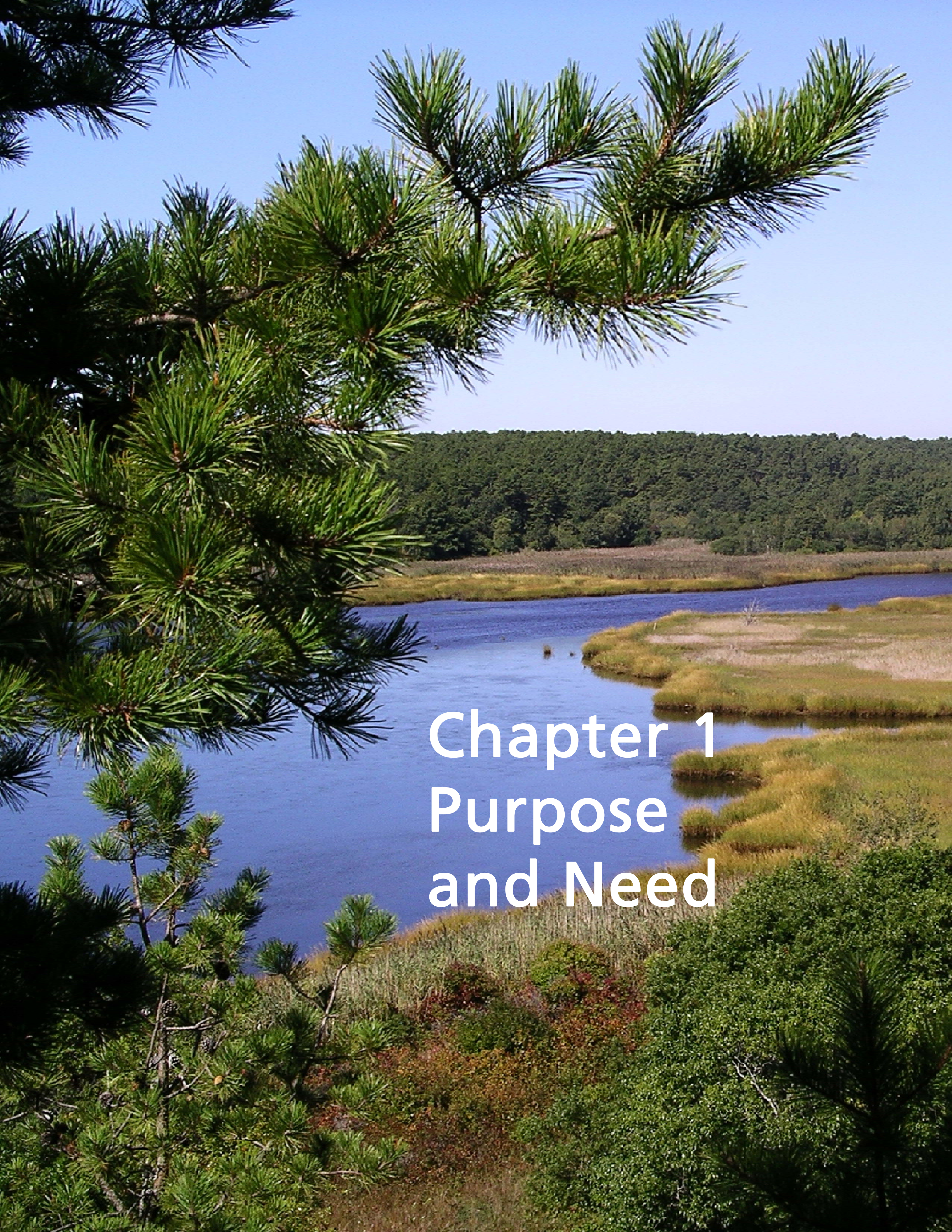

# Chapter 1 Purpose and Need

# CHAPTER 1: PURPOSE AND NEED

## 1.1 INTRODUCTION

The Herring River Restoration Committee (HRRC) and the National Park Service (NPS) propose to restore native tidal wetland habitat to large portions of the Herring River flood plain in and adjacent to Cape Cod National Seashore (the Seashore) (figure 1-1), by re-establishing tidal exchange in the river basin and its connected sub-basins. Tidal exchange would be increased incrementally, over time, using an adaptive management approach, to achieve desired conditions for native estuarine habitats.

The HRRC and NPS have prepared this *Herring River Restoration Project, Draft Environmental Impact Statement/Environmental Impact Report* (draft EIS/EIR) for the Herring River Restoration Project to assist the public, the Seashore, and the Towns of Wellfleet and Truro in developing a tidal restoration project for the Herring River. This draft EIS/EIR has been prepared in accordance with the 1969 National Environmental Policy Act (NEPA), the Massachusetts Environmental Policy Act (MEPA), and the Cape Cod Regional Policy Plan. For this project, the Towns of Wellfleet and Truro are the lead agencies for MEPA and the Cape Cod Commission (CCC); the NPS is the lead agency for NEPA compliance, with the participation of the following cooperating agencies (agency consultation letters are included in appendix A):

- U.S. Fish and Wildlife Service (USFWS)
- Natural Resources Conservation Service (NRCS)
- National Oceanic and Atmospheric Administration (NOAA)
- U.S. Environmental Protection Agency (USEPA)
- U.S. Army Corps of Engineers (USACE)

This chapter explains what the restoration project intends to accomplish and why the NPS and the project partners are taking action at this time. The draft EIS/EIR presents several alternatives for tidal restoration in the Herring River estuary and assesses the impacts that could result from continuing current practices (the no action alternative) or implementing the action alternatives. The NEPA and MEPA processes will be used to select an alternative to implement as the final restoration plan for the Herring River. This alternative, with its various restoration components, will guide the Herring River tidal restoration project and will provide a strategy for long-term, systematic monitoring, management, and restoration of the Herring River estuary. Information in this chapter is largely taken from the *Herring River Tidal Restoration Project Conceptual Restoration Plan* (CRP) (Herring River Technical Committee (HRTC) 2007); where appropriate, references cited in the CRP are included to indicate the original supporting documentation.

## 1.2 PURPOSE OF THE PROJECT

The purpose of this project is to restore self-sustaining coastal habitats on a large portion of the 1,100-acre Herring River estuary in Wellfleet and Truro, Massachusetts. While the ecological goal is to restore the full natural tidal range in as much of the Herring River flood plain as practicable, tidal flooding in certain areas must be controlled to protect existing land uses. Where these considerations are relevant, the goal is to balance tidal restoration objectives with flood control by allowing the highest tide range practicable while also ensuring flood proofing and protection of vulnerable properties.

## 1.3 NEED FOR ACTION

The Herring River's wetland resources and natural ecosystem functions have been severely damaged by 100 years of tidal restriction and salt marsh drainage. Adverse impacts include the following:

**Tidal Restriction (Lack of Tidal Inflow and Outflow)**—The Chequessett Neck Road Dike restricts the tidal range (mean low water to mean high water) in the Herring River from more than 10.3 feet on the downstream, harbor side, to approximately 2.4 feet just upstream of the dike (figure 1-2). The dike dampens the upstream water surface elevation of the mean high spring tide and 100-year coastal storm by approximately 5.8 and 8.4 feet, respectively. Figure 1-2 also illustrates the relationship between two common geodetic vertical datums. All elevations referenced in this document are in North American Vertical Datum (NAVD) 1988.

*All elevations presented in this EIS/EIR are based on the NAVD88. NAVD88 replaced National Geodetic Vertical Datum of 1929 (NGVD29) as a result of greater accuracy and the ability to account for differences in gravitational forces in different areas based on satellite systems. NAVD88 is 0.86 feet lower in elevation than NGVD29.*

Since 1980 when the Seashore began to consider restoring the Herring River, many studies have documented the negative impacts of tide restriction, ditching, and drainage, and have assessed the beneficial impacts that tidal restoration could have on natural resources and infrastructure. The following section summarizes the HRTC's information as presented in the Herring River Tidal Restoration Project CRP.

**Plant Community Changes (Including Loss of Salt Marsh Vegetation and Increase in Non-native, Invasive Species)**—The reduction of tidal influence on the river flood plain and intensified marsh drainage efforts (ditch-draining) has had a gradual but dramatic impact on the species' composition of the naturally occurring tidal marsh plant communities. Reduced salinities denied salt marsh plants their competitive edge over herbaceous freshwater wetland species. Cattail-dominated plant communities gradually replaced characteristic salt marsh vegetation. By the 1960s, intensified drainage for mosquito control further dewatered the soils and allowed upland grasses, forbs, and even trees to replace cattails. For example, black cherry and pitch pine are now dominant in areas that were once naturally occurring salt marsh habitats. Drainage made it possible for upland plants to invade the flood plain and shade out wetland species adapted to the previously saturated soils. By the 1970s, much of the original Herring River wetlands had been converted from tidal marsh to forest and shrublands dominated by opportunistic upland species. Concurrently, large portions of the original sub-tidal and intertidal substrates between the dike and High Toss Road had converted to monotypic stands of common reed.

