



Massachusetts Department of Conservation and Recreation
Bureau of Planning and Resource Protection
Resource Management Planning Program

RESOURCE MANAGEMENT PLAN

Fort Phoenix Planning Unit

*Including Fort Phoenix Beach State Reservation, Nasketucket Bay State Reservation,
and West Island State Reservation*



May 2012



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RESOURCE MANAGEMENT PLAN

2012

Deval L. Patrick, Governor
Timothy P. Murray, Lt. Governor
Richard K. Sullivan, Jr., Secretary
Edward M. Lambert, Jr., Commissioner
John P. Murray, Deputy Commissioner for Park Operations

Resource Management Plans (RMPs) provide guidance for the management of properties under the stewardship of the Department of Conservation and Recreation (DCR). They are working documents for setting priorities, enabling the Department to adapt to changing fiscal, social, and environmental conditions. The planning process provides a forum for communication and cooperation with park visitors and the surrounding communities to ensure transparency in the DCR's stewardship efforts.

Massachusetts' South Coast is a special place; rich in history, natural resources, and picturesque land and seascapes. The three properties covered in this RMP are neither the largest nor best known parks in the DCR system. However, visitors to these properties are amply rewarded with some of the most interesting and scenic spots along Buzzards Bay. From swimming and picnicking at Fort Phoenix Beach State Reservation to walking in near solitude along the trails and shoreline of Nasketucket Bay State Reservation or West Island State Reservation, these properties provide a variety of ways to experience and enjoy the South Coast.

Being on the coast, these properties are subject to flooding, storm impacts, and sea level rise. Their management requires addressing day-to-day needs while preparing for both infrequent catastrophic and long-term changes in the coastal environment. This plan addresses current and future needs, and provides for the ongoing use, enjoyment, and enhancement of these properties.

I invite you to visit these hidden jewels and enjoy the variety of recreational experiences that they offer.

A handwritten signature in blue ink, reading "Edward M. Lambert, Jr.", with a stylized flourish at the end.

Edward M. Lambert, Jr.
Commissioner

The Massachusetts Department of Conservation and Recreation (DCR), an agency of the Executive Office of Energy and Environmental Affairs, oversees 450,000 acres of parks and forests, beaches, bike trails, watersheds, dams, and parkways. Led by Commissioner Edward M. Lambert, Jr., the agency's mission is to protect, promote, and enhance our common wealth of natural, cultural, and recreational resources. To learn more about DCR, our facilities, and our programs, please visit us at www.mass.gov/dcr. Contact us at mass.parks@state.ma.us.



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EXECUTIVE SUMMARY

INTRODUCTION

The Massachusetts Department of Conservation and Recreation (DCR) provides access and facilities for nature-based recreation along the Massachusetts coast. In southeastern Massachusetts, on the western shore of Buzzards Bay, the DCR operates five coastal parks. Three of these, Fort Phoenix Beach State Reservation, Nasketucket Bay State Reservation, and West Island State Reservation, comprise the Fort Phoenix Planning Unit. The level of recreation development and the extent and value of natural resources differ greatly among these properties.

Only one property in the planning unit is developed. Extensive recreation infrastructure covers much of Fort Phoenix Beach; portions of which are located atop filled tidelands and former building sites. The other two properties are largely undeveloped, with little infrastructure and high conservation value. Development at these two properties is limited to trails, culverts, and a single parking area.

All three properties are within the coastal zone and exposed to harsh conditions including winds, waves, currents, and infrequent tropical storms and hurricanes. They are also susceptible to the impacts of sea level rise.

This Resource Management Plan (RMP) addresses the challenge of enhancing the visitor experience and protecting natural, cultural, and recreation resources in a dynamic coastal environment.

MANAGEMENT PRINCIPLE AND GOALS

The resource management planning process provides a systematic assessment of natural, cultural, and recreation resources; their current conditions and future potential; and current and anticipated management resources and practices. Through this process a principle for the management of the Fort Phoenix Planning Unit and associated goals are identified.

The following management principle was developed for the Fort Phoenix Planning Unit.

Provide coastal access while actively managing the built environment for recreation and the natural environment for conservation.

The following five management goals have been identified to achieve the management principle. These goals are of equal importance, and are not presented by priority.

Goal 1. Maintain and enhance existing recreation facilities and experiences.

Goal 2. Prepare for rising sea level and storm surge through methods appropriate for each property.

Goal 3. Enhance communication with park visitors to promote the increased awareness, appreciation, and protection of natural and cultural resources and to improve the visitor experience.

Goal 4. Preserve and protect existing cultural resources and expand the level of public understanding of the cultural history of each reservation and the surrounding region.

Goal 5. Enhance conservation by acquiring additional natural resources information and by actively managing rare species, uncommon natural communities, and populations of invasive plants.

These objectives were developed with awareness that change is inevitable along the coast and that the protection of natural, cultural, and recreation resources requires both accommodating and mitigating these changes.

PRIORITY RECOMMENDATIONS

This RMP identifies 90 management recommendations; 35 are classified as high priorities. Resources are currently available to implement 14 of these high priority recommendations. It is anticipated that resources will be available in the next five years to implement 14 additional high priority recommendations. These recommendations, and the lead DCR unit responsible for their implementation, are identified in the Action Plan at the end of this Executive Summary.

PUBLIC PARTICIPATION IN DEVELOPING THIS RESOURCE MANAGEMENT PLAN

Notice of a public meeting and of the DCR's intent to prepare a Resource Management Plan for the Fort Phoenix Planning Unit was published in the April 6, 2011 issue of the Environmental Monitor. An initial public meeting was convened at the Millicent Library, Fairhaven on April 13, 2011. Approximately 20 people attended this meeting, which ran from 6:30 to 8:00 P.M. Public input on the plan was received at the meeting and through U.S. and e-mail received after the meeting.

Notice of a public meeting on the draft RMP for the Fort Phoenix Planning Unit, and of the availability of the plan, was published in the December 21, 2011 Environmental Monitor. The meeting was held on January 11, 2012 in the Rita E. Steele Auditorium of the Millicent Library; 15 people attended.

The public comment period on the draft RMP ran from January 12, 2012 through February 13, 2012; 12 sets of written comments were received. Information on the public process for this RMP is provided in Appendix B (Public Participation).

This RMP was submitted to the DCR's Stewardship Council on April 6, 2012 and was adopted by the council on May 11, 2012.

Action Plan 2012–2016

Priority Action	DCR Lead Unit
Goal 1. Maintain and enhance existing recreation facilities and experiences.	
Maintain the Fort Phoenix administrative road during the winter so that public safety agencies have regular access to the bathhouse and Lower Lot.	Operations
Pursue discussions with NSTAR about acquiring the property between Fort Phoenix Beach State Reservation and Doane Street.	Land Protection
Re-line the drainage pipe between the administrative road and the manhole at Fort Phoenix.	Engineering
Repair cracks in the surface of the tennis courts at Fort Phoenix.	Engineering
Provide appropriate striping and signs for the HP Lot at the Fort Phoenix bathhouse.	Engineering Operations
Remove weeds and seal cracks to extend the life of the Lower Lot at Fort Phoenix.	Engineering Operations
Replace rotted gates at Fort Phoenix with new gates bearing standard DCR markings.	Engineering Operations
Correct pavement markings and signs at designated parking spaces in the lot at historic Fort Phoenix.	Engineering
Install mobi-mat from the existing Fort Phoenix bathhouse to the beach in order to create universal access to this beach. Seasonally install and remove this mat.	Operations
Increase pet owners' awareness of the exclusion of dogs from Fort Phoenix Beach during the swimming season; enforce regulations as appropriate.	Operations Ranger Bureau
Goal 2. Prepare for rising sea level and storm surge through methods appropriate for each property.	
Allow the landward migration of salt marshes at Nasketucket Bay in response to coastal storms and sea level rise.	Operations
Allow the landward migration of salt marshes at West Island in response to coastal storms and sea level rise.	Operations
Goal 3. Enhance communication with park visitors to promote increased awareness, appreciation, and protection of natural and cultural resources and to improve the visitor experience.	
Increase pet owners' awareness of their responsibility to control and clean up after their dogs; enforce regulations as appropriate.	Operations Ranger Bureau
Install multi-lingual "Gate closes at" signs, at Fort Phoenix, that meet DCR and national standards.	Operations
Install multi-lingual beach regulation signs at Fort Phoenix.	Operations
Educate visitors about shared use of Nasketucket Bay State Reservation during the hunting season. Create and post improved signs informing the public of actions that they may take to improve their safety (e.g., wearing safety orange, keeping dogs leashed).	Operations Ranger Bureau
Educate visitors about shared use of West Island State Reservation during the hunting season. Create and post improved signs informing the public of actions that they may take to improve their safety (e.g., wearing safety orange, keeping dogs leashed).	Operations Ranger Bureau
Install a Main Identification, Rules and Regulation, and Unguarded Waterfront signs facing the water at the unofficial beach along the northeast shore of the Pine Neck.	Operations
Work with the Town of Fairhaven to develop and install a joint Town of Fairhaven/DCR educational kiosk at Town Beach, along the eastern trail to the beach, to include information on property ownership, resource protection, and rules and regulations.	Operations

Continued on next page.

Action Plan 2012–2016 (Continued)

Priority Action	DCR Lead Unit
Goal 4. Preserve and protect existing cultural resources and expand the level of public understanding of the cultural history of the reservation and region.	
Ensure that, early in the planning process, all projects involving ground disturbance and/or any potential impact to the cultural resources identified in this RMP are submitted to the Office of Cultural Resources for review and comment. Following this review, some projects may require the preparation of a Massachusetts Historical Commission Project Notification Form.	Office of Cultural Resources Operations
Continue to perform annual maintenance on the Fort Phoenix bathhouse, including preventing encroachment by sand and vegetation, ensuring that the roof and paved areas are maintaining proper drainage, repainting areas marred by vandalism, and making any repairs with like materials.	Operations
Stabilize foundation of Souza home site at Nasketucket Bay State Reservation by clearing destructive vegetation. Maintain as a preserved ruin.	Office of Cultural Resources Operations
Clear viewshed associated with the Souza home site and farm.	Operations
Goal 5. Enhance conservation by acquiring additional natural resources information and by actively managing rare species, uncommon natural communities, and populations of invasive plants.	
Control new populations of Japanese knotweed before they spread throughout Fort Phoenix. Continue to monitor for new occurrences and control them as encountered.	Operations
Maintain cultural grasslands in accordance with the MassWildlife approved Habitat Management Plan (Appendix J).	Planning
Continue monitoring and management of rare beach-nesting birds on DCR and Town of Fairhaven property at West Island.	Planning
Seasonally exclude dogs from the portion of West Island State Reservation to the north and east of Town Beach, in order to increase protection of rare beach-nesting birds.	Operations Ranger Bureau
Conduct preliminary investigation of the potential landfill at West Island.	Engineering



The bathhouse at Fort Phoenix Beach State Reservation, with Outer New Bedford Harbor in the background.

SECTION 1. INTRODUCTION

1.1. FORT PHOENIX

Massachusetts' coast is 2,819 miles long (Carlisle 2012). At many locations, most notably on Boston Harbor, the Department of Conservation and Recreation (DCR) provides coastal access and facilities for nature-based recreation. In southeastern Massachusetts, the DCR operates five coastal parks. Three of these, Fort Phoenix Beach State Reservation, Nasketucket Bay State Reservation, and West Island State Reservation are the subjects of this Resource Management Plan (RMP). The level of recreation development and the extent and value of natural resources differ greatly among these properties.

Only one property in the planning unit is developed. Fort Phoenix Beach State Reservation is a product of the mid-20th century effort by the Massachusetts Department of Public Works to create a series of recreation beaches along the Commonwealth's coast. Most of this property has been developed over the years for recreation and its original structures, parking lots, roads, and utilities are nearly 50 years old. The other two properties are more recent acquisitions that are largely undeveloped, with little infrastructure and high conservation value. All three

reservations are exposed to harsh coastal conditions including winds, waves, currents, and infrequent tropical storms and hurricanes.

This RMP addresses the challenge of providing continued public access to these reservations while protecting their natural resources, cultural resources, and infrastructure in a dynamic and changing environment. It provides guidance that will protect, promote, and enhance natural, cultural, and recreation resources at each of the planning unit's properties.

1.2. RESOURCE MANAGEMENT PLANS

Resource Management Plans guide the management of properties under the stewardship of the DCR. They identify clear goals and objectives; inventory and assess environmental, cultural, and recreation resources; identify current management practices and capabilities; and develop specific, implementable management recommendations.

The DCR is required to prepare management plans for "all reservations, parks, and forests under the management of the department" (M.G.L. Chapter 21: Section 2F; Appendix D). These plans "shall include guidelines for the operation and land

stewardship of the aforementioned reservations, parks and forests, shall provide for the protection and stewardship of natural and cultural resources and shall ensure consistency between recreation, resource protection, and sustainable forest management.” This is achieved through the preparation of RMPs.

In 2008, the DCR conducted a statewide survey of all of its properties for the purpose of guiding resource management planning (DCR 2009a). Nearly 400 properties were grouped into 86 planning units, largely on the basis of physical proximity and shared management structure. RMPs will be prepared for each of these units and, collectively, will include “all reservations, parks, and forests.”

The statewide survey reviewed and synthesized existing data on each planning unit’s natural resources, infrastructure, and staffing (DCR 2009a). New information was generated on each planning unit’s cultural resources, recreational activities, and operations and management considerations. These three variables, and natural resources, were used to prioritize the preparation of RMPs.

1.3. THE PLANNING PROCESS

RMPs are developed by the DCR’s Regional Planning Program through an iterative process of data gathering and analyses, public input, writing, review, and revision.

Public input is an important part of the process. The legislative mandate that requires the preparation of management plans directs the Commissioner of the DCR to “seek and consider public input in the development of management plans, and ... make draft plans available for a public review and comment period through notice in the Environmental Monitor.”

There were two periods of public input associated with the preparation of the Fort Phoenix RMP. The first occurred early in the planning process, prior to preparing the RMP. The second coincided with the release of the draft plan. A public meeting was associated with each of these comment periods. Additional information on public participation in the development of this plan is provided in Appendix B.

Following public comment and revision, draft RMPs are submitted to the DCR Stewardship Council for review. Once reviewed and adopted by the council,

RMPs become the primary guidance document for managing a planning unit’s resources.

1.4. MANAGEMENT PRINCIPLE AND GOALS

A principle for managing the Fort Phoenix Planning Unit and five associated goals were developed through the planning process.

Management Principle

Provide coastal access while actively managing the built environment for recreation and the natural environment for conservation.

Goals

The following five goals, and associated management recommendations (Section 4), have been developed to achieve the management objective. Each is of equal importance.

Goal 1. Maintain and enhance existing recreation facilities and experiences.

The recreational nature of this planning unit varies among its properties. Active recreation facilities are concentrated at Fort Phoenix Beach State Reservation, which was developed specifically for this purpose. In contrast, Nasketucket Bay and West Island state reservations are relatively undeveloped and active recreation infrastructure is inconsistent with their character. Because of this, active recreation facilities are most appropriate within the existing developed footprint at Fort Phoenix. Maintaining and enhancing these facilities ensures public recreational opportunities while preserving the distinct nature of individual properties.

Goal 2. Prepare for rising sea level and storm surge through methods appropriate for each property.

