier beaches and coastal banks to the greatest extent possible to protect important wildlife habitat and recreational amenities and provide storm surge protection. Continue to collaborate with the Natural Heritage and Endangered Species Program (NHESP) to meet current and future regulations. Use natural solutions to improve the resiliency of our public beaches and ways to water. Incorporate DEP wetland regulations, as amended, to ensure such review is compliant with state law.
- Strategy: Establish regulations to require that buildings and infrastructure in areas of projected sea level rise are designed for protection from flooding as well as to minimize risk to human health and safety. Establish a procedure for managed retreat including identification of land for relocation of existing structures.
- Strategy: Develop a long-term restoration plan for the town's salt marshes. Establish stabilization techniques to reduce erosion in the saltwater marshes. (Consider the Virginia Institute of Marine Science's living shoreline program with nature-based approaches for shoreline protection).
- Strategy: Continue to refine and implement strategies for complying with the Total Maximum Daily Loads (TMDLs) established as part of the Massachusetts Estuaries Program (MEP). Refine plans to address the new Title 5 Septic System and Watershed permit regulations, including updates to the CWMP and filing for watershed permits, as needed.
- Strategy: Protect environmentally fragile areas and reduce nitrate-nitrogen loading in marine recharge areas.

- Strategy: Update and expand the scope of the Town’s Coastal Resource Management Plan (2009) to provide guidance for the various competing uses of all the Town’s harbors and coastal resources, including marine services and facilities, fisheries and aquaculture, natural resources, coastal landforms, coastal structures, and coastal land uses.
 - The Town will explore options for the zoning of coastal waters as a mechanism for balancing and regulating competing interests such as protecting habitat, protecting overall coastal water quality, and providing coastal access for passive and active water dependent recreational activities.
 - Consider moratoriums on new (non pre-existing) docks and moorings until the plan is updated to evaluate the effects of these structures on shellfish and other habitat.
- Strategy: Continue to expand the Ways to Water program, to re-establish and/or designate through appropriate legal means traditional rights of way to marine waters to ensure that these are not lost or abandoned. Continue to develop and maintain signage, and outreach programs, including GIS mapping for posting to the Town website and internet sites.
- Strategy: Accomplish the Sandy Neck Beach Park coastal resiliency project.
- Strategy: Continue to identify and protect the Town’s remaining eelgrass beds.

Freshwater Lakes & Ponds

To the greatest extent possible, the water quality of Barnstable’s freshwater water bodies should be maintained to standards that support living organisms appropriate for the lake or pond, and allow recreation for the surrounding neighborhood, Town residents, and other recreational users.

- Strategy: Wherever possible, land within 100 feet of any freshwater lake or pond should be maintained in its natural, vegetated condition. Where significant populations of rare, endangered or threatened species have been identified, every effort should be made to ensure permanent control over these buffers through acquisition by the Town or a conservation organization through acquisition, conservation restriction or deed restriction. Coordinate consistent and frequent enforcement of protected natural resources areas.
- Strategy: Within lake and pond recharge areas, development or redevelopment located within 300 feet of freshwater water bodies shall continue to be required to meet critical nutrient loading standards. Where existing development exceeds identified critical loading standards for a freshwater recharge area, redevelopment should maintain or improve existing levels of nutrient loading. Continue to investigate and implement new strategies to reduce nutrient loading as research and technology evolve.

- Strategy: Continue to expand the Ways to Water program, to re-establish and/or designate through appropriate legal means traditional rights of way to freshwater lakes and ponds to ensure that these are not lost or abandoned. Continue to develop and maintain maintenance, signage, and outreach programs, including GIS mapping for posting to the Town website and internet sites. Enhance communication strategies to educate residents of the Town's Ways to Water program to promote opportunities to access the town's various waterbodies.
- Strategy: Maximize the ecological health of the Town's 5 herring runs.
- Strategy: Coordinate an inventory and analysis of all of the Town's freshwater ponds and lakes to evaluate the status of each waterbody including water quality and additional impacts like flooding. Reflect upon existing conditions data to develop a prioritization plan for the Town's ponds and lakes with consideration of future sewer infrastructure.
- Strategy: Coordinate a trust fund to incentivize homeowners within proximity of the Town's ponds to improve existing levels of nutrient loading by implementing best practice strategies such as vegetated buffers.

Wetland Resources

Preserve and restore the quality and functions of Barnstable's coastal and inland wetlands. Reclaim filled or non-functioning wetlands where possible, including cranberry bogs. Preserve, and restore where feasible, the quality and functions of isolated lands subject to flooding and in need of additional protection, including vernal pools.

- Strategy: Where the size of the lot permits, a vegetated buffer of at least 100 feet from the edge of coastal and inland wetlands, including isolated wetlands, shall be maintained in an undisturbed, natural state to protect the natural functions of these areas, including but not limited to mitigation of stormwater impacts and wildlife habitat value. Where the lot size does not permit a 100 foot buffer, the maximum feasible buffer shall be maintained but in no case shall this buffer be less than 50 feet. The Conservation Commission may require a larger buffer to protect sensitive areas or where the site conditions such as slopes or soils suggest that a larger buffer is necessary to prevent adverse impacts. Coordinate educational opportunities for members of the Conservation Commission to learn best practices strategies pertaining to vegetated buffers to establish more stringent requirements. Coordinate consistent and frequent enforcement of protected natural resources areas.
- Strategy: Continue state and federal grant funded measures to restore impaired ponds, salt marshes and estuaries.
- Strategy: Continue to identify, certify, and map vernal pools, and ensure that they are not used for stormwater management.