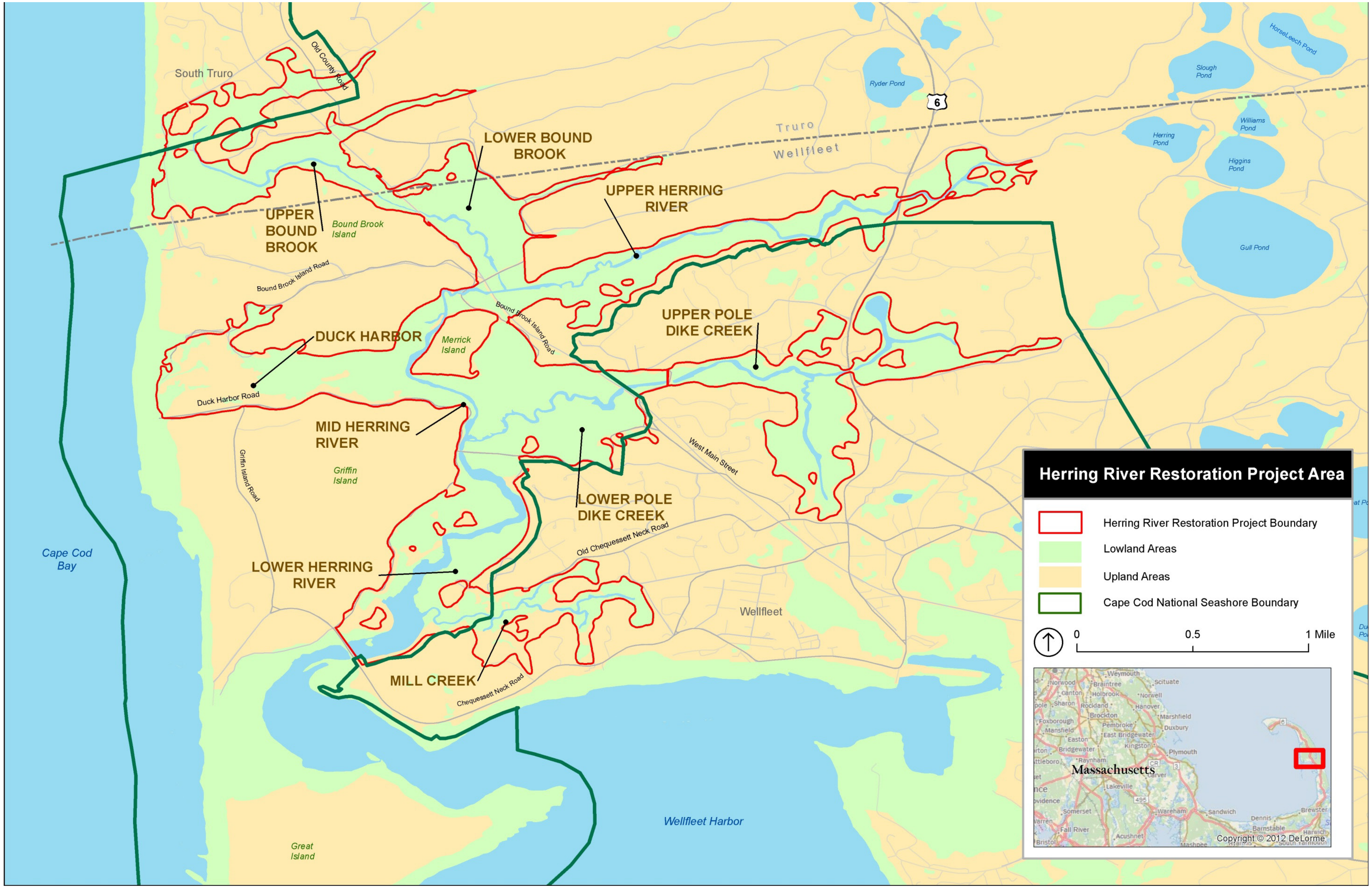


FIGURE 1-1: HERRING RIVER RESTORATION PROJECT AREA

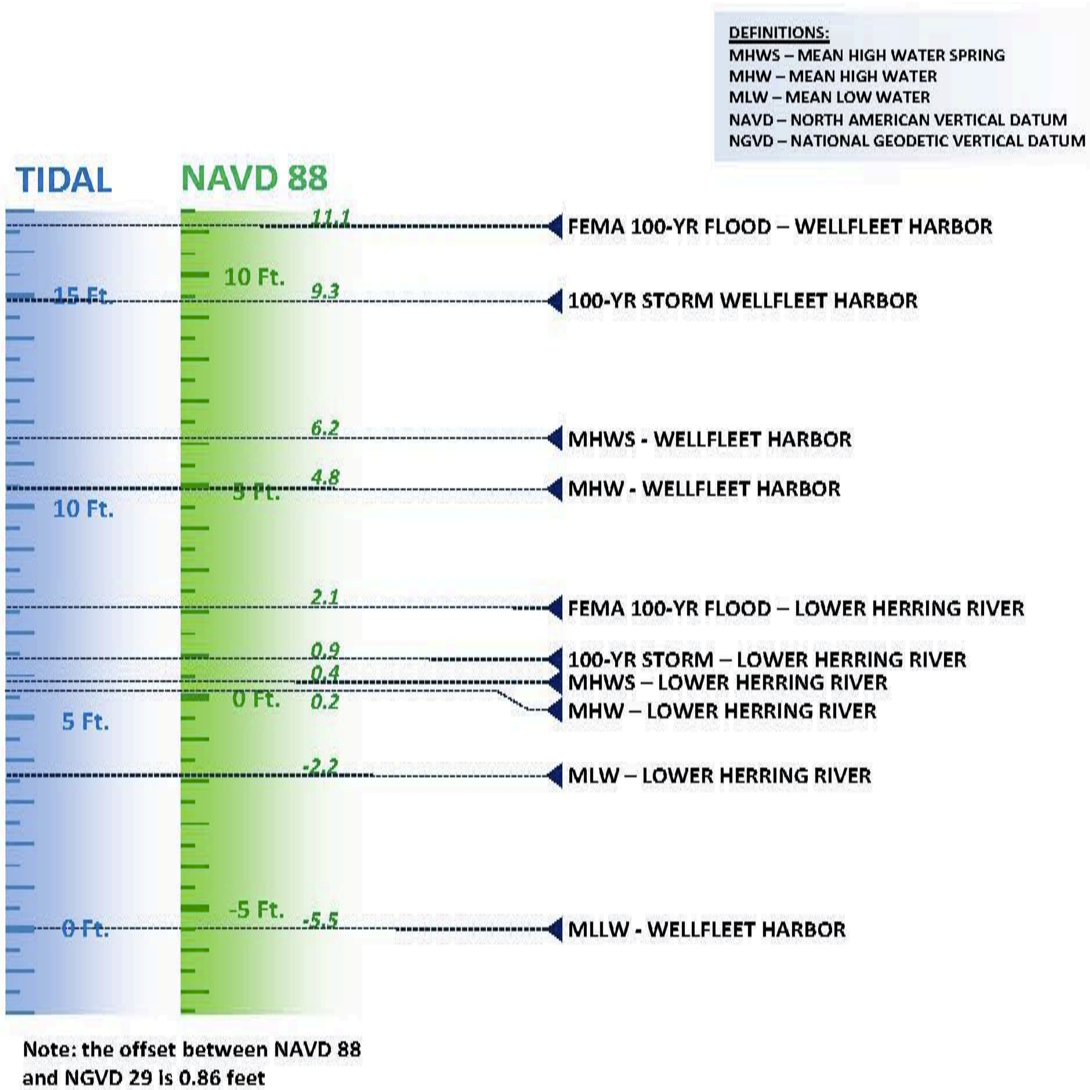


FIGURE 1-2: RELATIONSHIP BETWEEN NORTH AMERICAN VERTICAL DATUM OF 1988 AND TIDAL DATUM IN WELLFLEET HARBOR AND HERRING RIVER UNDER EXISTING CONDITIONS

**Loss of Estuarine Habitat and Degradation of Water Quality**—Elimination of salt water input to the estuary and marsh dewatering has dramatically degraded estuarine water quality, with severe ecological consequences. Salt marsh diking and drainage allows air to enter the normally anaerobic subsurface environment of the salt marsh, converting it to an aerobic environment where both organic material and iron–sulfur minerals can be readily oxidized. In salt marsh peat, a product of iron-sulfur mineral oxidation is sulfuric acid, which lowers pH when reaching surface waters. Low pH can cause fish kills and, in 1980, a large pulse of acidic water released into the Herring River main channel following a period of heavy rainfall killed thousands of adult American eel. Mainstem Herring River pH was determined to be highly acidic (pH 4), whereas ditches were 10 times more acidic. These ditches contained water so acidic that predatory fish that normally preyed upon floodwater mosquito larvae were chemically blocked from major mosquito breeding sites. Low pH causes leaching of toxic metals, particularly aluminum and ferrous iron, further degrading water quality.

Elimination of tidal flushing in the Herring River wetland system, which still contained abundant organic matter, caused regular summertime dissolved oxygen depletions and fish kills in the river's mainstem. Conditions, which were worst in mid-summer when oxygen demand was highest, compelled the NPS, at times, to control the emigration of juvenile herring to avert complete mortality and loss of the anadromous fish migration.

**Alteration of Natural Sediment Processes and Increased Salt Marsh Surface Subsidence**—Measurements indicate that, relative to sea level, much of the diked Herring River flood plain is up to 3 feet below its pre-dike elevation, and likewise below the current elevation of salt marsh seaward of the dike. Tidal restrictions radically affect the important process of sedimentation on the salt marsh. Coastal marshes must increase in elevation at a pace equal to, or greater than, the rate of sea-level rise in order to persist. This increase in elevation (accretion) depends on several processes, including transport of inorganic sediment into an estuary and its deposition onto the marsh surface during flood tides. This sediment transport must occur to promote the growth of salt marsh vegetation and gradually increase the elevation of the marsh surface. However, the 1909 diking has dramatically reduced inorganic sediment from reaching the salt marshes in the Herring River basin. Additionally, marsh drainage has increased the rate of organic peat decomposition by aerating the sediment and caused sediment pore spaces to collapse. All of these processes have contributed to severe historic and continuing subsidence in the Herring River diked wetlands.

**Nuisance Mosquito Production**—Despite decades of work and large public expenditures to eliminate them, the Herring River remains a major breeding area for nuisance mosquitoes. Dense vegetation, lack of tidal flushing and substantial freshwater flows, marsh surface subsidence, and prior disturbances to the flood plain create extensive stagnant water breeding areas. In sampling conducted by the Seashore and the Cape Cod Mosquito Control Program (CCMCP), the dominant mosquito species caught in the Wellfleet area, *Ochlerotatus cantator*, breeds in fresh to brackish water. Its larvae can tolerate the acidified waters that keep its predators—fish species that eat mosquito larvae—at bay.

**Impediments to River Herring Migration**—In its unrestricted state, the Herring River provided a crucial connection between Cape Cod Bay and hundreds of acres of herring spawning and American eel habitat at Herring, Higgins, and Gull Ponds. In addition, the unrestricted estuary featured a gradual transition in salinity from seawater to freshwater, providing anadromous herring and catadromous eels a salinity gradient in which to adapt physiologically. The Chequessett Neck Road Dike physically impedes migratory fish passage and creates an artificially abrupt transition from seawater to fresh river water. As described previously, the tidal restriction also upsets wetland biogeochemical cycling which, in turn, severely degrades the water quality of aquatic habitat (e.g., depletion of dissolved oxygen). This has led to periodic fish kills during the summer when juvenile herring must swim from their natal kettle ponds down the Herring River's mainstem to Cape Cod Bay.

## 1.4 OBJECTIVES IN TAKING ACTION

Objectives are "what must be achieved to a large degree for the action to be considered a success" (NPS 2011b). All alternatives selected for detailed analysis must meet project objectives to a large degree and resolve the purpose of and need for action. Objectives must be grounded in the enabling legislation, purpose, and mission goals of the Seashore, and must be compatible with the Seashore's General Management Plan direction and guidance, water resources plan, NPS *Management Policies* 2006, and/or other NPS management guidance. The NPS and HRRC identified the following objectives for developing this draft EIS/EIR.

### 1.4.1 NATURAL RESOURCES

- To the extent practicable, given adjacent infrastructure and other social constraints, re-establish the natural tidal range, salinity distribution, and sedimentation patterns of the 1,100-acre estuary.
- Improve estuarine water quality for resident estuarine and migratory animals including fish, shellfish, and waterbirds.
- Protect and enhance harvestable shellfish resources both within the estuary and in receiving waters of Wellfleet Bay.
- Restore the connection between the estuary and the larger marine environment to recover the estuary's functions as (1) a nursery for marine animals and (2) a source of organic matter for export to near-shore waters.
- Remove physical impediments to migratory fish passage to restore once-abundant river herring and eel runs.
- Re-establish the estuarine gradient of native salt, brackish, and freshwater marsh habitats in place of the invasive non-native and upland plants that have colonized most parts of the degraded flood plain.
- Restore normal sediment accumulation on the wetland surface to counter subsidence and to allow the Herring River marshes to accrete in the face of sea-level rise.
- Re-establish the natural control of nuisance mosquitoes by restoring tidal range and flushing, water quality, and predatory fish access.

### 1.4.2 CULTURAL RESOURCES

- Restore the expansive marshes and tidal waters that were once a principal maritime focus of both Native Americans and European settlers of outer Cape Cod in a manner that preserves the area's important cultural resources.
- Minimize adverse impacts to cultural resources during project construction and adaptive management phases.

### 1.4.3 SOCIAL AND ECONOMIC RESOURCES

- Minimize adverse impacts to surrounding land uses, such as domestic residences, low-lying roads, wells, septic systems, commercial properties, and private property, including the Chequessett Yacht and Country Club (CYCC).
- Educate visitors and the general public by demonstrating the connection between productive estuaries and salt marshes and a natural tidal regime.
- Improve finfishing and shellfishing opportunities.
- Enhance opportunities for canoeing, kayaking, and wildlife viewing over a diversity of restored wetland and open-water habitats.

## 1.5 DECISIONS TO BE MADE

In determining whether to implement the Herring River Restoration Project (HRRP) several federal agencies and two local communities will be using the environmental analysis in this EIS/EIR to inform their decision-making. These agencies and towns are currently working together to develop this document as lead and cooperating agencies under NEPA and MEPA, respectively. Each agency and town will consider the information in the EIS/EIR, public comments, and its own expertise related to the HRRP in making a decision whether to fund, authorize, implement, permit, or support the HRRP, or components of the HRRP.

MEPA requires that the environmental impacts of a proposed action be considered before a permit is issued by a state agency or commission if required by a local municipality. The two local municipalities for this HRRP are the towns of Wellfleet and Truro.

NEPA requires that the environmental impacts of a federal action be considered prior to a federal agency implementing the action to ensure its decision is informed. NEPA requires a lead agency for the development of the EIS and allows for the inclusion of cooperating agencies that either possess jurisdiction by law or have special expertise related to the HRRP. Federal NEPA decisions are captured in a Record of Decision. The following federal agencies intend to use this EIS/EIR to inform their decision, whether it is to fund, authorize, implement, or permit the HRRP in full or in part:

- NPS
- USFWS
- U.S. Department of Agriculture NRCS
- NOAA
- USEPA
- USACE.

## 1.6 BACKGROUND

### 1.6.1 PURPOSE AND SIGNIFICANCE OF THE SEASHORE

Cape Cod is a slender spit of land curving some 60 miles into the Atlantic Ocean (figure 1-1); it has long been recognized as an extraordinary and diverse resource. Congress recognized that the Outer Beach of the Cape Cod peninsula was nationally significant for ecological, historical, and cultural reasons. On August 7, 1961, President John F. Kennedy signed legislation that established the Cape Cod National Seashore (Public Law 87-126). The purposes of the Seashore, as interpreted in the most recent (NPS 1998) General Management Plan, are as follows:

1. Preserve the nationally significant and special cultural and natural features, distinctive patterns of human activity, and ambience that characterize the outer Cape, along with the associated scenic, cultural, historic, scientific, and recreational values.
2. Provide opportunities for current and future generations to experience, enjoy, and understand these features and values.