All properties in the planning unit are located on the coast where they are susceptible to sea level rise and subject to hurricane-associated inundation. Nasketucket Bay and West Island state reservations are better prepared for these events due to the natural buffers that remain intact along their shores (i.e., salt marshes and dunes). At these properties, the sea may migrate inland without impacting the built environment. However, much of the infrastructure at Fort Phoenix (i.e., parking lot, playground, and bathhouse) is located immediately adjacent to the beach and is at risk of being damaged or destroyed by coastal storms. Vegetated dunes, a natural buffer

against storms, would better protect this infrastructure.

Goal 3. Enhance communication with park visitors to promote the increased awareness, appreciation, and protection of natural and cultural resources and to improve the visitor experience.

Park management largely depends on the support of well-informed visitors. Programs and materials that educate visitors about the relationship between their actions and the health of a property's resources can decrease negative impacts to a park and improve the visitor experience.

Goal 4. Preserve and protect existing cultural resources and expand the level of public understanding of the cultural history of the reservation and region.

The planning unit's cultural resources are part of the larger story of human endeavor in southeastern Massachusetts. Preservation and interpretive activities are most appropriate in a broad cultural context that connects these properties to local and regional history.

Goal 5. Enhance conservation by acquiring additional natural resources information and by actively managing rare species, uncommon natural communities, and populations of invasive plants.

Existing natural resources management largely focuses on rare species; the reservations' best known organisms. Less is known about natural communities and the more common plants and wildlife. Acquiring additional information on these communities and organisms will allow for enhanced ecological health through active resource management.

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Salt marsh and barrier beaches along the east side of West Island State Reservation; beautiful yet fragile resources.

SECTION 2. EXISTING CONDITIONS

2.1. INTRODUCTION

Buzzards Bay is a moderately large estuary located between southeastern Massachusetts, Cape Cod, and the Elizabeth Islands (Buzzards Bay National Estuarine Program (BBNEP) 2012). It has an area of approximately 228 square miles and a mean depth of 36 feet. Its irregular coastline is over 280 miles long, only 11 miles (3.9%) of which are publically accessible beaches and coastal properties.

The bay's latitude and the presence of the Cape Cod Canal have produced a unique estuarine environment. Buzzards Bay is located at the northern edge of the Virginian Biogeographic Province and contains species common to coastal waters as far south as the Chesapeake Bay. More northerly species, from the Acadian Biogeographic Province, enter the bay through the Cape Cod Canal. This creates a mix of semi-tropical and cold-water species unique along the Atlantic coast (BBNEP 2012). These same conditions make the bay ideally suited for a variety of recreational activities, such as swimming and fishing.

The DCR operates five parks on the western shore of Buzzards Bay; each provides recreational opportunities and coastal access. Two of these parks, Horseneck Beach State Reservation and Demarest Lloyd Memorial State Park, were recently addressed in a separate RMP (DCR 2012). This plan considers the three remaining coastal properties, which collectively constitute the Fort Phoenix Planning Unit.

This section describes the present state of the natural, cultural, and recreation resources and infrastructure of the Fort Phoenix Planning Unit. An overview of the planning unit's physical, ecological, and political contexts is provided in Table 2.1.1.

2.2. FORT PHOENIX PLANNING UNIT

The Fort Phoenix Planning Unit includes Fort Phoenix Beach State Reservation, Nasketucket Bay State Reservation, and West Island State Reservation. These properties are included in this plan because of their physical proximity to each other and because they share a common management structure. Locations of these properties are identified in Figure 2.2.1.

Table 2.1.1. Physical, ecological, and political settings of the Fort Phoenix Planning Unit.

Planning Unit	Fort Phoenix		
Location	Town of Fairhaven Town of Mattapoisett	Bristol County Plymouth County	
DCR Management Structure	District Region	South Coast Southeast	
Properties	Town	Area (acres)^a	Perimeter (miles)^a
<i>Fort Phoenix Beach State Reservation</i>	Fairhaven	30.18	1.14
<i>Nasketucket Bay State Reservation</i>	Fairhaven	1.55	-
	Mattapoisett	209.68	2.73
<i>West Island State Reservation</i>	Fairhaven	341.79	5.16
Ecoregion	Bristol Lowland/Narragansett Lowland		
Watershed	Buzzards Bay		
Legislative Districts			
<i>Senate District</i>	Second Bristol and Plymouth	Senator Mark C. Motigny	
<i>House District</i>	Tenth Bristol	Representative William M. Straus	
Conservation Restriction	Nasketucket Bay State Reservation	1.55 acres	Fairhaven Land Preservation Trust
Designations	Fort Phoenix Beach State Reservation	Coastal Zone	
		Priority Habitat (0.16 acres ^a and offshore area)	
	Nasketucket Bay State Reservation	Coastal Zone	
		Priority Habitat (205.22 acres ^a and offshore area)	
	West Island State Reservation	Coastal Zone	
		Priority Habitat (166.58 acres ^a and offshore area)	

a. These values calculated through the use of a Geographic Information System.

In addition to sharing a common management structure, properties within the planning unit also share the waters of Buzzards Bay. The bay influences their climate; the plants, animals, and natural communities present; land use, both current and historic; and the types of recreation that take place.

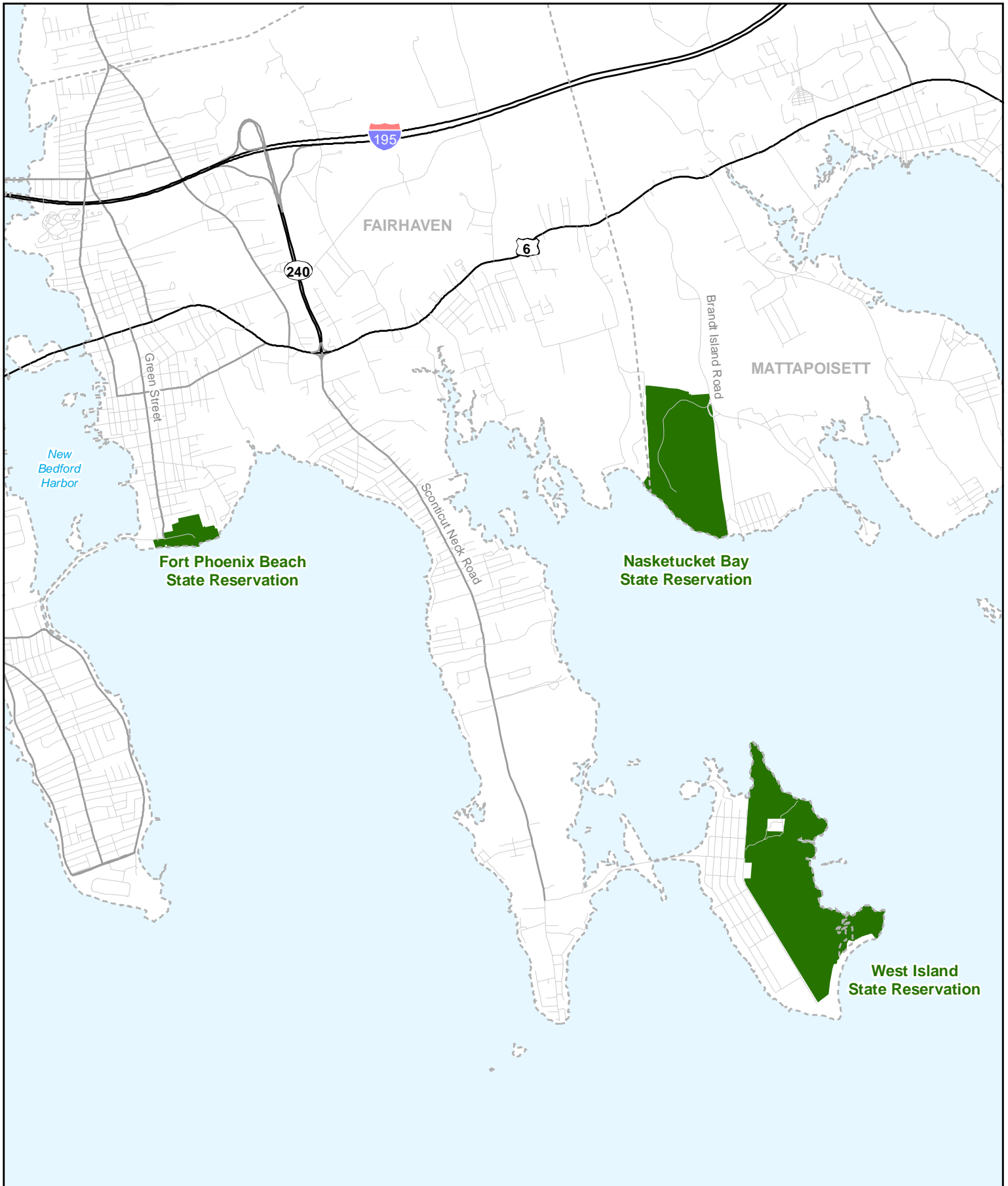
Information common to all properties in the planning unit is provided below.

2.2.1. Natural Resources

The natural resources and ecology of Buzzards Bay have been well-studied. For example, a Google Scholar search using the term “Buzzards Bay” returned approximately 6,800 results. Much of this information is associated with the bay’s value as a commercial fishery (e.g., King et al. 2010), the presence of a superfund site in New Bedford Inner

Harbor (e.g., Morris et al. 2011), or the occurrence of marine science research institutions on the bay’s east and west shores (i.e., Marine Biological Laboratory and UMass Dartmouth’s School for Marine Science and Technology, respectively).

Three documents synthesize information on the bay’s resources. The *Ecology of Buzzards Bay: an Estuarine Profile* report includes information on the bay’s physical environment and natural resources (Howes and Goehring 1996). The Buzzards Bay National Estuarine Program has developed a Comprehensive Conservation and Management Plan for the bay and its watershed; it is currently being updated (BBNEP 2012). Links between the region’s natural and cultural histories are described in *Imprint of the Past: Ecological History of New Bedford Harbor* (Pesch et al. 2011). Readers seeking



— Highway

— Major Road

— Minor Road

- - - Town Boundary

■ Planning Unit Property

Fort Phoenix Planning Unit

Figure 2.2.1.

0 0.5 1 Mile

DCR GIS May-12

Geographic data supplied by the Office of Geographic Information (MassGIS) and DCR GIS.

overviews of the bay’s natural resources are directed to these documents. Natural resources information specific to individual properties within the planning unit is presented in sections 2.3, 2.4, and 2.5.

Every four years the Buzzards Bay Coalition issues the *State of Buzzards Bay*. This report is an assessment of the bay’s health, as based on standard indicators of pollution, watershed health, and living resources. An overall assessment of health is presented on a scale of 1–100, with 100 representing a bay “unspoiled by harmful human activities.” The bay received a score of 45 in 2011 (Buzzards Bay Coalition 2011).

Sea Level Rise. Analysis of sea level data collected in Woods Hole, Massachusetts between 1932 and 2006 revealed a mean rate of rise of 0.86 feet/century (NOAA 2008). It is likely that the magnitude of sea level rise in the planning unit is similar.

Projections of sea level rise vary among models and are heavily influenced by assumptions about future carbon emissions. Models predict a 7 to 79 inch rise in Massachusetts’ sea level by the year 2100 (EOEEA and AAC 2011). In Buzzards Bay, accelerated sea level rise would likely result in increased coastal erosion, shoreline retreat, property destruction, and salt water intrusion into bays, rivers, and groundwater resources (Buzzards Bay NEP 2012). The severity of these effects will depend on the actual magnitude of sea level rise.

Fish. The commercially valuable fish of Buzzards Bay are identified in Table 2.2.1.

Table 2.2.1. Commercially valuable fish of Buzzards Bay (Howes and Goehringer 1996).

Common Name	Scientific Name
Alewife	<i>Alosa pseudoharengus</i>
Atlantic menhaden	<i>Brevoortia tyrannus</i>
Black sea bass	<i>Centropristis striata</i>
Blueback herring	<i>Alosa aestivalis</i>
Bluefish	<i>Pomatomus saltatrix</i>
Butterfish	<i>Peprilus triacanthus</i>
Scup	<i>Stenotomus chrysops</i>
Striped bass	<i>Morone saxatilis</i>
Tautog	<i>Tautog onitis</i>
Winter flounder	<i>Pseudopleuronectes americanus</i>

Invertebrates. The distribution of benthic animals, especially bivalves and other invertebrates, is determined by sediment characteristics of the sea floor. Howes and Goehringer (1996) identified the dominant soft-bottom and hard-bottom species of Buzzards Bay, including commercially important species (Table 2.2.2).

Table 2.2.2. Commercially important shellfish of Buzzards Bay (based on Howes and Goehringer 1996, with additional information from Churchill 2011).

Common Name	Scientific Name
Bay scallop	<i>Argopecten irradians</i>
Channeled whelk	<i>Busycon canaliculatus</i>
Knobbed whelk	<i>Busycon carica</i>
Eastern oyster	<i>Crassostrea virginica</i>
American lobster	<i>Homarus americanus</i>
Northern quahog (Hard-shelled clam)	<i>Mercenaria mercenaria</i>
Soft-shelled clam	<i>Mya arenaria</i>
Blue mussel	<i>Mytilus edulis</i>

2.2.2. Cultural Resources

Properties in the Fort Phoenix Planning Unit represent a range of cultural landscapes that, while tied together geographically, tell three distinct stories of mankind’s relationship to the natural environment. Connected through geology, geography, and ocean tides, these three areas have witnessed a wide range of human settlement, although the cultural resources that remain as evidence are not always immediately apparent. These resources are milestones in the course of history and teach us about how people lived during pre-Contact and pre- and post-Colonial times. They inform us about the industrial and technological changes of the 19th and 20th centuries and serve as a living reminder of the conservation movement of the late 20th century.

This section describes the known and potential cultural resource areas including pre-Contact and historic archaeological resources, and historic buildings, structures, and landscapes. Information on the pre-history of the Fort Phoenix Planning Unit is provided in Appendix E. Significant events in the planning unit’s history are identified in Table 2.2.3.

Table 2.2.3. Significant events in the history of the Fort Phoenix Planning Unit.

Year(s)	Event
ca. 8000 B.C. –1600 A.D.	Southeastern Massachusetts more or less continuously occupied by Native Americans.
ca. 1650	Settlers from the Plymouth Colony purchase what is now the South Coast, leading to European settlement of the region.
1762	First fort built atop rocky outcrop at the southeast corner of New Bedford Harbor.
1872	Fort Phoenix abandoned by military.
1895	Rail service established to Fort Phoenix Beach, an oceanfront tourist destination.
1938	Category 3 hurricane hits New England coast damaging structures at Fort Phoenix Beach and West Island.
1946	The West Island Fairhaven Estates company purchases West Island and begins development of a summer resort community.
1960	Fort Phoenix Beach Reservation is established through an eminent domain taking of 22.7 acres. Additional land acquisitions take place in 1966 and 1984.
1964	Paved parking lot, bathhouse, playground, and administrative road open at Fort Phoenix.
1968	Department of Public Works beach reservation transferred to the Department of Natural Resources.
1988	State purchases 338 acre tract on West Island for inclusion in the state park system for the benefit of all citizens of the Commonwealth.
1997	Approximately 5 acres of West Island State Reservation sold to the Town of Fairhaven for sewage disposal purposes.
1999	Nasketucket Bay State Reservation established with acquisition of 213 acres in Mattapoisett and Fairhaven.