- Strategy: Require expanded notification to abutters for large-scale proposals before the Conservation Commission.

Habitat

Prevent loss or degradation of critical wildlife and plant habitat, minimize the impact of new development on wildlife and plant habitat, maintain existing populations and species diversity, and maintain areas which will support wildlife's natural breeding, feeding, and migration patterns.

- Strategy: In mapped Sensitive Habitat Areas, clearing of vegetation should be limited. In areas that have multiple habitat attributes, no clearing or cutting of vegetation should be permitted. In less sensitive areas, clearing may be permitted, but will be limited to the minimum area needed for building construction, roads, driveways and accessory structures, and as needed for safe sight distances. In any other undeveloped areas, clearing and alteration of topography should be minimized, with appropriate vegetation planted as needed to enhance or restore wildlife habitat. Coordinate consistent and frequent enforcement of Sensitive Habitat Areas.
- Strategy: In undeveloped areas outside Sensitive Habitat Areas, clearing of vegetation and alteration of natural topography shall be minimized, with appropriate vegetation planted as needed to enhance or restore wildlife habitat and serve as carbon capture to help mitigate climate impacts.
- Strategy: Continue to expand the establishment of greenways and wildlife corridors of sufficient width to protect edge species and species that inhabit the interior forest through the protection or acquisition of large unfragmented areas and the enforcement of open space residential development. Wildlife should be provided with opportunities for passage through developed areas where such opportunities will maintain the integrity of wildlife corridors.
- Strategy: Continue to actively maintain wildlife habitat through controlled prescribed burns, removal of dead trees and brush, etc.
- Strategy: Encourage proactive planning, zoning and permitting to protect endangered species habitat while still providing recreational opportunity to the public.
- Strategy: Explore opportunities to increase aquaculture on the south side of Town.
- Strategy: Establish a living list of native and climate resilient tree and shrub species of all sizes that can thrive in current and future climate conditions projected for the region, paired with a list of complementary best practices for planting and maintenance. The tree and shrub list should promote biodiversity especially within wetland buffers and forested areas and provide guidance for urban vs rural streetscaping and for open space environments. Additionally, this list will prioritize local species and forestry practices that maximize the benefits of tree canopy

development (ex. carbon capture, energy savings, pollution mitigation, stormwater surge protection, urban agriculture, recreation, etc.). Establish mechanisms for ongoing care and maintenance of canopy trees with an emphasis on education and civic participation.

- Strategy: Coordinate zoning amendments to increase tree canopy and wildlife habitat. Amend the Town’s zoning to require that residential and commercial properties are improved with or maintain existing vegetated landscape buffers. Coordinate zoning to require a new tree to be planted whenever a significant tree is removed. Consider tax incentives for properties that maintain tree canopy.
- Strategy: Analyze town-owned properties to identify areas, especially within the right-of-way, that can be improved with vegetation, such as existing medians. Coordinate with the state and utility companies to promote enhanced vegetation as well.

Open Space

The Town will pursue the goals of its Open Space and Recreation Plan, adopted in 2018, including:

- Protect and maintain a maximum amount of open space to enhance environmental protection, recreational opportunities and community character.
 - Use land protection to protect water supply, protect fresh and marine surface waters, preserve historic, scenic and cultural resources, and provide opportunities for farming and agriculture.
 - Provide diverse recreational opportunities and access throughout Barnstable and ensure that the current and future needs of all user groups are met appropriately.
 - Provide adequate public access to and safe enjoyment of the Town’s open space and recreational resources and programs, particularly its fresh and marine shoreline areas.
 - Promote greater coordination and communication about community open space and recreation needs within government and among stakeholder groups in the Town.
- Strategy: The Barnstable Open Space and Recreation Plan (OSRP) is incorporated herein by reference. The Town will pursue the objectives and implement the actions laid out in Sec. 9.3 of the OSRP.
 - Strategy: The Town will pursue the goals defined within the Recreation Division’s Priority Plan.
 - Strategy: Expand recreational opportunities across Town for residents of all ages and abilities. In particular, coordinate recreational opportunities and activities accessible to people who are visually impaired and incorporate ADA accessibility. Suggestions for recreational opportunities include additional trails, playgrounds (equip with shade structures, water features, and interactive board games), pickleball and basketball courts, and outdoor fitness stations. Suggestions for recreational activities include community gardens and farmers markets.

Other Regulations and Processes

The Town will consider regulations that place more responsibility on property owners regarding environmentally sound practices, and lead by example with its own practices, including, but not limited to:

- Establish requirements and incentivizes for ecological landscaping and the reduction of lawn areas.
- Requirements for vegetated buffer zones/wildlife corridors along water bodies including installation of permanent markers to denote the extent of a buffer if a violation is cited.
- Bans on fertilizer, herbicides, and pesticides.
- Discourage use of water for lawn and coordinate restrictions on irrigation such as a mandate for automatic irrigation shut-off during rainfall.
- Investment in staff time and training to properly enforce existing and new regulations.

MAPS

Mapping is an important tool for visualizing natural resources policies. The maps below can help the community see where development should be moderated or prohibited to protect important natural resources.

Please see the Existing Conditions Report for a fuller range of maps.

Map X: Wellhead Protection Areas

[Use Map 3.1 from the Existing Conditions Report]

Map X: Open Space by Level of Protection