### 1.6.2 PROJECT LOCATION

The geographic study area for this draft EIS/EIR is the Herring River estuary in Wellfleet and Truro on Cape Cod, Massachusetts. The Herring River (along with its flood plain, tributary streams, and associated estuarine habitats within Wellfleet Harbor) was the largest tidal river and estuary complex on the Outer Cape. Most of the river's flood plain (approximately 80 percent) is within the boundary of the Seashore. The river itself extends from Wellfleet Harbor northeast for nearly 4 miles to Herring Pond in north Wellfleet. Bound Brook, a major tributary, stretches northwest to Ryder Beach in South Truro. The river system, approximately defined by the landward limit of the flood plain of the river and its tributaries, encompasses about 1,100 acres.

In addition to the Herring River's upper, middle, and lower basins, the restoration project area is composed of important stream sub-basins including Duck Harbor, Mill Creek, Lower and Upper Bound Brook, and Lower and Upper Pole Dike Creek (figure 1-3). Each basin is distinct physically, and thus chemically and biologically, because of its elevation and distance from the Herring River and Wellfleet Harbor. Therefore, tidal restoration will influence each basin to a different degree. In addition, each basin has a different land management history and habitat impacts, such as habitat fragmentation from road construction and residential development. The following section describes each sub-basin within the project area.

**Herring River Basin**—The Herring River basin is separated from Wellfleet Harbor by the Chequessett Neck Road Dike. The dike has three 6-foot wide box culverts, each with an attached flow control structure. One culvert has an adjustable sluice gate that is currently set partially open at 2 feet and allows limited bi-directional tidal flow. The remaining two culverts have tidal flap gates, designed to permit flow only during outgoing (ebbing) tides (WHG 2009).

The mainstem Herring River basin encompasses 396 acres and is divided into three separate hydrologic units: Lower Herring River, Middle Herring River, and Upper Herring River. The lower basin is the southern-most portion, immediately upstream of the Chequessett Neck Road Dike and extending northerly to the High Toss Road crossing. This basin covers roughly 166 acres and includes sub-tidal, riverine, vegetated wetland, and fringing upland flood plain habitats. The only remaining salt marsh in the Herring River system (approximately 13 acres) is located here, along with about 40 acres of non-native common reed (*Phragmites australis*) dominated marsh. The Middle Herring River covers 74 acres and extends north to Bound Brook Island Road. The Upper Herring River encompasses approximately 156 acres and extends northeast from Bound Brook Island Road and east of Route 6 to Herring Pond.

**Mill Creek**—Mill Creek sub-basin extends easterly from its confluence with the Herring River confluence, which is approximately 1,600 feet east of the Chequessett Neck Road Dike. The former tidal marsh portion of the Mill Creek basin comprises about 80 acres. *Phragmites* marsh and disturbed wooded wetland habitat covers much of the flood plain, although some salt marsh vegetation is found on the creek banks at the mouth of Mill Creek itself. In the 100 years since the Herring River Dike was constructed, CYCC, and several private residences and wells have been developed in the Mill Creek flood plain.

**Pole Dike Creek Basin**—This basin encompasses approximately 288 acres and forms the east central portion of the project area. The basin consists of two hydrologic units: Lower Pole Dike Creek and Upper Pole Dike Creek. Covering about 114 acres, Lower Pole Dike Creek sub-basin extends northeast from High Toss Road to Pole Dike Road. Upper Pole Dike Creek extends east of Pole Dike Road and includes the wetland and flood plain north of Wellfleet Center and east of Route 6. This basin is composed of about 174 acres of freshwater marsh. Private properties have been more intensely developed around the Upper Pole Dike Creek wetlands than in other Herring River sub-basins.

**Duck Harbor Basin**—This basin extends west from the mainstem of the river to the Duck Harbor barrier beach and comprises about 131 acres of flood plain north of Griffin Island and south of Bound Brook Island. Dry deciduous woodland are typical in the eastern portion, while freshwater wetland shrubs dominate in the lower, wetter, western portion, except where the basin rises up to the barrier beach. The shift of the Herring River from salt marsh to predominantly fresh/brackish and upland habitat was not solely caused by the 1909 Chequessett Neck Road Dike, but the natural closures of Bound Brook and then Duck Harbor also contributed to the changes. Today, Duck Harbor is separated from Cape Cod Bay by a line of vegetated dunes. However, historic maps show a tidal channel connecting it to the bay as recently as 1848 (Tyler 1922).

**Bound Brook Basin**—The Bound Brook basin extends to the north and west of Herring River above Old County Road. This basin consists of two hydrologic units: Lower Bound Brook (86 acres) and Upper Bound Brook (148 acres) that form a 234-acre wetland extending into the Ryder Hollow area of Truro. Today, Bound Brook basin is separated from Cape Cod Bay by a line of vegetated dunes, but this may be a relatively recent geological development, as the Bound Brook basin was connected to Cape Cod Bay until the mid-1700s (Roman 1987). In the past, Bound Brook basin was likely an estuary with tidal connection to Cape Cod Bay.

### 1.6.3 HISTORIC ALTERATIONS TO THE HERRING RIVER SYSTEM

Historically, the Herring River estuary included about 1,100 acres of salt marsh, intertidal flats, and open-water habitats (HRTC 2007) (figure 1-4). In 1909, the Town of Wellfleet diked the Herring River at its mouth, primarily to drain the breeding area for salt marsh mosquitoes. While salt hay production and fisheries productivity decreased, the mosquitoes did not. As a further attempt to control mosquitoes, the town dug drainage ditches in the marsh upstream of the dike structure. By the mid-1930s, the Herring River mainstem, now flowing with freshwater, was channelized and straightened, which cut off many creek meanders between High Toss Road and the present Route 6, substantially reducing the length of the river. Between 1929 and 1933, private developers of the CYCC constructed a nine-hole golf course in the Mill Creek flood plain. Several homes also have been built at low elevations in the flood plain. Freshwater vegetation and upland shrubs and trees now dominate the former tidal wetland (NPS 1999).

By the 1960s, structural deterioration caused the tide gates in the Chequessett Neck Road Dike to rust in an open position. As a result, tidal range and salinity in the Herring River increased, and shellfish recolonized in the river bottom and tidal flats upstream of the dike. However, increased tidal range in the river also caused periodic flooding of the CYCC golf course and other private properties. Although many local residents, scientists, and environmental advocates recognized and spoke publicly about the benefits of increased tidal flow in the river, in 1971 the Town of Wellfleet voted to allocate $37,500 toward repair of the damaged dike. In 1973, the Wellfleet Conservation Commission issued an Order of Conditions requiring that the repaired structure allow water levels matching those caused by the damaged tide gates. They further required that the new dike accommodate anadromous fish passage. Amid controversy, the state Department of Public Works rebuilt the dike in 1974 (HRTC 2007).