Archaeological Resources

The southeastern portion of Massachusetts, as represented by Bristol and Plymouth counties, has possibly been the focus of more archaeological activities than any other part of the state, with the exception of the outer Cape. Despite the intensity of activity here, substantive archaeological information is uneven at best, as most of the work has been performed by avocational archaeologists. Thus, for most sites there is locational information, but nothing of its functions, age, size, seasonal use, integrity, or significance. Studies undertaken by professional archaeologists have typically been pre-construction evaluations, limited in scope.

Massachusetts Historical Commission (MHC) files reveal a high frequency of pre-Contact archaeological sites in Plymouth and Bristol counties, indicating that this area was more or less continuously inhabited by Native Americans for over 10,000 years.

The lower frequency of documented sites within the planning unit, as compared with the surrounding landscape, does not necessarily indicate less intensive occupation. To the contrary, the environmental setting and natural resources within the corporate boundaries of the planning unit are

virtually identical to those that exist around it. Native Americans knew no such boundaries, so there is every reason to speculate that similar site densities exist within the planning unit as outside of it.

Areas protected from development and most extensive disturbances are most likely to have archaeological resources survive intact below ground. Therefore, it would be predicted that both Nasketucket Bay and West Island state reservations would have high potential for the survival of undisturbed pre-Contact sites. Importantly, such sites would add immeasurably to our understanding of Native American adaptations, social organization, and land use.

Historic Resources

White settlement in the area began in the 1650s, when a group of colonists from the Plymouth Colony purchased a tract of land stretching from Fairhaven to Tiverton, RI. The expansion of Plymouth Colony increased in the 1680s following King Phillip's War. The towns of Mattapoisett and Fairhaven and the many coves and inlets along Nasketucket Bay spurred a local shipping industry that supported the rapid growth of New Bedford. The three properties in the Fort Phoenix Planning Unit began to develop within this historical context,

but just as they supported a variety of Native American uses, each would develop along a distinct track as the region grew and changed over the centuries.

2.2.3. Recreation Resources

Properties within the planning unit provide no cost coastal and upland access for active and passive recreation. Recreation within the planning unit includes the following authorized activities.

- Basketball
- Fishing/Shellfishing
- Geocaching/Letterboxing
- Hiking/Running
- Horseback riding
- Hunting
- Mountain biking
- Nature study
- Picnicking
- Pitching horseshoes
- Skiing, cross-country
- Snowshoeing
- Swimming
- Tennis
- Volleyball

Demographics

There is no information on the number or demographic characteristics of visitors to each of the three reservations in the planning unit. In the absence of information on actual visitors, only the demographics of potential visitors may be identified and addressed.

All three reservations are perceived as local parks; properties used primarily by the area’s residents, with few visitors travelling long distances specifically to visit the park. The following demographic description of potential visitors is based on residents living within a 10 mile radius of Fort Phoenix Beach State Reservation. This area includes all properties within the planning unit.

There are 188,537 residents, in 73,311 households, living within 10 miles of Fort Phoenix Beach State Reservation. These potential visitors share some demographic characteristics with the average Massachusetts resident, but also differ in important ways.

The age structure of potential visitors is similar to that of all Massachusetts residents (Table 2.2.4). The

percentage of adults in the population is slightly lower, and the percentage of seniors slightly higher, among potential visitors than the Massachusetts average. The percentage of children in the population of potential visitors is nearly the same as the state average. Given the similarity in the local and state age structures, it is unlikely that the observed variation reflects the need for unique facilities or management within the planning unit. It is the size, rather than percentage, of the population within each age class that informs the need for different types of facilities and recreational activities. With over 44,000 children and 30,000 seniors among the potential user base, facilities and programming must be both “child friendly” and “senior friendly.”

Table 2.2.4. Age of population potentially served by reservations within the Fort Phoenix Planning Unit.

Age	#	%	State Average (%) ^a
Children (Under 18)	44,247	23.5	23.6
Adults (Ages 18–64)	113,832	60.4	62.9
Seniors (65 and older)	30,458	16.2	13.5
Total	188,537	100.1 ^b	100.0

a. Data compiled, for Massachusetts, from 2000 SF4 Sample Data (DP-1) dataset (<http://factfinder2.census.gov>).

b. Value exceeds 100% due to error associated with presenting percentages with one number after the decimal point.

Many potential visitors come from households where English is not the primary language spoken (Table 2.2.5). Over 30% of households (i.e., 22,658 households) have primary languages other than English; a much higher proportion than the state average. Census data indicate that Portuguese is overwhelmingly the most common language spoken in these households. Spanish and French/French Creole are the second and third most common non-English languages spoken, respectively. These findings suggest the need for bilingual or multi-lingual signs and printed materials.

Table 2.2.5. Primary language spoken in households potentially served by the Fort Phoenix Planning Unit.

Language	#	%	State Average (%) ^a
English	50,653	69.1	81.3
Spanish	3,258	4.4	6.2
Other European	18,801	25.6	8.9
Asian	398	0.5	2.9
Other	201	0.3	0.7
Total	73,311	100.0	100.0

a. Data compiled, by municipality, from 2000 SF4 Sample Data (DP-2) dataset (<http://factfinder2.census.gov>).

Households potentially served by DCR properties in the Fort Phoenix Planning Unit differ significantly from the state average in income (Table 2.2.6). There are more low income households and fewer high income households. The percentage of medium income households is consistent with the state average. This highlights the need for, and importance of, no cost and low cost recreational opportunities in the region.

Table 2.2.6. Income of households potentially served by the Fort Phoenix Planning Unit.

Income Range	#	%	State Average (%) ^a
Low (Under \$25,000)	25,427	34.7	24.5
Medium (\$25,000–\$74,999)	33,906	46.2	45.0
High (\$75,000 and over)	13,978	19.1	30.5
Total	73,331	100.0	100.0

a. Data compiled, by municipality, from 2000 SF4 Sample Data (DP-3) dataset (<http://factfinder2.census.gov>).

2.3. FORT PHOENIX BEACH STATE RESERVATION

In 1959, the Massachusetts Legislature authorized the expenditure of \$90,000 for “the acquisition by transfer, purchase or by eminent domain ... of certain land in the town of Fairhaven known as Fort Phoenix and Fort Phoenix Beach.” The following year, approximately 22.7 acres were taken through eminent domain and Fort Phoenix Beach Reservation, as it was then known, was established under the control of the Massachusetts Department of Public Works’ (DPW) Division of Waterways. Development of recreation facilities soon followed.

In 1962, the Massachusetts Legislature authorized and directed the Division of Waterways to provide recreation facilities at Fort Phoenix Beach. Two years later, a paved parking lot, bathhouse, playground, and paved administrative road opened.

The park expanded in 1966 with the acquisition of 1.1 acres northeast of the intersection of Green Street and Old Fort Road. In the late 1960s, athletic courts were built on this acquisition and a second parking lot was added to the original property. In 1968, control of the reservation was transferred from the DPW’s Division of Waterways to the Department of Natural Resources.

The reservation expanded northward in 1984 with the acquisition of an additional 9.2 acres. Over the years, additional facilities such as grills, horseshoe pits, and a shade shelter were added and existing facilities renovated.

More than 50 years after its establishment, Fort Phoenix Beach State Reservation continues to provide coastal access for public recreation.

2.3.1. Natural Resources

The reservation’s natural resources are the product of geography, geology, coastal processes, and historic land use. All of the property’s land cover types (i.e., forest, turf, dunes, and beach) are highly modified, as are water and sediment chemistry in New Bedford Outer Harbor. Such modifications are commonly associated with urban properties. Despite these conditions, Fort Phoenix continues to provide habitat for a variety of native plants and animals.

Physical Features

Topography. The reservation ranges in elevation from sea level to approximately 20 feet above sea level. The majority (98.8%) is 10 or fewer feet above sea level. The bathhouse, sun shelter, multi-use court, and Lower Lot are approximately 10 feet above sea level. The tennis, basketball, and volleyball courts and the Upper Lot are slightly higher. The topography has been highly modified by filling and grading.

From the bathhouse, the land rises to the west; reaching an elevation of approximately 30 feet atop the exposed ledge on adjacent Town of Fairhaven property.

Barrier Beaches. There are no barrier beaches.

Geology. The bedrock of the Fort Phoenix area is present, and observable, above the ground's surface. Although best viewed on adjacent Town of Fairhaven property, this bedrock also occurs along sections of the shore and in the vicinity of the bathhouse.

The area's bedrock consists of biotite gneiss; a coarse-grained metamorphic rock streaked with grains of mica. Bands of coarse pink granite intrude this gneiss. These bands are believed to be the eastern extension of the granite that underlies Narragansett Bay and southern Rhode Island (Skehan 2001).

Soils. Soils differ between the developed area to the south and the forested area to the north (NRCS 2010). Soils in the southern section of the reservation are largely classified as beaches (22.4%) or Udorthents (34%); areas where the original soils have been removed or filled. To the north are fine sandy loams in the Whitman and Woodbridge soil series (32.5% of reservation). The former is located in the northwest corner of the forest; it is considered well-drained. The latter occurs throughout much of the forested area and is considered a very poorly drained upland soil. Both sandy loams are considered "very limited" for paths, trails, and picnic areas (Roffinoli and Fletcher 1981).

Water Resources

Ponds. There are no ponds.

Wetlands. There are 1.1 acres of emergent marsh and approximately 4.3 acres of forested wetlands. The emergent marsh and 2.7 acres of red maple swamp are located in the wooded portion of the reservation to the east of the carriage road. The remaining 1.6 acres of red maple swamp are located west of the carriage road, to the north of the multi-use court (Figure 2.3.1).

Vernal Pools. There are no certified or potential vernal pools (Harper 2011).

Streams. There are no known perennial streams on the reservation. However, two such streams are located immediately north of the reservation and provide water to the reservation's wetlands.

Storm water from Doane Street and Laurel Street flows into the woods at the southeast corner of the

intersection of these two streets. It then flows south through private property (i.e., NSTAR), passes through a culvert beneath a footpath, and accumulates in a depression on the reservation. This depression is located to the northeast of the multi-use court. Portions of this depression are forested wetlands.

The second stream passes under Doane Street, to the east of the old carriage road, and onto NSTAR's property. The stream enters a wetland, which extends southward onto the reservation.

A circa 1962 aerial photo reveals an extensive area of intertidal flats where the bathhouse, playground, and lower parking lot are now located. A single channel extended across these flats at low tide, from the existing tree line to the bay. The filling of the beach area in the early 1960s effectively created a barrier to the flow of water into Buzzards Bay.

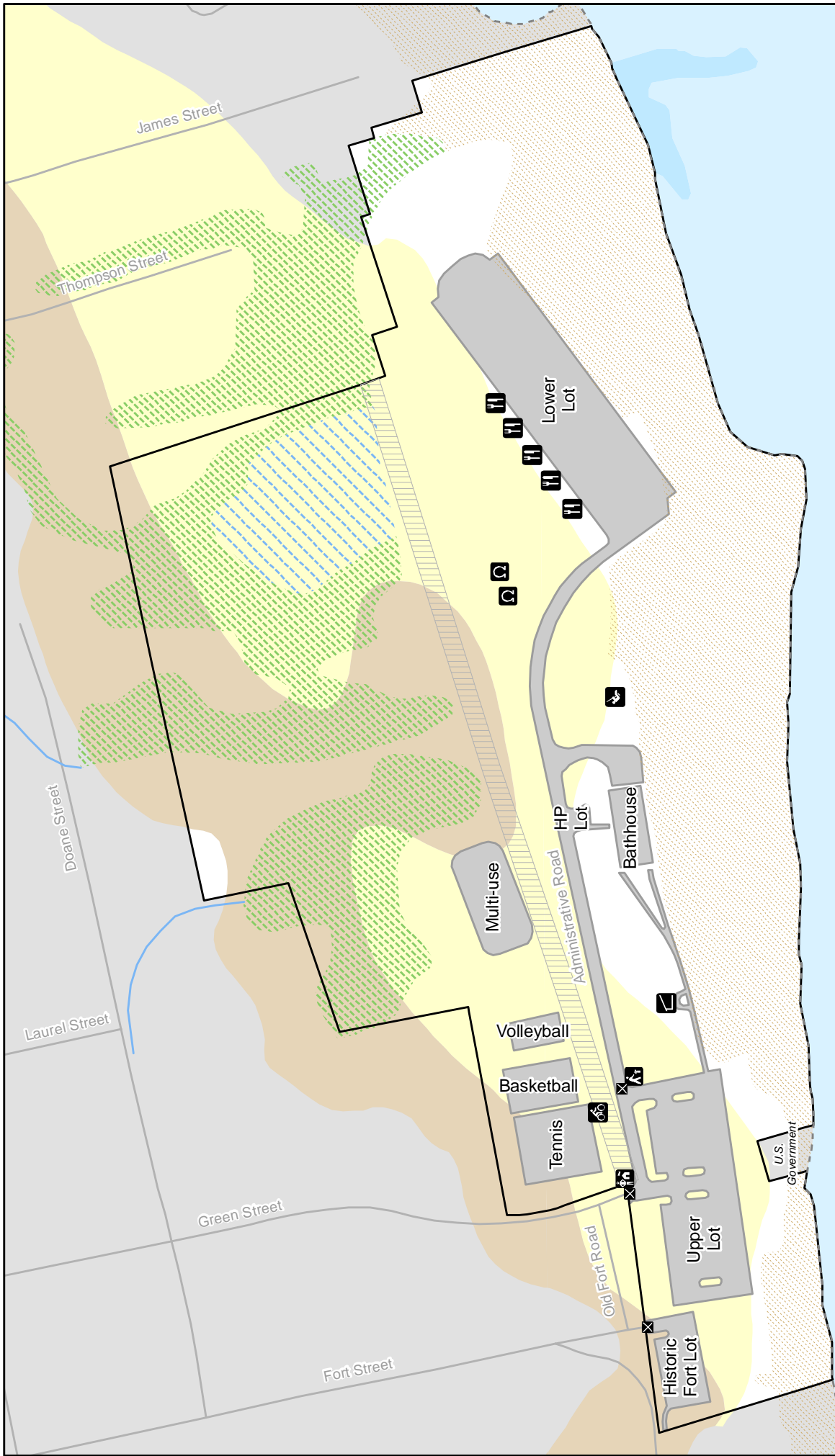
Groundwater. There are no known aquifers.

Flood Zones. The 100-year flood zone covers 23.9 acres (81.6%) of the reservation and includes all developed areas. The 500-year flood zone covers an additional 5.3 acres (17.6%; Figure 2.3.1).

Hurricane Inundation. The hurricane inundation map for the Town of Fairhaven indicates that 91.7% of the reservation will be inundated by Category 1 and 2 hurricanes (USACE 1994a). This includes all of the developed area and much of the forested area. Category 3 or higher storms are predicted to inundate the entire property. These predictions are based on worst case scenarios and assume the most damaging track and tide height when a hurricane makes landfall.

Sea Level Rise. It is likely that the magnitude of recent sea level rise at Fort Phoenix is similar to the 0.86 feet/century recorded at Woods Hole (NOAA 2008).

Land below 1.5 meters (4.9 feet) in elevation is considered vulnerable to sea level rise because "as a general rule, it is reasonable to assume that the area ... is at risk of tidal inundation from the projected rise in sea level over the next century, and is likely to be inundated within the next 2 centuries" (Titus and Richman 2001). The southeast corner is the lowest portion of the reservation, with elevations at or near sea level.



Fort Phoenix Beach State Reservation

Figure 2.3.1.

Legend:

- Gate
- Bike Rack
- Contact Station
- Cooking Grill
- Horsehoe Pit
- Kiosk
- Playground
- Sun Shelter
- Public Road
- Stream
- Marsh
- Wooded Marsh
- Beach
- Open Water
- Tidal Flat

- 100-Year Flood Zone
- 500-Year Flood Zone
- Town Boundary
- Fort Phoenix State Reservation
- Fee Interest
- Utility Easement

Geographic data supplied by the Office of Geographic Information (MassGIS) and DCR GIS.

An assessment of lands vulnerable to sea level rise indicated that the southeastern corner of the reservation is the most susceptible portion of the property (Titus and Richman 2001). However, this area is predicted to be above mean sea level for at least another 100 years.

Rare Species

There are no records of state- or federally-listed species occurring on the reservation and less than 0.2 acres (0.5%) have been designated Priority Habitat. The entire area just offshore has been designated Priority Habitat because it provides foraging habitat for roseate and common terns (Harper 2011). The former is both federally and state Endangered and the latter is a Species of Special Concern in Massachusetts.

Vegetation

There have been no inventories of the reservation's plants. Preliminary information is provided in Appendix F, Table F.1.

Invasive Species. The following eight species of invasive plants are known from the reservation.

- Sycamore maple
- Louise's swallow-wort
- Japanese barberry
- Japanese honeysuckle
- Oriental bittersweet
- Common reed
- Japanese knotweed
- Multiflora rose

Several of these species are associated with the fill used to create the reservation's recreation facilities in the 1960s. Common reed is abundant along the north and east margins of the turf-covered areas, in two basins north of these areas, and between the Lower Lot and the shore. Louise's swallow-wort and oriental bittersweet are common along the margin of the field and forest. They are also common in the dunes. Japanese knotweed is becoming established among the common reed in the northeast corner of the turf-covered area.

Oriental bittersweet is common throughout; found in the dunes, forested areas, and amidst ornamental plantings.

Other invasive plants are associated with past and current land use in the forested portion of the

reservation. Multiflora rose forms a near monoculture in the western half of this area and is also common in the eastern half. Japanese barberry and Japanese honeysuckle are also present in low numbers.

Sycamore maple was planted near the bathhouse earlier this decade.

An additional invasive plant, garlic mustard, is locally abundant along the south side of Doane Street. It is associated with yard waste dumped, presumably by area residents, in the woods along the south side of the road. It is likely that this population of garlic mustard will spread into the reservation.

Natural Communities. Six communities have been identified; they are presented in Table 2.3.1.

Table 2.3.1. Natural communities of Fort Phoenix Beach State Reservation^a.

Community Type	System^b	State Rank^c
Cultural Grassland	T	N/A
Deep Emergent Marsh	P	S4
Maritime Beach Strand	E	S3
Maritime Dune	E	S2
Oak–Hickory Forest	T	S5
Red Maple Swamp	P	S5

a. Classified according to Swain and Kearsley (2001).

b. E = Estuarine, T = Terrestrial, and P = Palustrine in accordance with Swain and Kearsley (2001).

c. Communities are ranked from the most rare (S1) to the most common (S5); N/A indicates a cultural community, which is not ranked.

Fort Phoenix's natural communities are artificially created or heavily modified. The two maritime communities were created through a combination of filling and planting following the reservation's establishment in 1960. They lack most plant species that typify these communities elsewhere on the Massachusetts coast. The Cultural Grassland was also created through filling and planting. The shrub layer of the Oak–Hickory Forest contains abundant non-native species (e.g., multiflora rose) that reflect land use prior to the establishment of the reservation. Along the property's northern boundary, as elevation rises, the understory becomes more natural.

The palustrine (i.e., non-tidal freshwater) communities are located in the northern portion of the reservation. Much of this forested area is dominated by examples of the Red Maple Swamp community type. These wetlands extend off the

reservation onto adjacent private properties. The Deep Emergent Marsh is a near monoculture of common reed; it is located north of the Lower Lot. The hydrology of these wetland communities was largely affected by the filling of low-lying areas associated with the construction of recreation facilities in the early 1960s. As a result, neither wetland type drains to the bay.

Interior Forests. There are no interior forests.

Sea Grass. Two small patches of eelgrass, totaling approximately 2.2 acres, have been documented just offshore (CZM 2011a).

Wildlife

There is little site-specific information on the reservation's wildlife resources. Given the property's small size, level of development, function as a recreation area, and the high level of development of the adjacent landscape, these resources are likely limited.

Birds. Although no formal surveys have been conducted, 37 species have been identified. This includes a variety of sea ducks, gulls, and migratory and breeding songbirds. Please see Appendix F, Table F.2 for a list of these species.

Mammals. There is no information on the reservation's mammals. Over 40 species are known from Bristol County; many with the potential to occur on Fort Phoenix (Appendix F, Table F.3).

Reptiles. There have been no surveys of the reservation's reptiles. Although 17 species of reptiles are known from Bristol County, most are unlikely to occur on the reservation (Appendix F, Table F.3). Data from the Massachusetts Herpetological Atlas indicate that snapping turtles occur near the reservation (Jackson et al. 2010). However, their presence on the reservation is unlikely due to the lack of permanent fresh or brackish ponds.

Amphibians. There have been no surveys of amphibians. Seventeen species are known from Bristol County; some are likely to occur on the reservation (Appendix F, Table F.5). Massachusetts Herpetological Atlas data indicate that red-backed salamanders occur in the general vicinity of the reservation (Jackson et al. 2010).

They may also occur in the forested portion of the reservation. However, multiple searches failed to locate any individuals of this easily detected species (Cavanagh 2011a).

Fish. Not all of Buzzards Bay's commercially valuable fish (Table 2.2.1) occur immediately offshore of Fort Phoenix. Black sea bass, scup, and blue fish were confirmed from these waters in 2008 (DEP and DMF 2010).

The EPA has issued guidance on the consumption of fish, shellfish, and lobster caught in the vicinity of New Bedford Harbor (EPA 2010). Fort Phoenix, which is located along the eastern shore of the outer harbor, is in an area referred to as Closure Area 2. The EPA recommends consuming no more than one meal of black sea bass per month and avoiding all bottom-feeding fish from this closure area, including eel, flounder, scup, and tautog. These recommendations apply to fish caught from Fort Phoenix Beach State Reservation.

Due to the absence of permanent ponds or perennial streams, there are no freshwater fish.

Invertebrates. The commercially important shellfish of Buzzards Bay are identified in Table 2.2.2. It is unknown which of these species occur in the water immediately adjacent to Fort Phoenix.

The EPA recommends avoiding the consumption of American lobster from the waters off Fort Phoenix and eating no more than one meal per month of hard- and soft-shelled clams, mussels, and other shellfish.

There is no information on terrestrial or freshwater insects.

2.3.2. Cultural Resources

The small rocky peninsula standing sentinel over New Bedford Harbor has witnessed the birth and development of America. It has seen valuable Native American fishing grounds give way to English colonists and the violent clashes of the late 17th century that resulted. It has watched New Bedford grow from a small port town to the center of an international trade network. The struggle over American independence occurred off her shores and the picturesque spot became one of the region's most popular seaside recreation areas.

The area's most notable cultural resource, historic Fort Phoenix, is not on the reservation, but on adjacent town property. However, its history is intertwined with that of the adjacent Fort Phoenix Beach.

The first fort on the site was built in 1762, presumably in anticipation of hostilities to come during the French and Indian War. One of the first naval battles of the American Revolution took place off the shores of the fort when Nathaniel Pope and Daniel Egery captured two British ships in 1775. The fort was soon rebuilt at its present site ("Nolscot Point") to protect New Bedford. In September 1778, the fort was burned by British troops under Henry Clinton. The fort received its name soon after when it was rebuilt, like the mythological phoenix rising from the ashes. It was expanded during the War of 1812, when it repelled a British attack by sea. The fort was armed and garrisoned through the Civil War, but saw no action and was abandoned by the military in 1872 (Bernard 1975; DCR 2011).

The federal government retained ownership of the fort and adjacent beach, and in 1880, the first clambake lease was awarded, starting a tradition that would last through the next century. With the introduction of rail service in 1895, and a large steamboat pier, Fort Phoenix Beach became a premier destination for tourists throughout the northeast. Whitfield's and Grimshaw's and Brown's were some of the favorite establishments, serving meals to hundreds of customers at a sitting. In 1888, a trolley company constructed the Beacon Villa, a grand ballroom, as well as multiple bathhouses. An elaborate new Spanish Colonial-Revival bathhouse was built in 1917 at the location of the current modern bathhouse (Federal Writers' Project 1937). Hurricanes in 1938 and 1954 did substantial damage to many of the older structures. When the state acquired the property in 1959, the landscape changed once again; bathhouses and clambake pavilions were replaced with a modern bathhouse, a larger parking lot, playground, and improved beach facilities.

The expansion of recreational activities at Fort Phoenix was symbolic of the growth of what became known as the typical seaside New England vacation and continues to provide a place for families of all ages and income levels to enjoy the natural and cultural opportunities the site offers.

Archaeological Resources

There are no known archaeological sites on the reservation.

Three archaeological excavations have been conducted at historic Fort Phoenix, which is owned by the Town of Fairhaven. All three campaigns recovered significant historical features associated with the military land use history. "The archaeological resources identified at the site have archaeological integrity and important interpretive and commemorative value, and have the potential to address significant historic and archaeological research questions relating to military history, including living conditions at the fort, foodways, sanitation, military discipline and control, and land use and changes to the historic landscape over time" (Binzen et al. 2002). It is likely that extensive additional unrecorded archaeological resources exist at the site and, potentially, on adjacent DCR property.

Historic Resources

Bathhouse. The current bathhouse was designed by Colletti Brothers, Architects and constructed for the DPW's Division of Waterways; it was dedicated in 1964. This concrete building replaced an older wood frame structure. The modern style building has a flat roof and two asymmetrical wings separated by a covered central passage. The elevation facing the beach is shaded by a projecting cantilevered canopy supported by full-height diagonal struts. The bathhouse signifies a major change in the recreation landscape at Fort Phoenix Beach and reflects a larger national move towards modernist park designs, with references towards the increasingly visible Modernist Style. The National Park Service followed a similar direction through their mid-century "Mission 66" planning program, in contrast with the rustic design standards of the CCC-era (Carr 2007).

Playground Equipment. The remains of equipment designed and built as part of the Division of Waterways' development of recreation facilities at the property are located in the edge of the woods. These concrete structures feature abstract interpretations of animals molded with raised letters corresponding to the name of the animal. Examples include an ostrich bearing an "O" and a camel bearing the letter "C." These figures reflect the same

sense of abstraction and modernism in style and materials as the design of the new bathhouse (Department of Public Works of Massachusetts 1968).

Wooded Area/Rogers Estate. The wooded and mostly overgrown section of the park between the beach and NSTAR’s property is associated with the Rogers family estate. The estate is most likely that of Cara Leland Rogers, daughter of 19th century industrialist and Fairhaven benefactor Henry Huttleston Rogers. The estate was centered on an 85 room mansion with multiple porches and verandas adjacent to the public beach. Cara Leland Rogers, also known as “Lady Fairhaven,” donated the property to the town in 1926. A number of stone walls are located in the western section of the property, north of the tree line. These walls are in fair to poor condition and some are partially submerged, most likely from storm water runoff and ground water infiltration in the inlet that was filled in the early 1960s. The area also features a number of culverts and drainage features that may or not be associated with the former estate. The property includes a network of mostly unimproved trails, with the exception of one or two wider trails that are purported to be remnants of bridle trails that once traversed the estate (Avila and Thomas 2003).

Boundary Markers. Approximately a dozen triangular concrete bollards are located at the eastern property boundary, near the shore. These former fence posts were most likely property boundary markers dating from the first part of the 20th century.

Site of U.S. Navy Beacon. The dramatic stone formations that make up Fort Phoenix’s natural boundary to the sea retain evidence of a naval beacon that once stood at the site. (See Section 2.3.1 for information on the site’s geology.) Constructed in 1848, the unique pyramidal beacon originally stood approximately 40 feet high and was topped with a reflective globe. The beacon was destroyed in the 1938 hurricane but a number of foundation bolts remain. In addition, graffiti dating to the 1850s is still evident in places, including the names of 8–10 men, some associated with the military and recreational history of the site (Gillingham et al. 1903).

This resource is not on DCR-owned property, but on a federally-owned inholding.

2.3.3. Recreation Resources

Fort Phoenix offers a variety of recreational opportunities. Most, such as swimming, sun bathing, tennis, basketball, volleyball, horseshoe pitching, and grilling are facility-based. Non-facility-based recreation includes dog walking, fishing, kite flying, picnicking, feeding wildlife (e.g., gulls, geese, and rock pigeons), and socializing. See Figure 2.3.1 for locations of the reservation’s recreation facilities.

A seasonally guarded waterfront area is located immediately seaward of the bathhouse. This beach is classified as a marine beach by the Massachusetts Department of Public Health (MassGIS 2005); indicating that it is a coastal swimming beach open to the public. Lifeguards are present from mid-June through early-September. Swimming is allowed “at your own risk” outside of this period. Water quality is sampled weekly during the swim season, in accordance with state law. (See Section 3.3.3 for additional information.) On average, the beach is closed once per season due to insufficient water quality (Table 2.3.2). However, since 2003 the number of closures has ranged from zero to two per year. Only four (44.4%) of the closures were associated with storm events, indicating that factors other than storm water are also impacting water quality.

Table 2.3.2. Water quality sampling and associated beach closures at Fort Phoenix, 2003–2011^a.

Year	# Samples	# Exceeding Standards	# Beach Closures ^b
2003	7	0	0
2004	11	0	0
2005	15	1	1
2006	17	2	2
2007	18	4	2
2008	15	1	1
2009	21	4	2
2010	16	1	1
2011	15	0	0

a. Data from Massachusetts Department of Public Health (2011).

b. Because multiple samples may be taken during a single beach closure, the number of samples exceeding state standards does not always equal the number of closures.

Universal access to the beach is provided two ways. First, a wooden boardwalk from the bathhouse provides an accessible approach to the edge of the dunes. An abrupt change in grade, between the boardwalk and beach, prohibits further access to the

beach. Second, a beach wheelchair is available for visitor use; it provides full beach access.

A sun shelter (i.e., pavilion) with picnic tables is located to the west of the bathhouse. The bathhouse and this shelter provide visitors their only protection from sun or rain. Both buildings are also used for the playing of, and listening to, live music. The sun shelter and adjacent beach are also used for wedding ceremonies. Locations of these buildings, and other recreation facilities, are indicated in Figure 2.3.1.

To the north of the sun shelter is a cluster of tennis, basketball, and volleyball courts; all are in good repair, although the surfaces of the tennis courts are cracking and in need of preventative maintenance. The tennis courts are surrounded by a 10-foot-high vinyl covered chain-link fence; there is no fencing around the other two courts. Two benches are located next to the tennis courts, within the fenced-in area. The reservation's only bike rack is located south of, and adjacent to, the tennis courts. This rack accommodates far fewer than the 35 bikes recommended for a recreation facility with 353 vehicle parking spaces (Metropolitan Area Planning Council 2010).