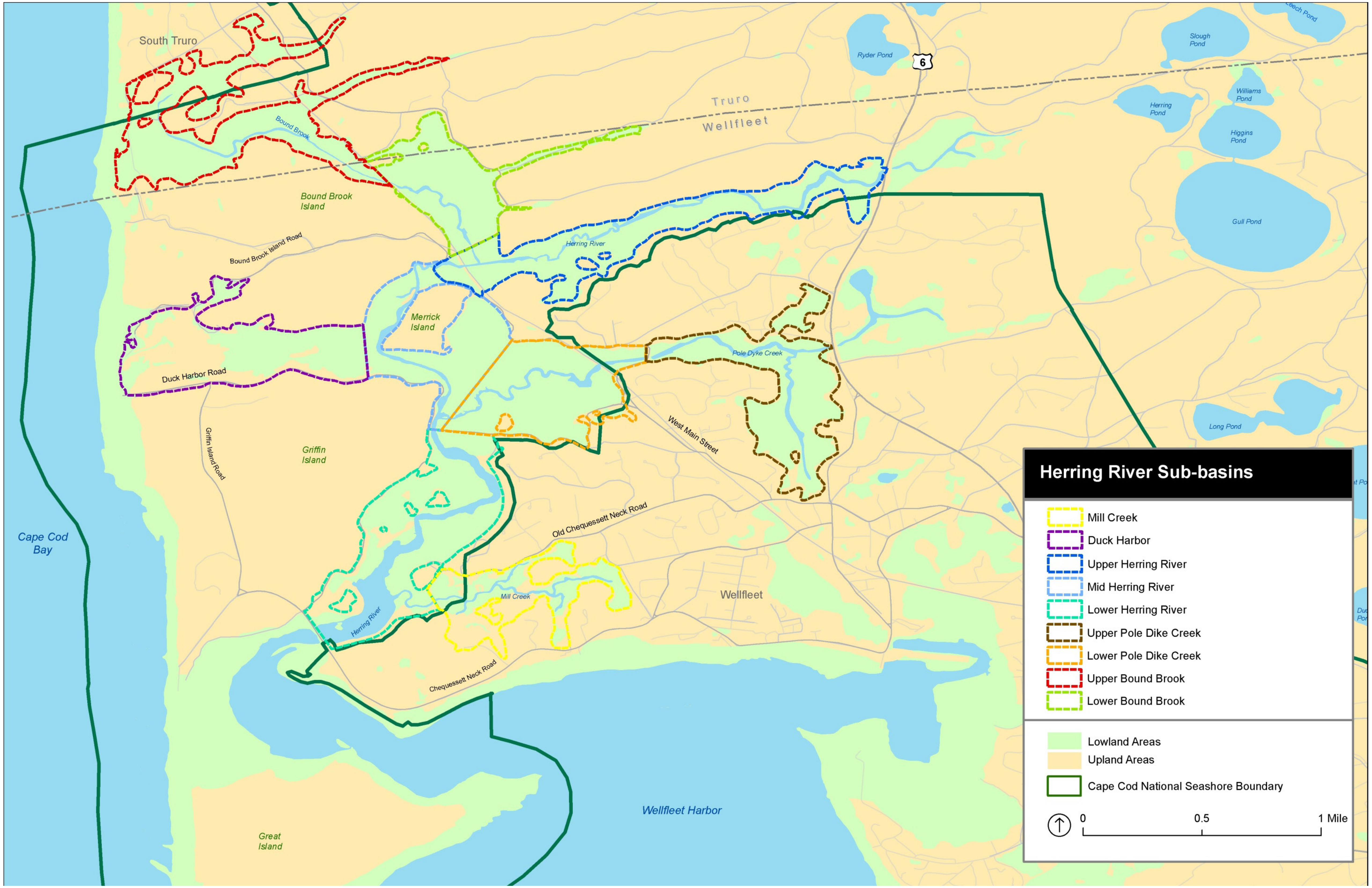


FIGURE 1-3: HERRING RIVER SUB-BASINS

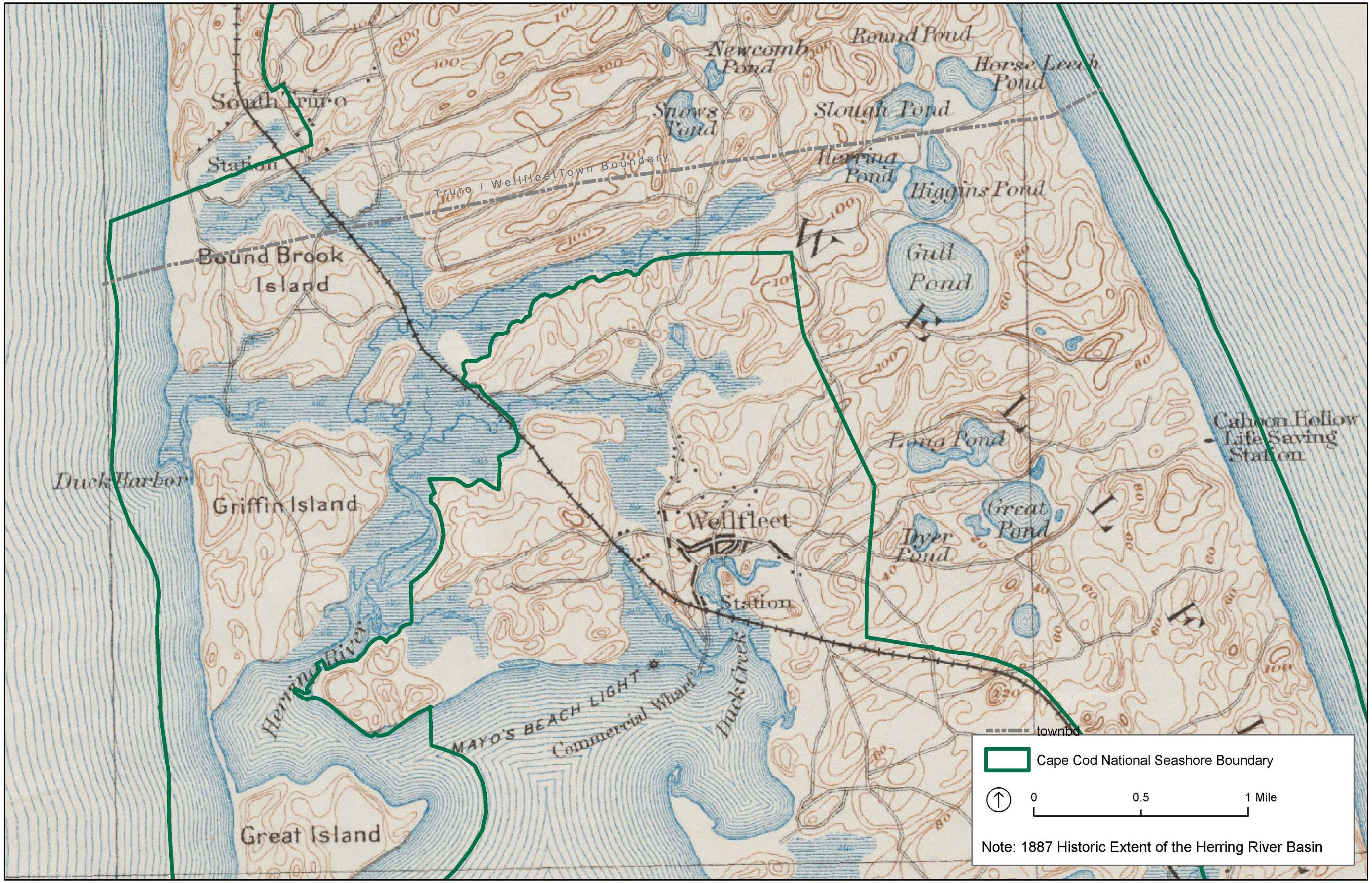


**Figure 1-4: Herring River Basin Historic Extent (circa 1887)**

Following dike reconstruction, tide height monitoring conducted by the Association to Preserve Cape Cod showed that the new tide gate opening was too small to achieve the tide heights prescribed in the Order of Conditions. Local fishermen complained that siltation had increased and shellfish had again declined upstream of the Chequessett Neck Road Dike. The Association to Preserve Cape Cod sought to have the tide gate opened to the height mandated in the Order of Conditions. In 1977, the State Attorney General ordered that control of the dike be transferred to the Department of Environmental Quality Engineering (now the Department of Environmental Protection, or MassDEP) so that increased tidal flow could be attained in the interest of restoration (HRTC 2007).

In 1980, a large die-off of American eel (*Anguilla rostrata*) and other fish focused attention on the poor water quality conditions in the Herring River. Massachusetts Division of Marine Fisheries and NPS scientists identified the cause of the fish kill to be high acidity and aluminum toxicity caused by diking and marsh drainage (Soukup and Portnoy 1986). Within a year of the eel kill, the NPS determined that the tide gate opening still did not provide the tide heights mandated in the 1973 Order of Conditions. Under continuing pressure from the Department of Environmental Quality Engineering and the Seashore, the town increased the tide gate opening to 20 inches in 1983. That same year, the Seashore scientists documented summertime dissolved oxygen depletions and river herring (*Alosa* spp.) kills for the first time (Portnoy 1991) and subsequently took steps to protect river herring and avert kills by blocking their emigration from upstream ponds to prevent the fish from entering low oxygen waters (HRTC 2007).

Despite these poor habitat conditions, concerns about tidal flooding of private properties and increased mosquito production prevented the town from opening the tide gate further. NPS mosquito breeding research conducted from 1981 to 1984 documented that although the principal mosquito species (*Ochlerotatus cantator* and *O. Canadensis*) were breeding abundantly in Herring River creeks and ditches, estuarine fish, which are important mosquito larvae predators, could not access mosquito breeding areas because of low tidal range, low salinity, and high acidity (Portnoy 1984a). In 1984, the town increased the sluice gate opening to 24 inches, where it has since remained (HRTC 2007).

In 1985, the Massachusetts Division of Marine Fisheries, in a program of intensified bacteriological sampling of shellfish waters, classified shellfish beds in the river mouth as "prohibited" due to fecal coliform contamination. In 2003, water quality problems caused the MassDEP to list Herring River as "impaired" under the federal Clean Water Act (CWA) Section 303(d) for low pH and high metal concentrations. More recently, NPS researchers identified bacterial contamination as another result of restricted tidal flow and reduced salinity (Portnoy and Allen 2006).

### 1.6.4 Expected Changes from Tidal Restoration

A restored tidal regime would provide diverse and interdependent changes in the Herring River estuary including the following:

- Higher average water levels in the estuary's wetlands (Spaulding and Grilli 2001), including the resaturation of hydric soils that have been drained by diking and ditches since 1909
- Lower low tides (Spaulding and Grilli 2001), which would improve basin drainage
- Reduced mosquito production by enhancing habitat quality for major predatory fish species, including mummichogs (*Fundulus heteroclitus*) and sticklebacks (*Gasterosteus* spp.) (Portnoy 1984b)

- Reversal of the chemical processes that have caused high acidity, mobilized toxic metals, and triggered fish kills (Portnoy and Giblin 1997b)
- Increased sediment transport and deposition onto the wetland surface, as flood tides would again overtop the river and creek banks and inundate the marsh surface, contributing to raising the surface elevation of the former tidal wetlands
- Dilution of high fecal coliform counts that have closed shellfish beds at the mouth of the Herring River (Portnoy and Allen 2006)
- Increased dissolved oxygen concentrations in the estuary by flooding the wetland twice each day with oxygen-rich Cape Cod Bay water
- Conversion of upland and woody vegetation that has invaded the flood plain and re-colonization of native tidal marsh plants and re-establishment of a gradient of community types including tidal, brackish, and freshwater marsh
- Enhanced canoe/kayak access throughout the estuary on higher tides through salt marsh habitat instead of through the presently drained shrub thicket
- Increase in extensive, abundant, and diverse marine and estuarine resources for observation, education, and harvest both within the estuary and in nearby coastal waters.

Figure 1-5 provides a graphic representation of the interacting components of an HRRP.

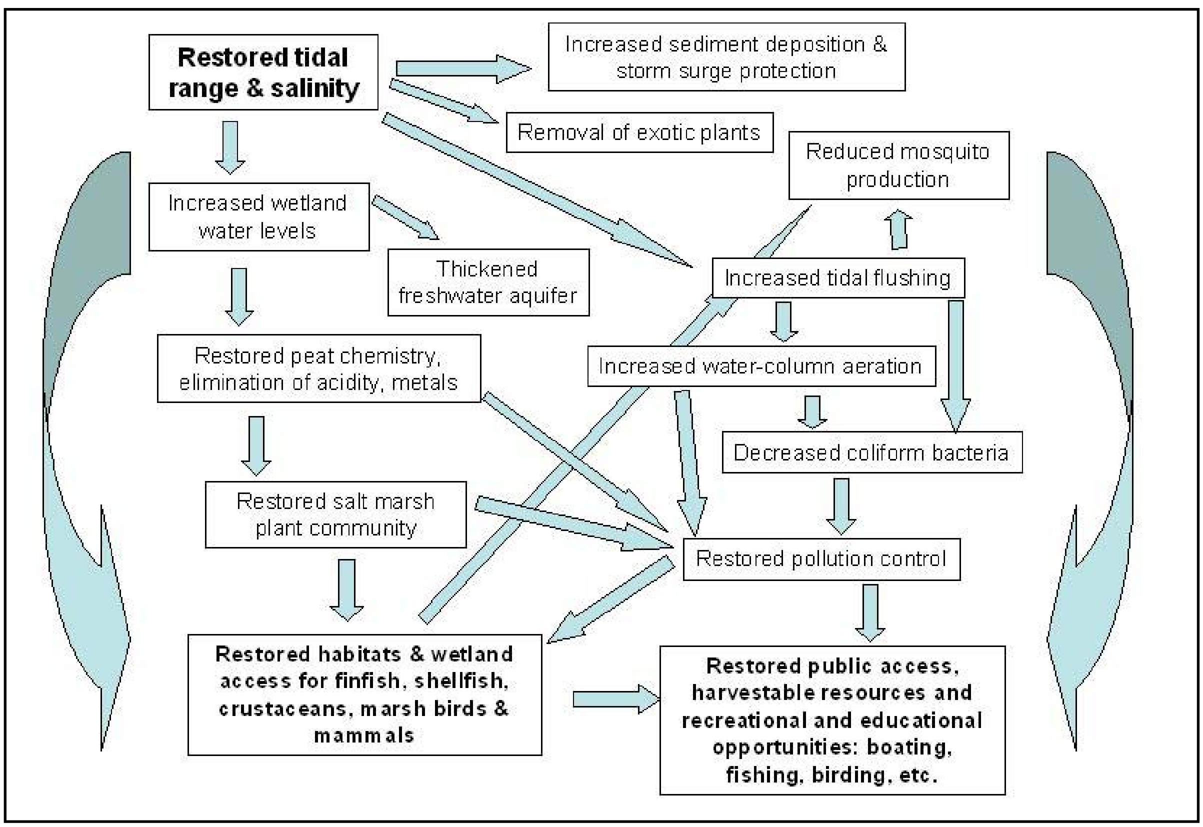


**FIGURE 1-5: RESTORATION PROCESSES CONCEPT DIAGRAM**

## 1.7 USE OF HYDRODYNAMIC MODELING TO DESCRIBE CURRENT CONDITIONS AND EXPECTED CHANGES

The Woods Hole Group was contracted by the Town of Wellfleet to develop a hydrodynamic model sufficiently flexible to integrate with the adaptive management approach, capable of simulating the complexities of the Herring River system. The model is central to developing a restoration plan, as it allows for the evaluation of specific questions about potential change to surface water elevations, flow velocities, salinity changes, and sediment processes in the estuary. Spatially variable, time-dependent predictions from the model have allowed for an assessment of flood and ebb patterns and have been used to identify potential areas of ponding or stagnation.

Specifically, the numerical modeling has been used to evaluate the goals for the restoration effort. Some of the modeling objectives include

- Prediction of restored water surface elevations and salinities
- Estimation of hydroperiod and wetting/drying of marsh surfaces
- Assessment of potential change in the water flow velocities and sedimentation patterns in the project area
- Assessment of impacts to low-lying properties and infrastructure.

Information on and results of the modeling process are included in “Chapter 2: Alternatives,” “Appendix B: Hydrodynamic Modeling Report,” and is discussed throughout the impacts analysis in “Chapter 4: Environmental Consequences.”

## 1.8 USE OF ADAPTIVE MANAGEMENT TO ACHIEVE DESIRED CONDITIONS

Adaptive management is an important tool for resource management. It is based on the assumption that current scientific knowledge is limited and a level of uncertainty exists. In 2007, the Department of the Interior released its *Adaptive Management Technical Guide*, defining the term and providing a clear process for building adaptive management processes into natural resource management (Williams, Szaro, and Shapiro 2007). In 2008, the Department of the Interior codified the definition in regulations stating that adaptive management is “a system of management practices based on clearly identified outcomes and monitoring to determine whether management actions are meeting desired outcomes; and, if not, facilitating management changes that will best ensure that outcomes are met or re-evaluated” (43 CFR 46.30). The Department regulations also direct its agencies to use adaptive management (43 CFR 46.145).

Since the early planning stages of the Herring River Restoration Project, reintroduction of tidal influence has been understood as a long-term, phased process that would occur over several years. Gradual opening of adjustable sluice gates would incrementally increase the tidal range in the river. The primary reasons to implement the project in this manner are to avoid unexpected or sudden irreversible changes to the river and Wellfleet Harbor and to allow monitoring of the system so that unexpected and/or undesirable responses could be detected and appropriate remedial actions taken. In addition to the uncertainty, size, and complexity of the proposed project, other aspects of the project also dictate use of an adaptive management approach. Among these are a large and divergent group of stakeholders, multiple and potentially conflicting objectives, and the need for phased and recurrent decisions. More information on the adaptive management approach to restoration of the

Herring River estuary can be found in "Chapter 2: Alternatives" and "Appendix C: Overview of the Adaptive Management Process for the Herring River Restoration Project."