Tennis courts are used seasonally, from mid-May through mid-October. Typically, these courts are used in the mornings; afternoon play is difficult due to winds off the bay. The basketball and volleyball courts are also used seasonally, receiving peak use during the summer beach season.

A multi-use court, originally intended for volleyball and badminton in the summer and ice skating in the winter, is located immediately east of the athletic courts. It has a 165 foot by 85 foot paved surface, with a 3-foot-high by 24-foot-long chain-link fence on two ends. This court has not been flooded for ice skating for several winters. Unlike the other courts, the multi-use court is in fair condition and rarely used.

A playground, constructed in 2000 and in good repair, is located immediately east of the bathhouse. Pieces of a previous playground, consisting of steel reinforced concrete animals, have been dumped along the tree-line approximately 200 feet north of the current playground; they are visible to the public. (See Section 2.3.2 for additional information on the previous playground pieces.)

Five cooking grills are located on a grassy area immediately north of the Lower Lot (Figure 2.3.1). All are in good condition; however, they are situated in a low spot, where the soil becomes saturated by rain. Picnic tables are provided for each grill, however they are often redistributed by park visitors. A pair of horseshoe pits is located in the same grassy area as the grills.

Fifteen benches, including two memorial benches, are located on a grassy area just south of the Upper Lot. Additional benches are located to the west, on Town of Fairhaven property.

There is one known geocache and one letterbox at Fort Phoenix Beach State Reservation. Two geocaches are located on nearby public land; one each at historic Fort Phoenix and the hurricane barrier.

2.3.4. Infrastructure

Property Boundary. The boundaries are largely marked. Corners of the original acquisition (1960) are marked with a combination of bounds, drill holes, and an iron fence post. The boundaries of the 1984 acquisition are unmarked. They are approximately 124 feet east of Laurel Street on the west and approximately 124 feet south of Doane Street to the north. The abutting property along Doane Street (i.e., NSTAR's property) has been proposed for a four house subdivision (Perdue 2009). The eastern boundary abuts numerous parcels of private undeveloped land. Multiple encroachments appear to have occurred along the reservation's eastern boundary near James Street. Under the Massachusetts Public Waterfront Act, the seaward (i.e., southern) boundary of the reservation is the historic mean low water line. (See Chapter 91; Appendix D.)

The U.S. Government owns an approximately 3,900 square-foot (i.e., 0.09 acre) in-holding along the shore, to the south of Green Street (Figure 2.3.1). The Commonwealth ceded this property to the federal government in 1847 for use as the site of a survey beacon. (See Cultural Resources, above and Appendix G for additional information.)

A 30-foot-wide utility easement, held by NSTAR, passes through the reservation. This 0.85 acre easement begins at Green Street, passes south of the athletic courts, and follows the edge of the tree-line

to a parcel of NSTAR property east of the reservation (Figure 2.3.1).

Buildings and Structures. There are three buildings: a small, hexagonal contact station; an octagonal sun shelter; and a bathhouse. Locations of these buildings are shown in Figure 2.3.1.

The contact station is 4-foot-wide on a side, constructed of wood framing and sheathing, and has an asphalt shingle roof. There is no foundation. The contact station's condition is classified as Poor; in need of renovation. The date of construction is unknown.

The sun shelter, constructed circa 1985, is located to the west of the bathhouse. It is approximately 13.5 feet on a side, has wooden framing and sheathing, and an asphalt shingle roof. This is considered a small picnic pavilion under 801 CMR 4.02 (see Appendix D). The shelter sits atop a poured concrete slab. It is universally accessible. The shelter's condition is classified as Adequate; in need of corrective and preventative maintenance. This condition assessment is largely due to corrosion of the metal plates and hardware that connect the shelter's wooden structural elements.

The bathhouse, which was opened in 1964, is 45 feet by 117 feet in area and has metal framing and poured concrete walls atop a concrete foundation. It consists of two sections, a western wing and an eastern wing, connected by a 24-foot-wide open hallway-like central passage. The western wing measures 45 feet by 62 feet and contains accessible changing rooms and bathrooms. A water fountain and external showers are located on the southern wall of this section; water from these showers drains into the building. The eastern wing measures 31 feet by 45 feet and contains office space, a first aid room, and a one-bay garage. The entire building is connected to municipal water and sewer. Its condition is classified as Adequate; in need of corrective and preventative maintenance.

A system of catch basins and pipes collects and conveys storm water from roads and parking areas into Buzzards Bay. There are six catch basins: two at the intersection of Old Fort Road and Green Street; two in the Upper Lot; one along the administrative road near the northwest corner of the bathhouse; and one in the southeast corner of the staff parking lot. Each catch basin is stenciled "Don't dump, save our

bay" in yellow paint; a silhouette of a fish accompanies the text. All catch basins connect to two manholes near the southwest corner of the bathhouse via a series of concrete pipes. Two concrete pipes, each approximately 200 feet long, convey the storm water from the manholes into Buzzards Bay. The outlets of these pipes are concealed inside a rock groin.

In recent years, portions of the pipe between the administrative road catch basin and the manholes have been obstructed by tree roots, resulting in flooding of the administrative road, northern portion of the bathhouse, and adjacent lawn. Maintenance was performed in May of 2011 and the drainage system is now fully functional; bi-yearly maintenance is required to retain this functionality (Valton 2011).

Three rock groins project southward from the reservation's beach. The first is located south of the bathhouse and is approximately 100 feet long; this groin conceals the discharge pipes for the storm water system. The second groin is located south of the western edge of the Lower Lot; it is approximately 170 feet long. Both of these groins were constructed as part of the initial reservation development between 1959 and 1964. The third groin is located along the reservation's eastern boundary; it is approximately 180 feet long. This groin was constructed ca. 1968 as part of facilities improvements.

Roads. A single administrative road (1,017 feet long) extends from the northeast corner of the Upper Lot, eastward past the bathhouse, to the Lower Lot (Figure 2.3.1).

Parking. There are four public parking areas; all are paved (Figure 2.3.1). Two are open year-round. The other two lots are located within the gated portion of the administrative road and are only open on a seasonal basis. None of the parking lots are illuminated.

The first lot is a small parking area immediately east of historic Fort Phoenix. Its entrance is located at the intersection of Fort Street and Old Fort Road. There are four designated accessible spaces and 19 other spaces; all have pavement markings. The markings of the accessible spaces are not compliant with the Americans with Disabilities Act (ADA). Although a

gate is present at the lot entrance, this lot is generally open.

The second lot, referred to as the Upper Lot, is located immediately south of Old Fort Road. It has two entrances, the first at the southern extension of Green Street and the second off of the park's administrative road. Individual spaces are not marked and there are no designated accessible spaces. The estimated capacity of this lot is 119 cars. There are no traffic control devices at either entrance or within the parking lot. This lot is open during the day; the Fairhaven Police Department closes and locks the gate at 10:00 P.M. This lot's gates are rotted and, although previously repaired, in need of replacement.

The third lot, referred to as the HP Lot, is located immediately north of the bathhouse. There are three designated accessible spaces; associated pavement markings, signs, and aisles are not ADA compliant. Access to this lot is regulated by daily and seasonal closures of the administrative road's gate.

The fourth lot, referred to as the Lower Lot, is located on the reservation's east side. Individual spaces are not marked and there are no designated accessible spaces. The estimated capacity of this lot is 215 cars. Access to this lot is also regulated by seasonal gate closure. The surface of this lot is pitched so that storm water runs from the lot into the designated swim area. There are numerous cracks in the pavement, with plants growing through these cracks.

In addition to public parking, there is a non-public parking lot located east of the bathhouse. It is used for DCR vehicles and equipment, and staff parking. During the summer the capacity of the lot is insufficient, with some staff parking on the lawn adjacent to the bathhouse.

Trails. Although a historic carriage road is located in the forested (i.e., northern) portion of the reservation, there are no formal trails. Visitors have created an informal trail network, including footpaths through the dunes and along the carriage road. Preliminary estimates indicate 0.94 miles of these trails.

A bikeway/harbor walk around New Bedford Harbor, from the hurricane barrier in New Bedford to the hurricane barrier in Fairhaven, has been proposed (Fort Point Associates, Inc. et al. 2009).

This trail system would include historic Fort Phoenix and Fort Phoenix Beach State Reservation. Because a dedicated pedestrian or bicycle corridor is not feasible, an open space network connected by streets has been proposed.

Kiosks and Signs. A Main Identification Sign is located west of the entrance to the Upper Lot, along Old Fort Road (DCR n.d.a). A kiosk is adjacent to, and south of, the gated entrance to the administrative road (Figure 2.3.1). The western side of the kiosk, which faces the Upper Lot, has a locking bulletin board. The back of the kiosk bears an obsolete map of Department of Environmental Management (DEM) forests and parks. Numerous metal and wood Regulatory Signs (e.g., "No golf") are attached to a wooden guardrail in front of this kiosk. The locations and materials of these signs do not meet DCR graphic standards (DCR n.d.a).

A variety of standard and non-standard Regulatory, and Rules and Regulation signs (DCR n.d.a) are located at the entrance to the Lower Lot and on the nearby entrance to the beach.

Markings on all gates are inconsistent with DCR graphic standards (DCR n.d.a).

Lead-in Signs (DCR n.d.a) are present, directing motorists to the park from both Route 6 and Route 240. There are no Lead-in Signs to direct cyclists and pedestrians from the Phoenix Bike Trail to the park.

Memorials and Markers. Two memorials and one marker are known from the reservation. The memorials are in the form of plaques attached to benches in the southwest corner of the reservation; they are in memory of Danielle Bruno Templeton and Ken Paulsen.

The one known marker is a metal plaque that commemorates the dedication of the Fort Phoenix bathhouse in 1964. It reads, in part, "The Commonwealth of Massachusetts, Department of Public Works, Division of Waterways; Fort Phoenix Beach Reservation, Dedicated 1964."

A variety of markers are located on the Town of Fairhaven's historic Fort Phoenix property. An additional memorial is located along Fort Street immediately south of the entrance to the Army Corps of Engineers' New Bedford-Fairhaven Hurricane Barrier.

2.4. NASKETUCKET BAY STATE RESERVATION

Nasketucket Bay State Reservation is located in the towns of Mattapoisett (209.7 acres) and Fairhaven (1.6 acres). For millennia, Native Americans and later, European colonists, were drawn to the area's coastal resources and protected waters. In the 19th and 20th centuries, the land was used for agricultural purposes. Stone walls and the foundation of a 19th century farmhouse attest to the property's agricultural past.

In the late 1980s, a golf resort and residential community was proposed for a 435 acre site that included what is now the reservation. Following a decline in the real estate market, this proposal was abandoned and a smaller residential community proposed (Epsilon Associates, Inc. 2000). As part of this development, a one-mile-long roadway, drainage systems, and detention basins were constructed. Stumps and soils associated with land clearing were stockpiled on site.

In 1999, the Commonwealth of Massachusetts acquired 213 acres through a friendly taking and added it to the state park system. Initial management efforts focused on remediating development impacts (e.g., restoring the road corridor) and establishing infrastructure for passive recreation (e.g., parking and trails).

Nasketucket Bay State Reservation was acquired to protect scenic features, natural resources, and cultural resources and to provide visitors with an attractive, safe, and welcoming destination (DEM 2000). The property's undeveloped 3,400-foot-long coastline continues to provide visitors with a sense of solitude that is uncommon along Buzzards Bay.

2.4.1. Natural Resources

The reservation's resources quickly transition from ocean edge, to ocean influenced, and finally to interior forests, fields, wetlands, and wildlife. Tides, wind, and salt spray exert a strong selective pressure on the plants and animals living along the shore and adjacent forests. Farther inland, and upslope, the reservation's resources are beyond both direct and indirect marine influence and are similar to wetlands and forests found throughout the interior of southeastern Massachusetts.

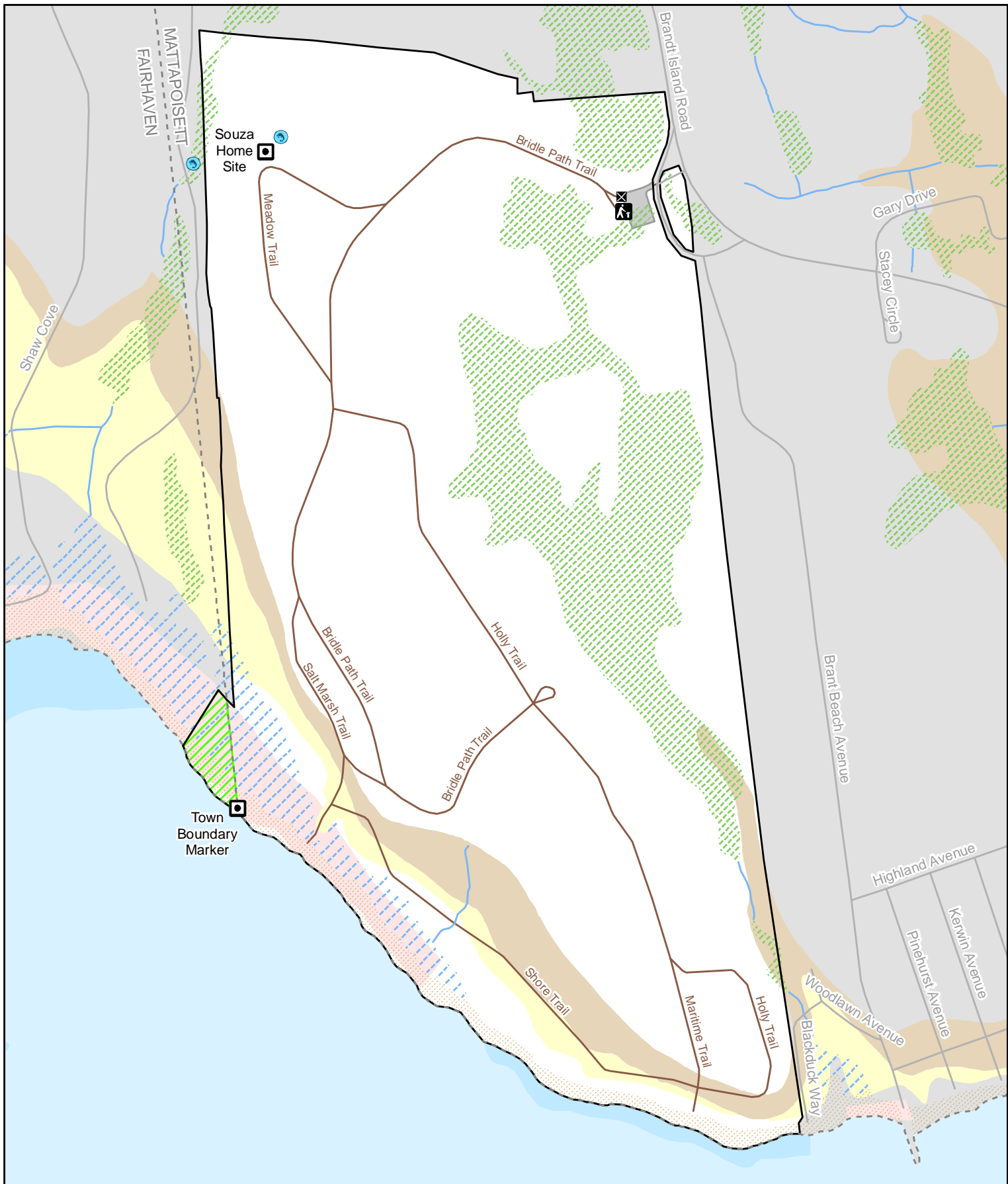
Physical Features

Topography. Elevation ranges from sea level along the shore to approximately 44 feet above sea level in the cultural grassland. There is a general pattern of increasing elevation from west to east and from south to north (i.e., moving away from the ocean). Approximately 63.9% of the reservation, including the parking lot, kiosk, and most of the trails, are located more than 20 feet above sea level. Infrastructure associated with salt marshes (i.e., culverts) is at or below sea level.

Barrier Beaches. A single barrier beach extends from approximately the midpoint of the reservation's shore, northward to Shaw's Cove (Figure 2.4.1). Salt marshes are present on the landward side of this beach.

Geology. The reservation is underlain by alaskite, a pale granite, and covered by a drumlin field and till deposits (Skehan 2001). Boulders and cobble from these deposits are present in the intertidal zone along the southern shore.

Soils. Nasketucket's soils (Table 2.4.1) are arranged in bands running approximately northwest to southeast. The largest consists of well-drained upland soils that extend from the grassland in the north to the reservation's southeastern shore. These soils are considered "somewhat limited" for paths, trails, and picnic areas (Roffinoli and Fletcher 1981). To the east are poorly and very poorly drained sandy loams and Swansea peat; soils associated with freshwater wetlands. They are considered "very limited" for paths, trails, and picnic areas (Roffinoli and Fletcher 1981). Ipswich-Pawcatuck-Matanuck soils, which underlie salt marshes, form a narrow band along much of the shore.



Legend

- NHESP Certified Vernal Pool
- X Gate
- K Kiosk
- H Historic Resource
- Trail
- Public Road
- Stream
- 100-Year Flood Zone
- 500-Year Flood Zone
- Salt Marsh
- Wooded Marsh
- Beach
- Open Water
- Tidal Flat
- Barrier Beach
- Town Boundary
- Nasketucket Bay State Reservation
- Fee Interest
- Conservation Restriction

Nasketucket Bay State Reservation

Figure 2.4.1.

0 250 500 Feet

Geographic data supplied by the Office of Geographic Information (MassGIS) and DCR GIS.

DCR GIS May-12

Table 2.4.1. Soils of Nasketucket Bay State Reservation.

Soils	%	Comment
Beaches	2.2	Inundated daily, tidal
Birchwood loamy sand, very stony	11.5	Moderately well drained
Brockton sandy loam	10.9	Very poorly drained
Canton-Chatfield-Rock outcrop complex	0.7	Well drained
Ipswich-Pawcatuck-Matunuck complex	3.4	Inundated daily, tidal
Massasoit-Mashpee complex	0.1	Somewhat poorly drained
Mattapoisett loamy sand, extremely stony	28.8	Somewhat poorly drained
Montauk fine sandy loam (including very stony)	4.8	Well drained
Pawcatuck and Ipswich peats	0.3	Very poorly drained
Poquonock sand, very stony	0.9	Well drained
Ridgebury fine sandy loam	1.3	Poorly drained
Scituate gravelly sandy loam (including very stony)	36.3	Moderately well drained
Swansea peat	3.2	Very poorly drained
Woodbridge fine sandy loam, very stony	8.9	Moderately well drained

Water Resources

Ponds. There are no known ponds.

Wetlands. There are approximately 6.3 acres of salt marsh and 31 acres of red maple swamp. The former is located along the western edge of the reservation; the latter extends from north to south along its interior, to the east of the Holly Trail (Figure 2.4.1).

Vernal Pools. There is one certified vernal pool; it is located on the northeast edge of the grassland (Harper 2011). An additional vernal pool is located just beyond the reservation's western boundary (Figure 2.4.1).

Streams. There are two perennial streams. The first is located along the southwest side of the reservation (Figure 2.4.1). It discharges into the lower salt marsh and originates approximately 550 feet upslope in the woods. A second stream is located along the eastern boundary of the reservation, near the intersection of Woodlawn Avenue and Black Duck Way. This stream drains water from the large forested wetlands on the reservation's east side into Buzzards Bay.

Groundwater. There are no known aquifers.

Flood Zones. A 100-year flood zone forms a narrow band along the coast, largely paralleling the shore. It covers approximately 24.5 acres (11.7%) of the

reservation (Figure 2.4.1). The 500-year flood zone extends further inland (i.e., upslope) than the 100-year zone; it covers an additional 13.7 acres (6.5%). It also extends upstream into the reservation's wetlands, along the stream near the intersection of Woodlawn Avenue and Black Duck Way.

Hurricane Inundation. The rapid increase in elevation as you move away from the shore results in a relatively low level of inundation, as compared to other properties within the Fort Phoenix Planning Unit.

The hurricane inundation map for the Town of Mattapoisett indicates that only 11.7% of the reservation will be inundated by Category 1 and 2 hurricanes (USACE 1994b). The affected areas are the salt marsh, shoreline and immediately adjacent areas, and a stream bed in the southeast corner of the reservation. A Category 3 hurricane is predicted to result in the inundation of 18% of the reservation, and a Category 4 hurricane 27%. Most of the reservation is not subject to inundation.

These predictions are based on worst case scenarios and assume the most damaging track and tide height when a hurricane makes landfall.

Sea Level Rise. It is likely that the magnitude of recent sea level rise at Nasketucket Bay State Reservation is similar to the 0.86 feet/century recorded at Woods Hole (NOAA 2008).

Land below 1.5 meters (4.9 feet) in elevation is considered vulnerable to sea level rise because "as a general rule, it is reasonable to assume that the area ... is at risk of tidal inundation from the projected rise in sea level over the next century, and is likely to be inundated within the next 2 centuries" (Titus and Richman 2001). Little of the reservation, chiefly the salt marsh and immediate shoreline, is below 1.5 meters.

The Massachusetts Natural Heritage and Endangered Species Program (NHESP) identified the uplands adjacent to the reservation's salt marsh as important for coastal adaptation to sea level rise (NHESP 2010). Such areas have a "high potential to support inland migration of salt marsh and other coastal habitats over the coming century" (NHESP 2010).

Wind

A study conducted between May 1, 2006 and April 20, 2007 identified a mean wind speed of 12.8 mph at 161 feet (49 meters) above the ground (Henson et al. 2007). The prevailing wind direction was from the south-southwest.

Rare Species

Four state-listed species, three terns and the eastern box turtle, are known from Nasketucket Bay State Reservation (Table 2.4.2). All three species of terns are known to forage in the waters off the reservation; none are known to nest on the property. There are no known state-listed plants.

Table 2.4.2. State-listed species of Nasketucket Bay State Reservation, as identified by the NHESP^a.

Species	Type ^b	MESA ^c
Common tern ^d	B	SC
Eastern box turtle	R	SC
Least tern ^d	B	SC
Roseate tern ^{d,e}	B	E

a. From Harper (2011). See text for state-listed species observed on the reservation but not included in the NHESP database.

b. Types of state-listed species include B = Bird and R = Reptile.

c. Status of species listed under the Massachusetts Endangered Species Act (MESA): E = Endangered; SC = Species of Special Concern; and T = Threatened.

d. Use waters adjacent to the reservation for foraging.

e. This species is also listed as Endangered under the U.S. Endangered Species Act.

One additional state-listed species, the sharp-shinned hawk (a Species of Special Concern), has also been observed on the property (e.g., Lash 1998). There are no records in the NHESP database for this species at this location.

Vegetation

The vegetation of Nasketucket Bay State Reservation is the best known of any of the properties in the planning unit. An ecological inventory conducted shortly after the property was acquired identified 123 species of plants (Epsilon Associates, Inc. 2000). An additional 21 taxa have since been identified (Appendix F, Table F.1). Although this information begins to describe the flora, it is likely that most of the reservation's plants have yet to be identified.

Invasive Species. The following eight species of invasive plants are known from the reservation.

- Japanese barberry
- Oriental bittersweet
- Autumn olive
- Black locust
- Reed canarygrass
- Common reed
- Glossy buckthorn
- Multiflora rose

Spotted knapweed, which is classified as “Likely Invasive,” is present in the cultural grassland.

Most invasive plants are associated with the Bridle Path Trail, cultural grassland, and forest openings; areas disturbed prior to the acquisition of the property. Black locust and barberry are associated with forests and common reed is primarily associated with the salt marshes.

Natural Communities. Seven communities have been identified; they are listed in Table 2.4.3.

Table 2.4.3. Natural communities of Nasketucket Bay State Reservation^a.

Community Type	System ^b	State Rank ^c
Coastal Forest/Woodland ^d	T	S3
Cultural Grassland	T	N/A
Maritime Beach Strand	E	S3
Maritime Dune	E	S2
Red Maple Swamp ^e	P	S5
Salt Marsh ^{d,e}	E	S3
Woodland Vernal Pool	T	S3

a. Classified according to Swain and Kearsley (2001).

b. E = Estuarine, T = Terrestrial, and P = Palustrine.

c. Communities are ranked from the most rare (S1) to the most common (S5); N/A indicates a cultural community, which is not ranked.

d. Fact sheets for these communities are available at www.mass.gov/dfwele/dfw/nhesp/natural_communities/fact_sheets.htm.

e. The extent of this community type may be greatly expanded (>50%) in Massachusetts in response to climate change (Manomet and DFW 2010; Low Emission Scenario).

The estuarine communities are located along the narrow margin on the reservation's west side where the land meets the sea. The salt marsh has been altered, divided in two for cart path access to the shore and ditched for mosquito control. The other estuarine communities are intact. Red Maple Swamps are common on the eastern half of the reservation, in association with the poorly and very poorly drained sandy loams and peats described

above. Terrestrial communities, chiefly the Coastal Forest/Woodland community type, are found throughout the remainder of the property.

Interior Forests. There are no interior forests.

Sea Grass. Eelgrass beds extend from just offshore of the southern third of the reservation, to the waters south and east of Brant Island. Additional eelgrass beds have been identified elsewhere in Nasketucket Bay, including the areas south of Nuland's Neck and east of Sconticut Neck.

Wildlife

Given the diversity of natural communities, it is likely that Nasketucket Bay State Reservation provides habitat for a variety of breeding, resident, and migratory wildlife. However, only preliminary information is available. Because of this, the importance of this property to local and regional wildlife conservation cannot be fully assessed.

Birds. Despite few formal surveys, 64 species of birds have been recorded (Appendix F., Table F.2). Breeding Bird Atlas data for the survey block that includes this property suggest that additional species are likely present (USGS and MAS 2011).

Mammals. Five species of mammals have been confirmed: eastern gray squirrel, eastern chipmunk, coyote, raccoon, and white-tailed deer. Thirty-six additional species are known from Bristol and Plymouth counties; several of which may occur on the reservation (Appendix F, Table F.3).

Reptiles. Ecological inventories (Epsilon Associates, Inc. 2000) identified two species of snakes and one species of turtle (Appendix F, Table F.4).

A DeKay's brown snake was observed in a dry vernal pool and a common gartersnake was observed in the cultural grassland. North American racers, eastern hog-nosed snakes, and milksnakes may also be present, but have gone undetected (Epsilon Associates, Inc. 2000).

Eastern box turtles, a Species of Special Concern, were observed in 1999 (Epsilon Associates, Inc. 2000) and again in 2011 (Sheynin 2011). The abundance and distribution of this species on the reservation is unknown. Its presence has resulted in most of the reservation (97.2%) being classified as Priority Habitat.

Spotted turtles have been recorded in the survey block in which the reservation is located (Jackson et al. 2010). These turtles use a variety of wetland and upland habitats throughout the year. The reservation's vernal pool, red maple swamps, and adjacent uplands may meet some of their habitat needs. Because of this, these turtles may periodically occur.

Amphibians. Five species of frogs or toads have been confirmed (Appendix F, Table F.5). Green, pickerel, and wood frogs inhabit the lone certified vernal pool. The latter species may also be found in upland forested areas. Spring peepers and American toads have also been observed on the reservation.

Two salamanders, the spotted and eastern red-backed, occur on the reservation. The former breeds in the reservation's vernal pool (Epsilon Associates, Inc. 2000) and the latter is present throughout reservation's forests (Cavanagh 2011a).

Fish. Commercially valuable fish common to Buzzards Bay are identified in Table 2.2.1. There is no information on the use of the reservation's salt marshes by fish.

Nasketucket Bay is outside of the closure areas associated with the contamination of New Bedford Harbor. There is no EPA guidance on the consumption of fin fish from this bay.

Due to the absence of permanent ponds or perennial streams, it is unlikely that freshwater fish are present.

Invertebrates. Nasketucket Bay "appears to be healthy in terms of shellfish and sediment quality" (Rogue Wave Field Services (RWFS) 2011). Water quality is considered good for shellfish production and the area supports varying shellfish in slight to moderate abundances (Churchill 2009). Hard-shelled clams, bay scallop, and channeled whelk are found throughout the bay; soft-shelled clams are less abundant. An assessment of shellfish habitat conducted immediately offshore of the reservation revealed a sandy substrate with red and green algae (*Gracilaria* sp. and *Codium* sp., respectively), slippersnails (*Crepidula* sp.), blood ark clams (*Anadara ovalis*), and quahog shells (data from stations 79–81; RWFS 2011).

The waters adjacent to the reservation are within the Nasketucket Bay shellfish growing area (BB21;

Churchill 2009). There is no EPA guidance on the consumption of shellfish from this bay because it is outside of the area affected by the contamination of New Bedford Harbor. An aquaculture grant, for the production of eastern oysters, has recently been proposed for a two acre the portion of the bay located approximately 200 feet off the reservation's Mattapoissett coast (O'Dowd 2011).

There is no information on terrestrial or freshwater insects.

2.4.2. Cultural Resources

The lands around Nasketucket Bay, like many early settlements along Buzzards Bay, saw its English population increase following King Phillip's War, when members of the Plymouth Colony were drawn by the same resources that attracted Native Americans: abundant fish and shellfish and sheltered harbors. In 1679, 30 settlers were granted the lands of "Sippican," which included Nasketucket Bay (Shultz and Tougias 1999). The area was part of the Town of Rochester in 1686 and remained part of the town until Mattapoissett was founded in 1857. Throughout the 18th and 19th centuries, many communities around Mattapoissett were involved in trades supporting the shipbuilding industry. The area comprising the reservation, however, appears to have been sparsely populated compared to the more densely developed area around Mattapoissett Harbor. The peninsula, located between Sconticut Neck and Mattapoissett Neck is referred to on one 1907 map as "Antassawommack Neck" (Stiles 1907). The land has historically been associated with the 20th century Nunes Farm, although historic maps indicate the location of a "Souza" residence at the site of the extant cellar foundation. The abundance of stone walls and records of sparse settlement (i.e., Geo. H. Walker and Co. 1879) suggests that the area has traditionally been a predominantly agricultural community.

With the arrival of the railroad in the 1870s, the area from Fairhaven to Marion developed in the late 19th century as an exclusive summer resort for Boston and New York's upper classes. The arrival of notable figures, such as Oliver Wendell Holmes, Grover Cleveland, Robert Lowell, and Henry James, changed the character of the area from shipbuilding industry to leisure resort. However, it appears that the land making up the reservation did not see the influx of building as did the surrounding areas,

including the nearby Brant Island Cove (Wood 1995).