## 1.9 SCOPING PROCESS AND PUBLIC PARTICIPATION

NEPA and MEPA regulations require an early and open process for determining the scope of issues to be addressed in the draft EIS/EIR. Scoping is used to define the purpose and need of the project; identify issues to be analyzed and eliminate issues that are not relevant; allocate assignments among interdisciplinary team members and participating agencies; identify relationships to other planning efforts or documents; identify additional permits, surveys, or consultations required by other agencies; and define a time schedule for document preparation and decision-making. Scoping is conducted both internally, with appropriate subject matter experts and with agency managers having legal jurisdiction or special expertise, and externally with interested and affected organizations and the public.

### 1.9.1 HERRING RIVER TECHNICAL COMMITTEE

Over the past several years, local, state, and federal partners and non-governmental organizations have expressed growing support for restoring the Herring River estuary. The process has not only encompassed many years of scientific and engineering investigations but also has included a public review process to ensure that all concerns and interests are recognized and considered.

Because the Town of Wellfleet owns the Chequessett Neck Road Dike and the Seashore manages roughly 80 percent of the Herring River flood plain, these two parties have been at the forefront of restoration planning. In August 2005, the two parties formally agreed to work together to restore the Herring River by signing a Memorandum of Understanding (MOU) that established a "process and framework that will determine whether a restoration of the Herring River is feasible and subsequently to develop a conceptual plan of the restoration goals and objectives to meet stakeholder needs should restoration be deemed appropriate." Prior to signing the MOU, in January 2005, the Town of Wellfleet Board of Selectmen agreed "…in principle to the fact that restoring the Herring River salt marsh will be beneficial to the public interests and the environment and is a project worth proceeding with, with the caveat that a MOU is signed between the NPS and the Town of Wellfleet and the development of a comprehensive restoration plan and filing for permits to [*sic*] proceed" (HRTC 2007).

The MOU called for a technical committee and a stakeholder group and provided criteria for the composition of both groups and their intended functions. The Board of Selectmen designated the HRTC to include representatives from the Seashore and the Massachusetts Coastal Zone Management's Wetland Restoration Program, plus representatives from the following local commissions and boards/agencies: Wellfleet Conservation and Health Agent, Wellfleet Open Space Committee, Wellfleet Shellfish Advisory Committee, Wellfleet Shellfish Constable, Wellfleet Herring Warden, Wellfleet Natural Resource Advisory Committee, CYCC, Town of Truro Selectmen, USFWS, NRCS, Cape Cod Cooperative Extension Service, NOAA Restoration Center, Barnstable County Health Department, and the Herring River Stakeholders Group Chair.

The Board of Selectmen further directed the HRTC to review and summarize the scientific and technical information on the Herring River system, consider community concerns, submit recommendations to the Board of Selectmen about the feasibility of restoring the system, and develop a CRP if appropriate. The HRTC formed subcommittees to address specific concerns about the restoration process, and each subcommittee produced reports summarizing the issues. Public involvement throughout the process included (1) attendance at HRTC meetings; (2) public presentations by HRTC members; and, (3) participation in the Herring River Stakeholder Group. The stakeholder group was composed of representatives from the towns and the Seashore, potentially affected landowners, the shellfish/fishing community, Cape Cod Mosquito Control Project, Massachusetts Division of Marine Fisheries, the NOAA, and the NRCS. The Board charged the group with communicating the public's interests and concerns to the HRTC.

In January 2006, the HRTC produced a "Full Report of the Herring River Technical Committee" which summarized their findings and recommended,

> . . .tidal restoration of the Herring River Salt marsh [*sic*] is feasible and will provide numerous and substantial public benefits. As outlined in the Technical Committee's Synopsis, significant improvements in water quality would provide subsequent public health, recreational, environmental, and economic benefits. Our recommendation includes a new structure capable of full tidal restoration. The new structure should incorporate controlled gates to provide incremental increases in tidal exchange. This would allow for well thought-out management, supervision, monitoring, and evaluation.

As the MOU directed, the HRTC's findings led to a CRP (HRTC 2007) which described several possible ways to restore the Herring River. On November 13, 2007, the Seashore and Wellfleet and Truro signed a second MOU accepting the CRP and agreeing to move forward with a detailed restoration plan, which is the subject of this draft EIS/EIR. Having completed its work, the Board dissolved the HRTC in 2007. The second MOU established a new committee, the HRRC. In addition to Wellfleet, Truro, and Cape Cod National Seashore, the HRRC is composed of representatives from the USFWS, Massachusetts Division of Ecological Restoration (formerly Coastal Zone Management's Wetland Restoration Program), NOAA Restoration Center, and the NRCS. The HRRC also has the authority to solicit input from additional technical experts as it develops a detailed restoration plan.

As part of the restoration effort, the HRTC obtained funding from a NOAA-Gulf of Maine Council restoration partnership grant to develop a comprehensive hydrodynamic model that could be used to assess existing conditions within the estuarine system, as well as evaluate a range of alternatives and their potential impacts (WHG 2009). The Woods Hole Group was contracted by the Town of Wellfleet to identify and develop the hydrodynamic model for the Herring River system (see "Section 1.7: Use of Hydrodynamic Modeling to Describe Current Conditions and Expected Changes").

### 1.9.2 PUBLIC SCOPING

Two public scoping meetings (one held in August and one held in September 2008) in Wellfleet gave the public the opportunity to learn about the planning process and provide input. Both meetings were open-house style sessions with short presentations that allowed the public to ask Seashore staff and HRRC members questions and provide input in an informal atmosphere. NPS representatives at the meeting recorded public comments. Following the meeting, a 60-day comment period gave the public the opportunity to submit additional comments through the mail or on-line through the NPS Planning, Environment, and Public Comment (PEPC) website.

Forty-two items of correspondence containing 288 separate comments were received during the public comment period. Topics raised by the public and agencies ranged widely – from concerns about impacts to private lands to compliance with state and local permitting requirements. A summary of the issues identified during public scoping is provided later in this chapter. A more detailed description of the issues is presented in “Chapter 5: Consultation, Coordination, and Regulatory Compliance.”

# 1.10 IMPACT TOPICS

Seashore staff, Wellfleet and Truro, members of the HRRC, and the public identified impact topics associated with tidal restoration in the Herring River. The impact topics provide the organizational structure for the description of the affected environment in chapter 3 and the analysis of environmental consequences in chapter 4 of this draft EIS/EIR.

## 1.10.1 SALINITY OF SURFACE WATERS

**Salinity**—Changes in the Herring River system would be driven primarily by increased tidal exchange and increased salinity levels. Species occurrence and distribution would depend on the salinity concentrations throughout the flood plain. Vegetation in areas subject to frequent tidal inundation would be expected to die out, allowing colonization of tidal marsh species. In addition, support for estuarine fauna would also depend on salinity concentrations and water depths.

## 1.10.2 WATER AND SEDIMENT QUALITY

**Surface Water Quality in the Estuary**—One of the more important hydrologic functions of tidal flushing and wetlands is water quality improvement. Degraded water quality conditions led the MassDEP to list the Herring River as “impaired” under the federal C Section 303(d) for low pH and high metal concentrations. Poor water quality in the river has also led to fish kills and closure of shellfish beds at the river’s mouth. Water quality parameters to be addressed in this draft EIS/EIR include the following:

- Dissolved oxygen—necessary to support fish and other aquatic animals
- pH—appropriate acidity range is needed to support the chemical processes required for nutrient cycling, waste processing, and to support aquatic animals
- Nutrients—balanced concentrations of nitrogen and phosphorus are important to support vegetation and the growth of algae
- Fecal coliform—increased tidal flushing would reduce these concentrations and improve water quality.

**Surface Water Quality in Receiving Waters**—The tidal flats of Wellfleet Harbor include the largest and some of the most productive shellfish aquaculture grants in the state. Protection of aquaculture interests is critical. Potential changes in water quality and sedimentation from increased tidal exchange between Wellfleet Harbor and the Herring River are a concern for restoration advocates, the Town of Wellfleet, and shellfish growers.

**Acidification**—Sudden reintroduction of salt water to diked salt marsh could potentially mobilize sulfides and nutrients into the system, inhibiting the recolonization of salt marsh vegetation. Gradual re-establishment of tidal range would resaturate wetland soils that were drained by diking, and over time reverse the chemical processes that have caused high acidity and triggered fish kills in receiving waters (Portnoy and Giblin 1997b). Restoration of the estuary would also improve flushing and eventually reduce or eliminate problematic acidity in the estuary.

**Metal Mobilization**—Tidal restoration would resaturate wetland soils with salt water and reverse the chemical processes that have mobilized toxic metals into the water column (Portnoy and Giblin 1997b).

### 1.10.3 SEDIMENT TRANSPORT AND SOILS

**Sedimentation on Tidal Marshes**—Much of the tidal marsh plain of the Herring River upstream of the dike has subsided up to 3 feet below its pre-dike elevation and below the surface of existing salt marsh seaward of the dike. If the elevation of the subsided wetland does not increase as tidal range is increased, the root zone would remain waterlogged throughout the tidal cycle, discouraging re-establishment of tidal marsh plants. Restored tidal range would lead to higher sediment transport and deposition onto the wetland surface, as sediment-carrying flood tides would again flood over creek banks and onto the marsh platform.

### 1.10.4 WETLAND HABITATS AND VEGETATION

**Wetland Transition**—Wetlands in the project area would change from degraded habitats influenced by freshwater to tidal marsh habitats influenced by varying degrees of salt water. Increased tidal range would restore an estuarine salinity gradient and allow for colonization of native tidal marsh plants.

**Submerged Aquatic Vegetation**—Reintroduction of tides into the Herring River flood plain may affect two important submerged aquatic vegetation species. The occurrence and distribution and widgeon grass (*Ruppia maritima*), which currently is found throughout the project area, would likely be affected by restored tidal flow and salinity, with an increase in coverage and biomass in high salinity areas and a general migration toward brackish areas. Eelgrass (*Zostera marina*), which is currently not found in the Herring River, could become re-established in higher salinity areas if suitable water quality and soil substrate conditions develop. With increased salinity, *Zostera* may be introduced to the Lower Herring River basin and has the potential to co-exist with *Ruppia*.

### 1.10.5 AQUATIC SPECIES

**Estuarine Fish**—Degraded water quality conditions have limited fish habitat diversity and abundance in the Herring River estuary (Roman 1987; Roman, Garvine, and Portnoy 1995). As demonstrated during the 1960s and early 1970s when poorly functioning tide gates allowed modest tidal exchange into the river, the benefits to estuarine species, such as mummichog, striped killifish, and Atlantic silverside, would occur quickly and persist in the long term by restoring habitat and a connection with the marine environment. Improved water quality and increased salinity would also increase the extent and value of the Herring River as a nursery for estuarine fish species.

**Anadromous and Catadromous Fish**—The Herring River system provides migratory and spawning habitat for two species of river herring (*Alosa aestivalis* and *A. pseudoharengus*) and American eel. As demonstrated during the 1960s and early 1970s when poorly functioning tide gates allowed modest tidal exchange into the river, restoration of tidal conditions would both improve the estuarine habitat conditions necessary to support these species and improve access to spawning ponds at the headwaters of the system.

**Shellfish and other Invertebrates**—Shellfish were once widely distributed in the Herring River estuary. As a result of diking, which reduced salinity and pH, shellfish species are now found only a short distance upstream of the dike or are completely absent from this area. As demonstrated during the 1960s and early 1970s when poorly functioning tide gates allowed modest tidal exchange into the river, restoring tidal flows and improving water quality would increase habitat for shellfish and other invertebrates.

### 1.10.6 State-listed Rare, Threatened, and Endangered Species

**State-listed Rare, Threatened, and Endangered Species**—Restoration of the Herring River estuary could impact several state-listed species and their habitats in the estuary, although not all impacts would be adverse. For marine or salt-tolerant species, such as diamondback terrapin (*Malaclemys terrapin*) and salt reedgrass (*Spartina cynosuroides*), tidal restoration would likely restore additional habitat. Changes in vegetation types could cause populations of eastern box turtle (*Terrapene c. carolina*) and water-willow stem borer (*Papaipema sulphurata*), species that rely on freshwater and upland habitats, to shift their range and move to adjacent habitat. Available nesting habitat for northern harrier (*Circus cyaneus*), primarily cat-tail dominated wetlands, could be affected by restored tidal exchange, but would likely remain unchanged. Foraging habitat for harriers would be improved with restored salt marsh. Four-toed salamander (*Hemidactylium scutatum*) and spotted turtle (*Clemmys guttata*), both found in the Herring River flood plain, were de-listed in 2008 and 2006 respectively. Several listed freshwater marsh bird species that may occur in the flood plain, including American bittern (*Botaurus lentiginosus*) and several rail species (*Rallus* spp.), could also be affected.