Development pressure in the 1980s and 90s saw a number of serious attempts to convert the property to residences, culminating in the Commonwealth's purchase of 213 acres, ensuring their preservation. The first steps of development, the layout of roads and intersections and the infrastructure of wetland remediation, can be seen today as a vivid reminder of the relatively modern cultural tradition of identifying and preserving selected unique areas for the enjoyment of the public (Alpha Land Surveying and Engineering Associates 1999).

Archaeological Resources

One post-Contact site has been recorded. It was identified in 1990 during a walk-over survey for the proposed Mattapoissett Residential Golf Community. It consisted of one felsite flake found on the ground's surface.

Historic Resources

Souza Home Site. The most significant built structure on the property is the remnants of a residential property on what is referred to as the Nunes Farm (Figure 2.4.1). The date of the foundation is unknown, although physical evidence suggests the early to mid-19th century. An 1879 map indicates a house on the same site, owned by a "Souza" family and a 1903 map labels the site as "Andrews" (Judson 1903). The foundation is composed of large granite slabs and rubble fieldstone. The site is in poor condition, but retains a large hearth foundation and the front and rear granite slab stairs. Stone foundation and wall remnants of a demolished 20th century horse barn lie adjacent to the house foundation. The barn does not retain any visual integrity.

Souza Home Site Landscape. While the field adjacent to the cellar hole has experienced a great deal of overgrowth, enough integrity remains to convey some of the visual association with the site's agricultural past. Edged by stone walls in good condition, the field also features views to the north to an adjacent farm that is currently in operation.

Circulation Paths. The main trail accessing the park was most likely a cart path to access the Souza home site. The road has been altered significantly over the past 25 years, both as part of the initial stages of a

planned residential development in the 1980s, as well as during environmental remediation during the 1990s (Alpha Land Surveying and Engineering Associates 1999).

Town Boundary Marker. A stone boundary marker noting the boundary between Fairhaven (Bristol County) and Mattapoisett (Plymouth County) is located at the shore near the reservation's western boundary (Figure 2.4.1).

2.4.3. Recreation Resources

Most recreation activities are trail based, including hiking, horseback riding, dog walking, mountain biking, nature study, cross-country skiing, and snowshoeing. Hunting takes place throughout the reservation.

There are two geocaches; one near the southern intersection of the Bridle Path and Holly trails, and the second along the reservation's southern shore.

Unauthorized off-highway vehicle (OHV) use occurs along the trails and in the cultural grassland.

2.4.4. Infrastructure

Property Boundary. The boundaries were surveyed in 1996; they are largely without permanent bounds. Stone walls were used to identify many of the property's boundaries. Under the Massachusetts Public Waterfront Act, the seaward boundary of the reservation is the historic mean low water line. (See Chapter 91; Appendix D.)

There is no obvious encroachment along either the eastern or northern boundaries.

A multi-partner coalition, including the DCR, is working to protect an additional 208 acres along Nasketucket Bay and Brant Island Road, including a 121 acre expansion of the reservation (CZM 2011).

Buildings and Structures. There are no buildings. One structure, the Souza farmhouse foundation, is a historic resource. Additional information on this resource was provided above in the Cultural Resources section (Section 2.4.2).

There are four corrugated metal culverts under the trails; three under the Bridle Path Trail and one under the Salt Marsh Trail. These culverts were installed circa 2002, all are in good repair.

There are two culverts in the salt marsh. The first, a corrugated metal pipe, connects the upper marsh to

Nasketucket Bay; this culvert is partially obstructed by sediments. The second culvert, a 3-foot-high by 6-foot-wide precast concrete box culvert, connects the upper marsh to the lower marsh (Epsilon Associates, Inc. 2002a). This culvert is located beneath the Salt Marsh Trail and provides beach access for emergency vehicles.

Several monitoring wells are located throughout the reservation, including along the Salt Marsh and Holly trails. The history, number, and locations of these wells are unknown. Many of the wells observed during a site visit were uncapped or unlocked, permitting direct injection into the groundwater.

A meteorological tower was erected on the reservation in 2006 by the Massachusetts Renewable Energy Research Laboratory acting on behalf of the Town of Mattapoisett (Wright 2005). The tower and associated instrumentation were removed in 2007 (Henson et al. 2007). There is no evidence of the former presence of this tower.

Roads. A single road corridor was cleared as part of the site development for an anticipated housing project. This corridor was approximately one-mile-long and ranged from 45 to 100 feet in width (Epsilon Associates, Inc. 2000). Creation of this roadway resulted in the loss of approximately nine acres of forest. Although largely revegetated, this roadway remains the reservation's most obvious landscape feature. The Bridle Path Trail is located along this roadway (Figure 2.4.1).

Parking. A single parking lot is located at the reservation entrance near the northern intersection of Brant Island and Old Brant Island roads (Figure 2.4.1). It is divided into two sections; a gravel section and a turf-surfaced section. The gravel section, which is approximately 0.25 acres, is covered in crushed stone. The turf-surfaced section, which is intended for overflow and trailer parking, covers approximately 0.33 acres. The location and capacity of this lot were selected to promote passive recreation while maintaining a sense of visitor solitude (DEM 2000).

Trails. Several trails, including two cart paths, foot trails, and an access road constructed for a proposed development were present at the time the reservation was acquired. The current trail system is largely based on these pre-existing trails (Figure 2.4.1).

Preliminary data indicate approximately 2.90 miles of marked trails (Table 2.4.3). In addition, a 0.03 mile segment of trail connects the parking lot to the Bridle Path Trail. Dog waste is common.

Table 2.4.3. Official trails of Nasketucket Bay State Reservation.

Trail Name	Length (miles)
Bridle Path Trail	0.99
Holly Trail	0.78
Maritime Trail	0.13
Meadow Trail	0.30
Salt Marsh Trail	0.26
Shore Trail	0.40

In addition to its recreation function, the Bridle Path Trail also serves as the main access path for park operations and emergency vehicles.

The northern half of the Shore Trail passes through wet areas that are frequently muddy. Logs and boards are used in some locations to provide a walking surface above the mud. These structures are inadequate, in poor repair, and do not meet the DCR's trail standards (DCR 2010).

Social trails lead into the reservation from adjacent properties to the north and east. There are no connections to long-distance trails. The only long-distance trail in the region, the Mattapoisett Rail Trail, crosses Brant Island Road approximately 0.4 miles north of the park entrance. This rail trail connects to the Phoenix Bike Trail in Fairhaven, which ends at New Bedford Inner Harbor.

Kiosks and Signs. A kiosk is located adjacent to the parking lot, at the connector to the Bridle Path Trail. A locking bulletin board was added to this kiosk in 2011 (Figure 2.4.1).

A Main Identification Sign (DCR n.d.a) is located at the intersection of Brant Island and Old Brant Island roads. It faces north so that it is visible to southbound traffic. Signs directing visitors from Route 6 to the reservation's parking lot were installed in 2011.

Many, but not all, trail intersections are marked with brown, wooden signs with white letters. These signs are consistent with the DCR's *Trail Guidelines and Best Practices Manual* (DCR 2010). There are no reassurance markers or blazes along the trails.

Memorials and Markers. Acquisition of the property carried with it a requirement for

establishing a memorial in honor of Manuel R. Nunes, Jr., a former property owner (Livingstone et al. 1997). A site plan for the property identifies the location of the "Nunes Memorial" as north of the entrance trail, opposite the kiosk (Horiuchi & Solien 2002). A rectangular gray granite monument, 6 by 18 by 48 inches, is present at this location. The site plan indicates that this monument bears a 12 inch by 12 inch bronze plaque; there is no plaque. The only other marker known from the property is the historic town/county granite marker that is located along the shore. See Section 2.4.2 for additional information on this marker.

2.5. WEST ISLAND STATE RESERVATION

West Island State Reservation is located on West Island in the Town of Fairhaven. Throughout its history, the island has been used for subsistence by the Wampanoag, seasonal cattle grazing by residents of Sconticut Neck, vacation cottages, and now year-round residences. The west side of the island is largely built out, while the east side, where the reservation is located, is largely undeveloped.

In 1988, the DEM, working in cooperation with a local citizen's group (Save West Island) and the Massachusetts Audubon Society, purchased 338 acres of the island for inclusion in the state park system for the benefit of all citizens of the Commonwealth. The intent of this acquisition was to protect its "natural resources and keep it as conservation land for passive recreation" (DEM 1997).

The reservation's size decreased in 1997, when the Commonwealth sold an approximately five acre lot, referred to as the "effluent disposal lot," to the Town of Fairhaven for sewage disposal purposes (South Bristol Land Court 1997). Two easements associated with the sewage treatment system were also granted to the town at that time. (See Property Boundary description, below.) Much of the reservation's infrastructure is associated with these easements.

West Island State Reservation is the least developed property in the Fort Phoenix Planning Unit. There are no active recreation facilities or even a parking area; a rudimentary network of forest roads and trails provide limited access. It remains as described at the time of its purchase, conservation land for passive recreation with an emphasis on natural resource protection.

2.5.1. Natural Resources

The reservation has the most extensive coastal resources of any property within the planning unit. A well-developed salt marsh and barrier beaches buffer the low-lying upland forests against the direct impacts of storms. Extensive brackish ponds to the north and freshwater wetlands to the south provide a variety of habitats for the reservation's plants and animals.

Physical Features

Topography. The highest point on West Island, approximately 39 feet above sea level, is located off the reservation near the intersection of Causeway Road and Ebony Street. This is the top of a drumlin. From this location, the elevation drops in all directions toward the ocean.

Much of the reservation is at or near sea level. Approximately 71.5% is between sea level and 10 feet above sea level. An additional 21.9% is between 10 and 20 feet above sea level. Most of the reservation's trails, as well as the Town of Fairhaven's sewage infiltration beds, occur at this elevation. Only 6.7% of the reservation is more than 20 feet above sea level.

Barrier Beaches. Five barrier beaches occur between North Point and Pine Neck. A series of brackish wetlands is located on the landward side of these beaches (Figure 2.5.1). A sixth barrier beach extends along the southeast corner of West Island, from Rocky Point northeastward to an unnamed point at the northern end of Town Beach. This barrier beach provides nesting and foraging habitat for piping plover both on the reservation and on the adjacent Town of Fairhaven beach. (See Wildlife, below.)

Geology. Most of West Island, including the state reservation, is underlain by alaskite; a pale granite. The southern end is underlain by biotite gneiss. Both bedrock types are covered by a drumlin field and till deposits (Skehan 2001).

Soils. The reservation's soils vary with elevation and proximity to the ocean. Salt marshes are underlain by Pawcatuck and Ipswich peats. Soils on the upland side of these marshes are poorly drained sandy loams and loamy sands. The capacity of these soils to support recreation has not been rated (Roffinoli and Fletcher 1981). Well-drained fine sandy loams

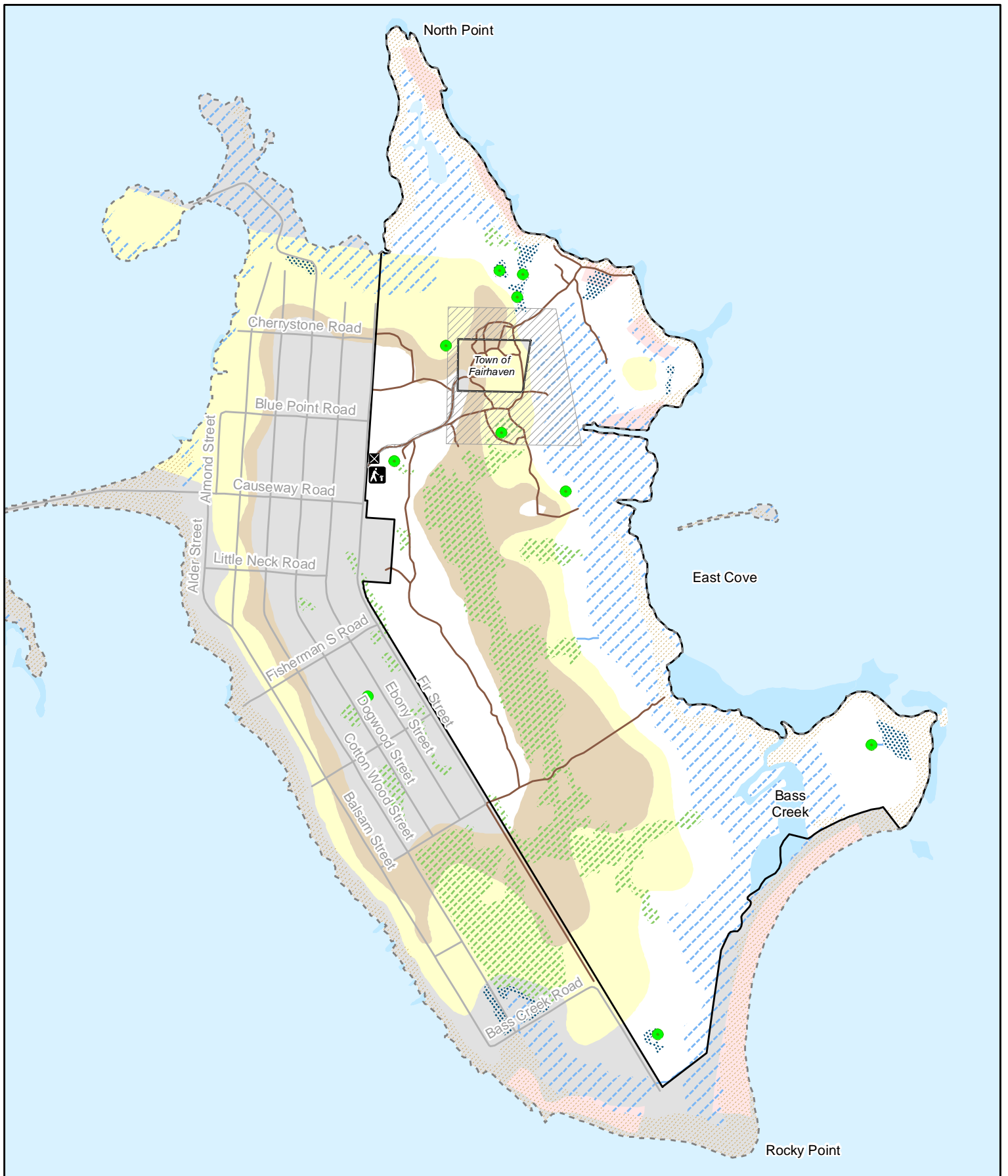
are common in the higher, drier areas. Most of these soils are considered "very limited" for paths, trails, and picnic areas (Roffinoli and Fletcher 1981). Information on the reservation's soils is provided in Table 2.5.1.

Table 2.5.1. Soils of West Island State Reservation.

Soil Series	%	Drainage Class
Beaches	14.0	-
Pawcatuck and Ipswich peat	23.1	Very poorly drained
Paxton Fine sandy loam	19.6	Well drained
Pipestone loamy sand	0.1	Poorly drained
Ridgebury fine sandy loam	13.1	Poorly drained
Udipsamments	1.5	Excessively drained
Whitman fine sandy loam, extremely stony	18.6	Poorly drained
Woodbridge fine sandy loam, extremely or very stony	16.1	Moderately well drained

Place Names. Most maps of West Island only identify three named features on or near the reservation: North Point, Rocky Point, and Bass Creek. North Point refers to the northernmost section of the reservation, located near the northern end of Fir Street. Rocky Point refers to the southern tip of the island, where Town Beach is located. Bass Creek is a tidal creek that originates near Town Beach and flows northeast through the salt marsh.