### 1.10.7 Terrestrial Wildlife

**Birds**—Species common to shrub thickets and freshwater habitat likely increased in the Herring River flood plain as conditions changed due to the tidal restriction. These include red-winged blackbird, song sparrow, prairie warbler, common yellowthroat, eastern towhee, and grey catbird. Many of these species are abundant nesters elsewhere on Cape Cod and southeastern Massachusetts (Veit and Peterson 1993). Tidal restoration would eventually alter habitat conditions for some of these species and may cause them to shift to appropriate habitats upstream in the Herring River system.

Several high priority tidal creek and salt marsh-dependent species such as salt marsh sharp-tailed sparrow (*Ammodramus caudacutus*), willet (*Tringa semipalmata*), American black duck (*Anas rubripes*) (especially in winter), common and roseate tern (*Sterna hirundo* and *dougallii*), and several species of shorebirds and wading birds (USFWS 2006) are expected to benefit from restoration of nesting (*Spartina* dominated habitat) and/or foraging opportunities (primarily estuarine fish). Other species, such as osprey (*Pandion haliaetus*), belted kingfisher (*Megaceryle alcyon*), and marsh wren (*Cistothorus palustris*) likely, will benefit from the restoration of foraging habitat.

**Mammals**—Small mammals, such as mice, voles, and shrews are abundant in the Herring River estuary. Larger mammals, such as coyotes (*Canis latrans*), river otters (*Lontra canadensis*), raccoons (*Procyon lotor*), muskrat (*Ondatra zibethicus*) and white-tailed deer (*Odocoileus virginianus*) also use the flood plain. The most common group of mammals found in marsh habitats are rodents, such as the meadow vole (*Microtus pennsylvanicus*), which are an important prey-species for northern harriers and other raptors. Other common mammals include red fox (*Vulpes vulpes*), opossum (*Didelphis virginiana*), skunk (*Mephitis mephitis*), and chipmunk (*Tamias striatus*) (Smith 1997).

Most mammals in the area are generalists, highly adaptable, and likely to move to adjacent habitat that is unaffected by tidal restoration (Smith 1997). However, mammals inhabiting the areas around the project sites may experience disturbances from construction activities associated with the project. Because concerns about these potential impacts were raised during initial public scoping, mammals are analyzed in detail in "Chapter 4: Environmental Consequences."

**Reptiles and Amphibians**—In addition to the previously cited state-listed rare species, other common species of reptiles and amphibians – notably, spotted turtle (*Clemmys guttata*), snapping turtle (*Chelydra serpentine*), green frog (*Rana clamitans melanota*), pickerel frog (*Rana palustris*), Fowler's toad (*Bufo woodhousii fowleri*), spring peeper (*Pseudacris crucifer*), and spotted salamander (*Ambystoma maculatum*) – use the existing habitats in the Herring River flood plain, despite the likely impact on these populations from low pH and poor water quality. As with mammals, tidal restoration is expected to affect reptile and amphibian species as habitats transition and the populations migrate to suitable habitat. Because concerns about these potential impacts were raised during initial public scoping, reptiles and amphibians are analyzed in detail in "Chapter 4: Environmental Consequences."

### 1.10.8 Cultural Resources

**Archaeological Resources**—Restoration of the Herring River estuary could impact pre-contact and post-contact archeological sites, primarily associated with construction activities, as well as any other ground-disturbing activities, including borrow or construction staging areas. According to an archaeological reconnaissance report completed for the Massachusetts Wetlands Restoration Program (LBG 2007) and a Phase IA Archeological Assessment (Herbster and Heitert 2011), there are numerous archeological sites around the project area. These sites are located in areas both above and below potential tidal inundation. Native American -pre-contact resources have the greatest potential to occur near shorelines, where natural resources would have been gathered and processed. Post-contact sites could include the remains of wharves, docks, mills, saltworks, and the Old Colony Railroad (Herbster and Heitert 2011).

**Historic Structures**—Although there are no listed historic structures in the Herring River estuary, a dike was located across Mill Creek near the confluence with the Herring River likely as part of a historical gristmill. Some low-lying structures may need further evaluation for historic significance.

### 1.10.9 Socioeconomics

**Nuisance Mosquitoes**—Conditions created over the past 100 years have increased mosquito breeding, despite the original intent to reduce nuisance mosquitoes by diking and draining the estuary. Tidal restoration is expected to improve drainage and reduce stagnant, freshwater breeding sites, but the potential that restoration could increase, rather than decrease, nuisance mosquitoes is nonetheless a concern of the surrounding communities. Nuisance mosquitoes are therefore retained for detailed analysis.

**Shellfishing**—Many people currently harvest shellfish commercially in Wellfleet Harbor, and oysters and softshell clams were once widely distributed in the Herring River estuary. As a result of diking, which reduced salinity and pH, oysters are now found only a short distance upstream of the dike. Due to poor tidal flushing and consequently high levels of fecal coliform bacteria in water exiting the river, the Division of Marine Fisheries has prohibited shellfishing and shellfish propagation in all areas upstream of the Chequessett Neck Road Dike, and at least 3,000 feet downstream of the dike depending on the season and rainfall. Research suggests that tidal flushing would substantially reduce fecal coliform concentrations in presently closed areas through dilution and increased salinity (Portnoy and Allen 2006).

**Finfishing**—The Herring River provides important spawning, nursery, and foraging habitat for many migratory and resident fish. Historically, the Herring River was heavily used by local residents for recreational and subsistence fishing. Sport fish found in the Herring River include estuarine and marine species such as striped bass (*Morone saxatilis*), white perch (*Morone americana*), Atlantic mackerel (*Scomber scombrus*), bluefish (*Pomatomus saltatrix*), and winter flounder (*Pseudopleuronectes americanus*), as well as freshwater species such as chain pickerel (*Esox niger*) and pumpkinseed (*Lepomis gibbosus*). Restored salinities would greatly increase fishing opportunities for estuarine species. Diking and drainage have degraded water quality and greatly reduced the extent and quality of fish habitat (Portnoy, Roman, and Soukup 1987). Improving water quality by restoring natural tidal flushing and increasing both upstream and downstream movement of fish would improve recreational finfishing opportunities.

**Low-Lying Properties**— Without additional flood controls, tidal restoration would impact some low-lying properties. Since the dike was constructed at Chequessett Neck, houses have been built in locations that may not be permittable under current regulations. Potentially affected features include buildings, driveways, wells, septic systems, lawns, and gardens. Protecting these properties is a critical part of all action alternatives. Flood protection will be realized on a site-specific basis incorporating measures appropriate for individual properties. The CYCC is the primary landowner in the Mill Creek sub-basin, occupying approximately 106 acres of upland and former tidal wetlands. The majority of this acreage is a nine-hole golf course built in 1929, a considerable portion of which was built directly on drained former salt marsh. Under all action alternatives, most high tides would inundate low portions of the course unless flood protection measures are implemented.

**Low-Lying Roads**—Several road segments, primarily at stream crossings, are vulnerable to restored tidal flooding, most notably along High Toss, Pole Dike, Bound Brook, and Old County Roads. Hydrodynamic modeling has confirmed the susceptibility of these roads to high tide heights as low as approximately 2.5 feet. In addition to the long-term disposition of low-lying roads, this draft EIS/EIR also considers ways to maintain temporary vehicle access and emergency routes during the construction phases of the project.

**Viewscapes**—Changes to the Herring River and its flood plain would result in changes to the viewscape currently offered to residents and visitors. Increasing the availability to view dynamic water environments such as open water and tidal wetlands would likely have impacts on property value associated with views of the river and tidal marsh. Since there is a potential to impact viewscapes, it is retained for analysis.

**Recreational Experience and Public Access**— The Herring River flood plain provides numerous recreational opportunities to local residents and visitors such as recreational finfishing and shellfishing, boating, wildlife watching, and hunting. The action alternatives may impact some of these activities by altering points of access to the estuary or by affecting the quality of recreation experiences.

**Regional Economic Conditions**—The restoration of the Herring River estuary would have local and regional impacts to economics such as projected employment in construction and other services necessary for restoration activities. Given the direct and indirect correlation between restoration activities and employment and spending, this topic is retained for analysis.

## 1.11 IMPACT TOPICS CONSIDERED BUT DISMISSED FROM FURTHER CONSIDERATION

The following impact topics were dismissed from further analysis, as explained in the following sections.

### 1.11.1 FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

The Endangered Species Act of 1973 provides legal protection for federally listed endangered and threatened species, as well as those species proposed for listing under the Act. A search of the USFWS database did not identify any listed species, species proposed for listing, or candidate species for listing occurring in the project area. Thus, this topic was not retained for analysis.

### 1.11.2 AIR QUALITY

The Seashore is classified as a Class II area under the Clean Air Act of 1973. The Seashore is within a non-attainment area (that includes the entire Commonwealth of Massachusetts) for ozone. During construction activities, air pollutants associated with burning of fossil fuels ($CO_2$, $NO_x$, $SO_x$) and fugitive dust would be generated by construction equipment and activities. It is not anticipated that these emissions would result in measurable changes to air quality because equipment would be operated only during daylight hours, idling time would be limited under standard NPS resource protection measures, and the project area is subject to coastal winds.

In addition, tidal restoration may result in increased limited amounts of hydrogen sulfide. Hydrogen sulfide (or $H_2S$) is a colorless gas with the characteristic odor of rotten eggs at concentrations up to 100 parts per million. It is the product of bacterial breakdown of organic matter in the absence of oxygen, such as in swamps and sewers; a process known as anaerobic digestion. It also occurs in natural gas, and some well waters. Hydrogen sulfide is detectable by humans at 0.47 parts per million and toxic at concentrations greater than 10 parts per million.

According to Portnoy and Giblin (1997a, 1997b), reintroducing seawater to diked marshes will cause hydrogen sulfide concentrations to increase as freshwater vegetation dies and the chemistry of underlying peat soils change. In the Herring River system, gradual reintroduction of seawater, coupled with availability of iron (ferrous) ions and resource monitoring, are expected to limit production of hydrogen sulfide. However, there is the potential for adjacent landowners and visitors to notice a “rotten egg” odor during the adaptive management phase of the restoration effort. Because the project area is subject to coastal winds, it is not expected that the limited releases of hydrogen sulfide gas would result in concentrations high enough to result in a considerable nuisance.

Any impact to air quality from implementing the project would be limited to small amounts of fugitive dust, emissions from construction vehicles, or production of hydrogen sulfide gas and would only be temporary in nature. Therefore, air quality was dismissed as an impact topic.

### 1.11.3 GROUNDWATER RESOURCES

The coastal aquifer system within the project area consists principally of a freshwater lens, known as the Chequessett Flow Lens. It consists of two principal lobes, each comprising a groundwater “mound,” separated by the Herring River (Masterson and Portnoy 2005). The lens is recharged through precipitation, which percolates to the water table. The mound of the lens reaches a maximum elevation of approximately 9 feet and fluctuates seasonally. Of the total estimated discharge of 24.2 million gallons per day (gpd) from the Chequessett Flow Lens, approximately half discharges to the Herring River system. Studies (Fitterman and Dennehy 1991) characterized freshwater lens thickness at residential well locations of approximately 42 to 95 feet.

Groundwater withdrawals affecting the project area are comprised of pumping of private and public water supply and irrigation wells located throughout developed areas. Recent studies (Martin 2007;

WHG 2009) focusing on identifying residential wells within low-lying portions of the project area have identified several within the 100-year flood plain of the Herring River. The public water supply in closest proximity to the project area is that of the CYCC (Massachusetts Public Water Supply No. 4318071), a non-community water system.

Because no new residential or commercial development is proposed under the actions proposed in this draft EIS/EIR, there would be no changes to withdrawals from the Chequessett Flow Lens or disturbance to the natural precipitation recharge mechanism. Recent studies by the NPS (Martin 2007; Martin 2004) have shown that tidal restoration will deepen the freshwater-saltwater interface in the groundwater and would not affect most wells in the project area. However, a few domestic wells currently located within or very near the Herring River flood plain could be affected by the project. These impacts are described in "Chapter 4: Environmental Consequences."

### 1.11.4 Health and Human Safety

Currently, fishing is permitted from the Chequessett Neck Road Dike, with no visible posted warning or hazard signs. As part of any design implemented for restoration of the Herring River estuary, areas of high velocity flows and other potential hazards would be identified, marked with warning notices, or periodically or permanently closed to public entry (depending on the nature of the hazard). For example, the new tidal conveyance at Chequessett Neck Road Dike may have warning/avoidance signs posted, marked with buoys or other marine marks, or chained/roped off to prevent entry near the sluice gates. Low-lying roads that may be temporarily inundated would be signed to protect the safety of travelers and their vehicles. Ongoing coordination with agencies and local government officials will continue once culvert designs are advanced. Because safety issues would be addressed under all proposed action alternatives, this topic is not carried forward for separate analysis.

### 1.11.5 Operations and Management of Tide-Control Structures

Following completion of the NEPA process for this project, the selected alternative will be moved forward for further design and implementation planning. Once the desired tidal inundation levels are established, through public and agency input and environmental impact analysis, more specific structural and operational characteristics of the dike(s), necessary roadwork, and resource protection measures can be developed. The permitting process, adaptive management and environmental monitoring process will be used to develop the operations and management plan. The operations and maintenance plan will specify how structures and water levels will be managed throughout the several years-long restoration process and will identify responsible management parties and oversight agencies. Because design details have not been determined, and proposed infrastructure would likely be owned and managed by a variety of entities (Wellfleet or the NPS), the range of responsibilities and responsible parties has not yet been identified. As implementation of the proposed project approaches the HRRC, Towns of Wellfleet and Truro, and NPS will work together to develop an operations and management plan and any associated binding legal agreements. Given the degree of information yet unknown about the long-term management of infrastructure components, this topic is not carried forward for full analysis.

### 1.11.6 Soundscape

In accordance with NPS *Management Policies 2006* and NPS Director's Order 47: Soundscape Preservation and Noise Management, an important part of the NPS mission is preservation of natural soundscapes associated with parks. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in park units, together with the physical capacity for transmitting natural sounds. The frequencies, magnitudes, and durations of human-caused sound considered acceptable varies, being generally greater in developed areas and less in undeveloped areas. Some increased recreational (i.e., canoeing/kayaking, fishing, shellfishing, and nature observing) and commercial (i.e., shellfishing) use of the Herring River estuary would be expected as a result of tidal restoration. These activities would result in some level of human-generated noise, but these levels are generally unobtrusive with little anticipated impact on wildlife and visitor enjoyment. Hauling material, operating equipment, and other activities associated with reconstruction/construction of dike structures could result in dissonant, human-caused sounds. However, any noise caused by construction activities would be temporary and limited in area; thus long-term or more than minor adverse impacts are not expected, and soundscapes is dismissed as an impact topic.

### 1.11.7 PRIME AND UNIQUE FARMLANDS

Prime farmlands have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Unique farmlands are defined as land other than prime farmland used for production of specific, high-value food and fiber crops. Both categories require the land be available for farming uses (CEQ 1980). Lands within the project area do not include designated prime farmland, nor are they available for farming. Therefore, they do not meet these definitions. This impact topic was dismissed from further consideration.

### 1.11.8 CULTURAL LANDSCAPES

According to the NPS Director's Order 28: Cultural Resource Management, a cultural landscape is a reflection of human adaptation and use of natural resources. It is often expressed in the way land is organized and divided, settlement patterns, land use, circulation systems, and the types of structures built. Themes and context define eligibility for the National Register of Historic Places (National Register), but cultural landscapes define physical settings where cultural and natural resources are managed together. There are several cultural landscapes within the Seashore boundary. Of the known historic districts, only the Atwood-Higgins Historic District is located in proximity to the proposed tidal restoration project area. None of the significant resources within the district are within or immediately adjacent to the estuary. Therefore, cultural landscapes is dismissed as an impact topic.

### 1.11.9 ETHNOGRAPHIC RESOURCES

Ethnographic resources are defined as "cultural and natural features . . . that are of traditional significance to traditionally associated peoples" (NPS 2006). At present, no discrete traditional cultural properties or ethnographic groups have been identified at Cape Cod National Seashore. Consultation with the Wampanoag Tribes of Gay Head-Aquinnah and Mashpee is being conducted by the NPS to identify ethnographic resources within the Herring River estuary. In addition, the HRRC has initiated consultation with the Massachusetts Historic Commission, with the submission of a Project Notification Form, and tribal interests. A representative of the Mashpee Wampanoag Tribe was invited to and attended a public meeting regarding the project in April 2011. The primary area of concern for the Mashpee Wampanoag within the project area is the uplands of the CYCC, which have been identified as archeologically sensitive for pre-contact sites.

### 1.11.10 MUSEUM COLLECTIONS

NPS *Management Policies 2006*, NPS Director's Order 28: Cultural Resource Management Guidelines, and NPS Director's Order 77-2: Floodplain Management require irreplaceable museum items, archival materials, photographs, natural and cultural specimens, artifacts, and other collections within the park be protected from threats by natural physical processes. Although the proposed action may result in the excavation and recovery of artifact collections from park land, the volume of these collections is expected to be minimal and should have no impact on the park museum collection; therefore, this topic was dismissed from further evaluation.

### 1.11.11 Indian Trust Resources and Sacred Sites

The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights. No formerly established or recognized Indian trust resources or sacred sites have been identified at in or near the project area, and this impact topic was dismissed from further consideration.

### 1.11.12 Minority and Low Income Populations, including Environmental Justice

Executive Order: 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high or adverse human health or environmental impacts of their programs and policies on minorities and low-income populations and communities. Guidelines for implementing this executive order under NEPA are provided by the Council on Environmental Quality (CEQ) (CEQ 1997). According to the USEPA, environmental justice is defined as

> The fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies. The goal of this "fair treatment" is not to shift risks among populations, but to identify potentially disproportionately high and adverse effects and identify alternatives that may mitigate these impacts (USEPA 1998).

There are minority and low-income populations in the general vicinity of the Seashore. However, environmental justice was dismissed as an impact topic for the following reasons:

- NPS and HRRC staff actively solicited public participation as part of the planning process and gave equal consideration to input from all persons, regardless of age, race, income status, or other socioeconomic or demographic factors;
- Impacts associated with the construction and operation of the proposed project would not disproportionately affect any U.S. minority and/or low-income populations or communities;
- Implementation of the proposed project would not result in adverse impacts specific to minority and/or low-income populations or communities; and
- NPS and HRRC staff do not anticipate adverse impacts on public health and safety or the human environment that would fall appreciably more severely, or result in disproportionately high and adverse impacts, to minority and/or low-income populations or communities in the area.
- No minority populations within the Census Tracts, or residing within 10 miles of the Town of Wellfleet, would be directly impacted by this project (see table 1-1) (U.S. Census 2010).

**TABLE 1-1: MINORITY AND LOW INCOME POPULATIONS IN THE VICINITY OF THE HERRING RIVER RESTORATION PROJECT AREA (2010)**

| Census Tracts within Barnstable County, Massachusetts | Census Tract 101 | Census Tract 102.06 | Census Tract 102.08 | Census Tract 103.04 | Census Tract 103.06 | Census Tract 105 |
|---|---|---|---|---|---|---|
| Total Population | 3,039 | 2,946 | 1,831 | 2,522 | 2,538 | 2,900 |
| Hispanic or Latino (of any race) | 1% | 0% | 0% | 1% | 5% | 0% |
| Non-Hispanic, White alone | 97% | 98% | 99% | 95% | 94% | 98% |
| Non-Hispanic, Black or African American alone | 1% | 0% | 0% | 0% | 0% | 0% |
| Non-Hispanic, American Indian and Alaska Native alone | 0% | 0% | 1% | 0% | 0% | 0% |
| Non-Hispanic, Asian alone | 0% | 0% | 0% | 4% | 1% | 2% |
| Non-Hispanic, Native Hawaiian and Other Pacific Islander alone | 0% | 0% | 0% | 0% | 0% | 0% |
| Non-Hispanic, Some other race alone | 0% | 0% | 0% | 0% | 0% | 0% |
| Non-Hispanic, Two or more races | 2% | 2% | 0% | 0% | 0% | 0% |
| Percentage of Total Population Living at or Below the Poverty Level | 8.8% | 4.2% | 8.4% | 5.0% | 6.5% | 3.0% |

Source: U.S. Census Bureau 2010

### 1.11.13 ENERGY RESOURCES

Construction and long-term management of the tidal control structures proposed for the restoration of the Herring River flood plain would require the use of non-renewable energy resources. Construction equipment would use diesel and gasoline during installation of the dike(s), to accomplish roadwork, and to implement changes at the CYCC and other flood proofing activities. Under alternative C, a pump may be needed to convey freshwater flows through a new Mill Creek Dike. Although there would be consumption of energy resources, design specifics, implementation timeframe, and nature of any pump which might be needed at Mill Creek are not yet known. In the absence of more project-specific details, it is difficult to estimate energy usage or the impacts of the project on the local availability of energy resources.

### 1.11.14 URBAN QUALITY AND GATEWAY COMMUNITIES

The NPS must consider the possible impacts on future planning efforts or land use and development patterns on adjacent or nearby lands. Residences and communities located adjacent to the Seashore and the Herring River estuary may be affected by the proposed alternatives, and any potential impacts to these communities are addressed under the Socioeconomics impact topic.

### 1.11.15 WASTEWATER

MEPA requires analysis of wastewater impacts for construction of wastewater treatment facilities and other actions that may discharge waste into waters of the state. The proposed tidal restoration project does not meet MEPA review thresholds because it does not involve the use or discharge of wastewater and would not, therefore, be expected to impact resources in the Seashore or the surrounding area.

### 1.11.16 Solid and Hazardous Waste

MEPA requires analysis of solid and hazardous waste for new capacity of expansion in capacity for storage, treatment, processing, combustion or disposal of solid waste. The proposed tidal restoration project does not meet MEPA review thresholds because it does not involve the use or storage of solid and hazardous waste.

## 1.12 FEDERAL AND STATE LAWS, POLICIES, REGULATIONS, AND REQUIREMENTS

A variety of federal, state, and NPS policies, regulations and guidelines apply to preparation of this draft EIS/EIR, and to the management of the resources potentially affected by the Herring River restoration project. Details on the variety of applicable laws, policies and regulations are listed in "Appendix D: Applicable Laws, Policies, and Regulations." Federal laws requiring special consultation or compliance processes are also discussed in "Chapter 5: Consultation, Coordination, and Regulatory Compliance."

The principal federal and NPS mandates applicable to the Herring River Restoration Project include

- NPS Organic Act of 1916
- NEPA of 1969
- NPS Management Policies 2006
- NPS Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision Making and Handbook
- Federal Water Pollution Control Act of 1972 (the CWA)
- Coastal Zone Management Act Consistency Review
- National Historic Preservation Act of 1966 (NHPA) and Amendments
- Fish and Wildlife Coordination Act of 1934 and Amendments
- Essential Fish Habitat (EFH) requirements of the Magnuson-Stevens Fisheries Conservation and Management Act of 1976 and Amendments.

The principal Commonwealth of Massachusetts, county, and local mandates applicable to the Herring River Restoration Project include the following:

- MEPA
- Massachusetts Waterways Licensing Program (M.G.L. c. 91)
- Massachusetts Endangered Species Act (MESA) (M.G.L. c. 131A)
- CCC–Regional Policy Plan
- Massachusetts Water Quality Certification

- Massachusetts Wetland Protection Act
- Wellfleet Environmental Protection Bylaw
- Truro Environmental Protection Bylaw.

## 1.13 COMPLIANCE WITH THE MASSACHUSETTS ENVIRONMENTAL POLICY ACT

A Special Review Procedure has been established for the project by MEPA, in part due to the multiple project components to be implemented over many years. A number of the components that may become part of the preferred tidal restoration plan are anticipated to meet or exceed several MEPA review thresholds; for example, the Herring River restoration project will alter more than one acre of salt marsh or bordering vegetated wetland (BVW), triggering a mandatory EIR. In addition, the project area is known to contain Estimated and Priority Habitat for state-listed threatened and endangered species, and species of special concern, and is located with the Wellfleet Harbor Area of Critical Environmental Concern. The project will require numerous state permits (Chapter 91 licenses, 401 Water Quality certification, etc.) and has already received state funding. MEPA jurisdiction is broad in scope and extends to all aspects of the project that may cause damage to the environment as defined in the MEPA regulations. These include water quality, wetlands, coastal/marine resources, rare species habitat, and cultural resources.

The Secretary's Certificate on the Environmental Notification Form (ENF) (November 7, 2008) identified the critical general issues to be addressed in the draft EIR, as well as specific requirements for the scope of the draft EIR. Table 1-2 indicates the MEPA impact topics addressed in this draft EIS/EIR and the document sections where they can be found. Thresholds presented are those found in MEPA Regulations 301 CMR 11.00.

**TABLE 1-2: DRAFT EIR REQUIREMENTS OF THE SECRETARY'S CERTIFICATE**

| EIR Scoping Topics | | Requirements | Section and Page References |
|---|---|---|---|
| Project Description | Include a thorough description of the project and all project elements and construction phases. | General requirement | "Chapter 2: Alternatives," sections 2.3.1, 2.5 through 2.9; and "Appendix C: Overview of the Adaptive Management Process for the Herring River Restoration Project" |
| | Include existing conditions illustrating resources, including the existing flood plain, structures and abutting land uses for the entire project area and a proposed conditions plan (or plans) illustrating proposed flood plain elevations, structures and access roads. | | Chapter 2, section 2.6.3; and "Chapter 3: Affected Environment," section 3.10 |
| | Include sufficient baseline data to allow a full characterization of existing conditions and natural resources and support a meaningful analysis of feasible alternatives. | | Chapter 3, sections 3.2 through 3.10 |

| EIR Scoping Topics | | Requirements | Section and Page References |
|---|---|---|---|
| | Identify all project related activities including structural modifications, dredging, fill and removal of vegetation. | | Chapter 2, sections 2.5 and 2.6.4; and appendix C |
| | Identify where and how public access will be improved or introduced. | | Chapter 2: section 2.6.6; chapter 3, section 3.10.7; and "Chapter 4: Environmental Consequences," section 4.10.8 |
| Project Permitting and Consistency | Describe state permits required for the project and how the project will meet applicable performance standards. | General requirement | "Chapter 5: Consultation, Coordination, and Regulatory Compliance;" "Appendix D: Applicable Laws, Policies, and Regulations;" and "Appendix G: Statement of Findings for Wetlands and Flood Plains" |
| | Discuss the consistency of the project with any applicable local or regional land use plans. | | Chapter 4, sections 4.1.2 and 4.12; chapter 5; and appendix D |
| | Address the requirements of Executive Order 385 (Planning for Growth). | | N/A |
| Adaptive Management/ Environmental Monitoring | Identify how adaptive management will be employed throughout the project and include a comprehensive Environmental Management Plan that incorporates a monitoring program for pre-construction, construction and post-construction phases that will provide sufficient information to adequate assess progress towards projects, identify impacts and inform the development of adaptive management strategies. | General requirement | Appendix C |
| | Identify what will be monitored, how monitoring will be conducted and the proposed duration of monitoring. At a minimum, monitoring should include water quality, rare species, fisheries, shellfish, sediment transport and vegetation. | | Appendix C |
| Alternatives Analysis | Identify benefits, impacts, and mitigation associated with each alternative and provide information, data, and analysis necessary for state resource agencies to evaluate the alternatives. | General requirement | Chapter 2, sections 2.3 through 2.6, and 2.13; chapter 4, sections 4.2 through 4.11; and appendix C |
| | Provide adequate information to support the selection of the preferred alternative and discuss mitigation approaches. | | Chapter 2, sections 2.6, 2.10 through 2.13; chapter 4, sections 4.2 through 4.11; and appendix C |

| EIR Scoping Topics | | Requirements | Section and Page References |
|---|---|---|---|
| | Evaluate impacts of the alternatives. | | Chapter 2, section 2.13; and chapter 4 |
| | Investigate all feasible methods of restoring salt marsh while avoiding, reducing or minimizing negative impacts, in particular impacts to private properties. | | Chapter 2, section 2.13; chapter 4; and appendix C |
| | Identify alternatives for avoiding impacts to private properties within each sub-basin. | | Chapter 2, sections 2.9 and 2.10; chapter 4, sections 4.10 through 4.12; and appendix C |
| | The results of the modeling should be included in the draft EIR including the tidal ranges, expansion of the flood plain, salinities and velocities at road crossings. | | Chapter 2, section 2.2; chapter 3; chapter 4; and "Appendix B: Hydrodynamic Modeling Report" |
| | Identify criteria that will be used to select a preferred alternative and explain any trade-offs in the alternatives analysis. | | Chapter 2, sections 2.2, 2.5, and 2.10 through 2.13 |
| | Consider and balance the private property concerns of the CYCC with potential impacts to wetlands, historic resources and rare species habitat. | | Chapter 4, sections 4.5, 4.7, 4.9, and 4.10 |
| Land Alteration | Quantify the amount of land alteration associated with the project. | Direct alteration of 50 acres of land or more | Chapter 2, sections 2.5 and 2.13; chapter 4, sections 4.4, 4.5, 4.10.5, 4.10.6, and 4.10.7; and appendix C |
| | Clearly identify how land should be altered, where vegetation will require removal and identify objectives and measures that will be included in the vegetation management program to maximize the effectiveness of the project. | | Chapter 2, sections 2.5, 2.6, and 2.13; chapter 4: sections 4.5, 4.10; and appendix C |
| Wetlands | Characterize wetland resources throughout the site, identify and quantify wetland alterations associated with each alternative and identify how negative impacts will be minimized. | Alteration of one or more acres of salt marsh or BVWs | Chapter 2, sections 2.5, 2.6.2, and 2.13; chapter 3: section 3.5; chapter 4: section 4.5; and appendix G |
| | Include plans at an appropriate scale that illustrate impacts to resource areas. | | Chapter 4, section 4.5; chapter 5; and appendix G |
| | Illustrate where new resource areas will be created and identify associated buffer zones. | | Chapter 4, section 4.5; chapter 5; and appendix G |

| EIR Scoping Topics | | Requirements | Section and Page References |
|---|---|---|---|
| | Consult with MassDEP to determine if an amendment or modification is required to the Town of Wellfleet Wetlands Restriction Order. | | Chapter 4, section 4.10.5; chapter 5: sections 5.3.5 and 5.3.6; appendix D; and appendix G |
| | If MassDEP determines that the project requires a variance, provide information required for variance request. | | Chapter 4, section 4.10.5; chapter 5, sections 5.3.5 and 5.3.6; appendix D; and appendix G |
| Waterways | Identify project elements associated with each alternative that would require Chapter 91 licensing. | Construction of a new dam<br>Alteration of 1,000 square feet or more of salt marsh or outstanding resource waters<br>Alteration of one half or more acres of any other wetlands<br>Construction, reconstruction or expansion of an existing solid fill structure of 1,000 square feet or more base area or of a pile-supported or bottom-anchored structure of 2,000 square feet or more base area, except a seasonal, pile-held or bottom-anchored float, provided the structure occupies flowed tidelands or other | Chapter 5, section 5.3.5 and appendix C |
| | Include an analysis of the project's compliance with the Waterways Regulations. | | Chapter 5, section 5.3.5 |
| | Assess the project's impacts, positive and negative, on the public's right to access, use and enjoy tidelands that are protected by Chapter 91 and identify measures to avoid, minimize or mitigate and adverse impact on these rights. | | Chapter 4, sections 4.5, 4.6, and 4.10; and chapter 5, section 5.3.5 |
| Dredging | Identify any dredging associated with project alternatives, estimate the amount of material to be dredged and describe the soils to be dredged. | Dredging of 10,000 cubic yards of material or more | Chapter 2, sections 2.6.4 and 2.13; chapter 4: sections 4.1.2, 4.3, 4.4, 4.6, 4.7, and 4.11; and appendix C |
| | Identify measures that can be employed to avoid release of sediments into the river environment and to protect downstream shellfish beds. | | Chapter 2, sections 2.6.4 and 2.13; chapter 4: sections 4.1.2, 4.3, 4.4, 4.6, 4.7, and 4.11; and appendix C |
| Rare Species/ Wildlife Habitat | Include detailed hydrologic/hydraulic models and impact analyses for all proposed alternatives. | Alteration of designated significant habitat | Appendix B |

| EIR Scoping Topics | | Requirements | Section and Page References |
|---|---|---|---|
| | Address impacts to state-listed species for both the proposed restoration efforts, as well as for any associated upland projects. | Greater than 2 acres of disturbance of designated priority habitat as defined in 321 CMR 10.02 | Chapter 2, sections 2.9 and 2.13; chapter 4, section 4.7; chapter 5, section 5.3.5; and appendix C |
| | Address how each alternative could be designed to avoid, minimize, and mitigate impacts to state-listed species. | | Chapter 2, sections 2.9 and 2.13; chapter 4, section 4.7; chapter 5, section 5.3.5; and appendix C |
| | Identify how overall habitat within the flood plain will be monitored and evaluated consistent with adaptive management goals. | | Appendix C |
| Fisheries | Summarize the benefits of the project to fisheries and shellfish and provide projections regarding growth. | | Chapter 2, sections 2.9 and 2.11; and chapter 4, sections 4.6 and 4.10 |
| | Identify temporary impacts to fish and shellfish during construction and identify measures to avoid, minimize and mitigate these impacts. | | Chapter 4, sections 4.6 and 4.11; appendix C; and "Appendix F: Essential Fish Habitat Assessment for the Herring River Restoration Project" |
| | Identify how restoration of tidal flow to the Herring River at Chequessett Neck Road will be designed to optimize fish passage. | | Chapter 2, section 2.9; chapter 4, section 4.6; and appendix C |
| Water Quality | Identify baseline water quality data that measures salinity, pH and metals, dissolved oxygen and fecal coliform. | | Chapter 3, sections 3.2 and 3.3; and appendix B |
| | Identify how project alternatives will affect water quality and identify how water quality will be monitored. | | Chapter 2, sections 2.9 and 2.13; and chapter 4, sections 4.2 and 4.3 |
| | Identify impacts on public and private water supplies and septic systems associated with each alternative. | | Chapter 4, sections 4.10.5, 4.10, and 4.11 |
| | Identify how the project will be conducted consistent with water quality standards associated with the 401 Water Quality Certification. | | Chapter 4, sections 4.3 and 4.4; chapter 5, section 5.3.5; and appendix C |
| | Discuss short- and long-term changes in rates and volumes of sediment transport associated with each alternative and related impacts on the river and the harbor. | | Chapter 4, section 4.4; appendix B; and appendix C |

| EIR Scoping Topics | | Requirements | Section and Page References |
|---|---|---|---|
| Historic/ Archaeological Impacts | Identify historic properties and archaeological sites within the project area and its vicinity and identify impacts to these sites. | Demolition of all or any exterior part of any Historic Structure<br>Destruction of all or any part of any Archaeological Site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth | Chapter 2, section 2.13; chapter 3, section 3.9; and chapter 4, section 4.9 (no demolition of historic properties or destruction of archaeological sites is proposed) |
| Greenhouse Gas Emissions | Identify how the impacts of climate change, including sea level rise are being incorporated into the analysis of the project. | | Chapter 2 |
| Construction Period Impacts | Include a discussion of construction phasing, evaluate potential impacts associated with construction activities and propose feasible measures to avoid or eliminate these impacts. | | Chapter 2, section 2.3.1; Chapter 4, section 4.11; and appendix C |
| | Implement measures to alleviate dust, noise, and odor nuisance conditions, which may occur during construction activities. | | Chapter 2, section 2.3.1; Chapter 4, section 4.11; and appendix C |
| Mitigation | Include a section in appendix C on mitigation measures. This section should form the basis of the proposed Section 61 Findings that will be proposed in the final EIR, including: a clear commitment to mitigation; an estimate of the individual costs of the proposed mitigation; the identification of the parties responsible for implementing the mitigation; and a schedule for the implementation of mitigation, based on construction phasing of the project. | | Chapter 4 and appendix C |
| Comments | Include a response to comments section. | | Final EIS/EIR; will contain a summary of public and agency comments with NPS/HRRC responses |
| | Circulate draft EIR in compliance with section 11.16 of the MEPA regulations. | | Draft EIS/EIR and chapter 5, List of Recipients |

| EIR Scoping Topics | | Requirements | Section and Page References |
|---|---|---|---|
| Circulation | Copies should be sent to the list of "comments received" and to local officials in Wellfleet and Truro. | Construction of a New roadway one-quarter or more miles in length<br>Cut five or more living public shade trees of 14 inches or more in diameter at breast height | Draft EIS/EIR and chapter 5, List of Recipients |
| | A copy of the draft EIR should be made available for public review at the Wellfleet and Truro public libraries. | | Draft EIS/EIR and chapter 5, List of Recipients |
| | Proponent should provide a hard copy of the draft EIR to each state agency and town department from which the proponent will seek permits or approvals. | | Draft EIS/EIR and chapter 5, List of Recipients |