A sanitary survey of the West Island, East shellfish growing area identifies several other place names (Germano and Pauline 1990). The uplands at the northeast corner of the salt marsh are referred to as Pine Neck and the tidal creek that flows behind it is referred to as High Pine Creek. The location where the salt marsh meets Nasketucket Bay is referred to as East Cove. It is unclear if these names are locally recognized and used. They are used in this RMP, when necessary, to refer to specific physical features.



Legend

- NHESP Potential Vernal Pool
- Gate
- Kiosk
- Trail
- Public Road
- Stream
- 100-Year Flood Zone
- 500-Year Flood Zone
- Barrier Beach
- Marsh
- Salt Marsh
- Wooded Marsh
- Beach
- Open Water
- Tidal Flat
- Town Boundary
- West Island State Reservation
- Fee Interest
- Utility Easement

West Island State Reservation

Figure 2.5.1.

Geographic data supplied by the Office of Geographic Information (MassGIS) and DCR GIS.

DCR GIS May-12

Water Resources

Ponds. There are no ponds. However, a series of brackish, emergent marshes are located east and northeast of High Pine Creek. Several have central, open water areas.

Wetlands. Wetlands comprise over half of the reservation's acreage. A single, large (74.7 acres) salt marsh covers most of the eastern side (Figure 2.5.1). Red maple swamps, oriented north-south in the reservation's interior, account for another 35.8 acres. A number of small, brackish emergent marshes occur in shallow depressions along the northern shore. Collectively, these marshes constitute 3.6 acres.

Vernal Pools. There are no certified vernal pools. However, there are nine potential vernal pools (Harper 2011; Figure 2.5.1).

Streams. There are two freshwater streams. The first, approximately 200 feet long, drains water from much of the reservation's forested wetlands eastward into the salt marsh. The second stream drains into an emergent marsh on the eastern-most point of the reservation.

Two tidal creeks, High Pine Creek to the north and Bass Creek to the south, are present in the salt marsh. Both drain to East Cove.

Groundwater. There are no known aquifers.

March 2010 data for monitoring well B113, located between the Town of Fairhaven's Waste Water Treatment Facility (WWTF) and the effluent infiltration area, reported non-detectable levels of nitrate-N, total nitrogen, total phosphorous, orthophosphate, and 39 volatile organic compounds (Town of Fairhaven 2010).

A landfill, observed to contain glass and metal, is located to the southeast of the effluent disposal area along the margin of the forest and marsh. It is unknown what other materials are present or if they are affecting groundwater quality.

Flood Zones. The 100-year flood zone covers 216.5 acres (67%) of the reservation; its boundary approximately parallels the border of the salt marsh (Figure 2.5.1). Variable in width, it extends up to approximately 350 feet inland; including the Town of Fairhaven's effluent disposal lot. The 500-year

flood zone is located upland of the 100-year zone and includes an additional 63.4 acres (18.6%).

Hurricane Inundation. The hurricane inundation map for the Town of Fairhaven indicates that much of the reservation (79.1%) will be inundated by Category 1 and 2 hurricanes (USACE 1994a). A Category 3 hurricane will inundate approximately 88% of the reservation and a Category 4 storm will inundate approximately 93%. These predictions are based on worst case scenarios and assume the most damaging track and tide height when a hurricane makes landfall.

Sea Level Rise. It is likely that the magnitude of recent sea level rise at West Island State Reservation is similar to the 0.86 feet/century recorded at Woods Hole (NOAA 2008).

Land below 1.5 meter (4.9 feet) in elevation is considered vulnerable to sea level rise because "as a general rule, it is reasonable to assume that the area ... is at risk of tidal inundation from the projected rise in sea level over the next century, and is likely to be inundated within the next 2 centuries" (Titus and Richman 2001). Much of the eastern side of the reservation, including the salt marsh and adjacent uplands, is at or near sea level. This is the portion of the property most susceptible to sea level rise.

The NHESP identified the forest immediately west of the reservation's salt marsh, as well as the reservation's northern and eastern shores, as important for coastal adaptation to sea level rise (NHESP 2010). Such areas have a "high potential to support inland migration of salt marsh and other coastal habitats over the coming century" (NHESP 2010).

Rare Species

Eight state-listed species, two plants and six animals, are recorded from on or near the reservation (Table 2.5.2). Approximately 167 acres (51.5%) of the reservation, including salt marsh and barrier beaches, has been designated Priority Habitat. This designation largely reflects nesting and foraging habitat used by piping plovers and American bitterns. The same designation applies to the waters off the reservation, where state-listed terns forage.

Table 2.5.2. State-listed species of West Island State Reservation, as identified by the NHESP^a.

Species	Type ^b	MESA ^c
American bittern	B	E
Common tern ^d	B	SC
Cypress panic grass (Mattamuskeet panic grass)	P	E
Eastern box turtle	R	SC
Least tern	B	SC
Piping plover ^e	B	T
Roseate tern ^{d,f}	B	E
Seaside knotweed (Sea-beach knotweed)	P	SC

a. From Harper (2011).

b. Types of state-listed species include B = Bird, P = Plant, and R = Reptile.

c. Status of species listed under the Massachusetts Endangered Species Act (MESA): E = Endangered; SC = Species of Special Concern; and T = Threatened.

d. These species use waters adjacent to the reservation for foraging.

e. This species is also listed as Threatened under the U.S. Endangered Species Act.

f. This species is also listed as Endangered under the U.S. Endangered Species Act.

Cypress panic grass has been observed on the southern portion of the reservation and adjacent properties. It is associated with sunny, seasonally wet habitats (NHESP 1990). There are seven known populations in Massachusetts.

The seaside knotweed has been observed off the reservation on nearby Town of Fairhaven property. Because similar habitat occurs on the reservation, this species may also be present there. It is associated with the Maritime Beach Strand natural community.

Five state-listed birds occur on the reservation (Harper 2011). Piping plovers, a federally- and state-threatened shorebird, nest and forage along the southeastern shore. They are the focus of intensive management activities on both the DCR and Town of Fairhaven portions of the beach. Five pairs nested here in 2011, with a total of 15 chicks fledged (Melvin 2011). This is among the highest productivity in Massachusetts and is likely the direct result of high-quality nesting and foraging habitats coupled with the Lloyd Center's management efforts (Melvin 2011). (See Section 3.5.1 for information on this management.)

Three species of terns nest or feed on the reservation. Least terns nest on the island and forage in nearby waters. The roseate tern, which nests on islands in Marion and Mattapoissett, forages

throughout Buzzards Bay, including the waters around West Island. Common terns also forage in these waters.

The state-endangered American bittern, a secretive member of the heron family, has nested and foraged in the marsh.

Although the eastern box turtle is a state-listed species, the West Island population is not regulated under MESA because it is not considered viable (Harper 2011). Because of this, the uplands used by this species are not designated Priority Habitat.

Additional state-listed species reported from the reservation, but not included in the NHESP database, are the peregrine falcon (Endangered), short-eared owl (Threatened), northern parula (Threatened), and blackpoll warbler (Species of Special Concern). (See Appendix F, Table F.2.)

Vegetation

There have been no formal surveys of the plants of West Island State Reservation. Fifty-four common plant taxa have been recorded; they are identified in Appendix F, Table F.1.

Invasive Species. Preliminary surveys identified the following seven species of invasive plants.

- Japanese barberry
- Garlic mustard
- Japanese honeysuckle
- Oriental bittersweet
- Multiflora rose
- Paleyellow iris
- Common reed

The first five of these plants are associated with the reservation's forests and roadsides. Japanese barberry tends to occur as individual plants or small clusters; the other three species typically occur in large populations.

The last two species, paleyellow iris and common reed, are associated with wetlands. The former is becoming established in the salt marsh to the southeast of the effluent disposal lot. The current population is still small enough to be effectively managed. Common reed is the dominant species in the brackish Deep Emergent Marshes along Pine Neck. It is also present, in small patches, along the upland margin of the salt marsh.

Natural Communities. Eight natural communities have been identified (Table 2.5.3).

Table 2.5.3. Natural communities of West Island State Reservation^a.

Community Type	System ^b	State Rank ^c
Coastal Forest/Woodland ^d	T	S3
Deep Emergent Marsh ^e	P	S4
Maritime Beach Strand	E	S3
Maritime Dune	E	S2
Maritime Shrubland	T	S3
Red Maple Swamp	P	S5
Salt Marsh ^{d,f}	E	S3
Shrub Swamp ^d	P	S5

a. Classified according to Swain and Kearsley (2001).

b. E = Estuarine, T = Terrestrial, and P = Palustrine.

c. Communities are ranked from the most rare (S1) to the most common (S5); N/A indicates a cultural community, which is not ranked.

d. Fact sheets for these communities are available at www.mass.gov/dfwele/dfw/nhesp/natural_communities/fact_sheets.htm.

e. The extent of this community type may be moderately reduced (<50%) in Massachusetts in response to climate change (Low Emission Scenario; Manomet and DFW 2010).

f. The extent of this community type may be greatly expanded (>50%) in Massachusetts in response to climate change (Low Emission Scenario; Manomet and DFW 2010).

Estuarine communities are present along the northern, eastern, and southern boundaries of the reservation, with Salt Marsh the most abundant of these communities. Terrestrial communities extend from the salt marsh westward and upslope to Fir Street. Red Maple Swamps and, to a lesser degree, Shrub Swamps occur among the terrestrial communities in a north-south oriented band. A series of Deep Emergent Marshes occur on the landward side of the barrier beaches along Pine Neck; they are poor examples of this community type due to the dominance of the invasive common reed.

It is likely that the Woodland Vernal Pool community type is present, but has gone unrecorded.

Mason (1996) described two occurrences of a shrubland dominated by eastern red cedar. Although the vegetation described is consistent with the Maritime Juniper Woodland/Shrubland community type (S1), this community was not located in 2011.

Interior Forests. There is a single, 67.93 acre block of interior forest on the reservation.

Sea Grass. The eastern side of West Island, from North Point to Rocky Point, is fringed with a narrow band of eelgrass. Additional eelgrass is present just

offshore from Town Beach and in East Cove. Germano and Pauline (1990) reported that the dense eelgrass in East Cove limits shellfishing at this site.

Wildlife

Although the reservation has long been considered wildlife habitat (e.g., DEM 1997), few surveys have been conducted. Much of our understanding of the property's wildlife, with the exception of its birds, comes from general information on the wildlife of Bristol County (Appendix F).

Birds. Ninety-nine species of birds have been recorded (Appendix F, Table F.1).

Many of the reservation's birds are associated with marine and estuarine environments. A variety of ducks feed in the marsh and offshore waters year-round; herons hunt the marsh and shore's shallow waters; shorebirds feed in the intertidal areas; and gulls forage along the shore. Flycatchers, swallows, red-winged blackbirds, and saltmarsh sharp-tailed sparrows nest and forage around and over the marsh and shore.

The reservation's uplands provide habitat for nesting and migratory species. Woodpeckers, titmice, nuthatches, and thrushes nest in the forest and sparrows, finches, kinglets, catbirds, and towhees forage among the thickets. These forests provide stop-over habitat for migratory warblers and several migrants have been recorded (e.g., Baird and Nisbet 1960; DEM 2000).

Mammals. The reservation's mammals are poorly known. Of the more than 40 species that may occur, only 13 have been confirmed (Appendix F, Table F.3). None of the confirmed species is state-listed.

Reptiles. There have been no surveys of the reservation's reptiles. Only two species, the eastern box turtle and common gartersnake, have been confirmed to be present on the property.

A list of additional reptiles that may occur on the reservation is provided in Appendix F, Table F.4.

Amphibians. There have been no amphibian surveys. Only two species, the wood frog and the American toad, have been confirmed to occur. Given the mixture of wetlands, uplands, and potential vernal pools, several additional species are likely to be present (Appendix F, Table F.5).

Fish. There is no information on the use of the salt marshes or brackish emergent marshes by fish. Commercially valuable fish common to Buzzards Bay were previously identified in Table 2.2.1.

Nasketucket Bay is outside of the closure areas associated with the contamination of New Bedford Harbor. There is no EPA guidance on the consumption of finfish from this bay.

It is unknown if freshwater fish are present.

Invertebrates. The area's water quality is considered excellent for shellfish production. Hard-shelled clams are the most abundant shellfish in the area, with concentrations occurring in East Cove and east of North Point (Churchill 2011). Recreational fishing for this species occurs in East Cove, while deeper waters are fished by a single commercial dredge boat. Bay scallops are limited in both distribution and abundance. Whelks are fished with pots throughout the area, as are lobster (Germano and Pauline 1990; Churchill 2011). Soft-shelled clams occur in limited number in Bass Creek.

An assessment of shellfish habitat conducted at sampling sites immediately offshore of the reservation revealed a variety of substrate types (e.g., sand, boulders, eelgrass beds) with green algae, slippersnails, bamboo worms (Family Maldinidae), blood worms (*Glyceria* sp.) and tellin (*Tellina* sp.; data from sites 118, 120, 121, and 122; RWFS 2011). No commercially harvested shellfish were identified in this survey.

The West Island, East shellfish growing area (BB19) is open to the taking of all shellfish (Churchill 2011). There is no EPA guidance on the consumption of shellfish because the growing area is outside of the affected area.

There is no information on terrestrial or freshwater insects.

2.5.2. Cultural Resources

One of the earliest references to West Island in the post-Contact period is a transaction between Massasoit and a group of Plymouth Colony Pilgrims, including John Cooke, which transferred rights to the lands around Dartmouth, including the island. References have also been found connecting the sale of the island, reportedly known by the native population as "Mackatan," by Metacomet (King Phillip), one of Massasoit's sons. Sources claim that

the agreement included a clause stating that any whale that washed ashore of the island would be split evenly between the two parties (McCabe 1986). Cooke's daughter, Mercy, married Steven West, the island's namesake, and the two settled on the island (Baron n.d.). The predominant uses of the land through the 16th to 19th centuries were cattle grazing and the hunting of deer and other game. Sources describe the tradition of herds of cattle from farms on adjacent Sconticut Neck swimming across the area of today's causeway at low tide to graze on the island.

West Island, originally incorporated into Dartmouth and later New Bedford, was incorporated into Fairhaven as one of its 19 districts in 1812. The last member of the West Family reportedly sold the property in 1880 (Donnelly 1918). References to cattle crossing the causeway have been found as late as 1885 and 19th and 20th century historic maps show little to no residential occupancy up through the 1940s (e.g., Walling 1858). In 1946, only one house stood, the early 19th century home of Captain John T. Besse.

The U.S. Army established an observation tower on a 14 acre tract at the south end of the island. While the barracks and other military buildings were removed following the end of World War II, the well-preserved concrete observation tower remains on town land. The 20th century history of the island brought a number of changes, mainly the residential development of the west side of the island. Title for the island changed hands a number of times between the late 19th and early 20th centuries. In 1946, the entire island was purchased by West Island Fairhaven Estates. Development of the island as a summer resort began that year with the construction of the causeway bridge, roads, utilities, and 40 cottages (Flanagan 1946). By 1952, 200 families lived on the island.

Although residential expansion to the eastern side of the island had been proposed as early as the 1950s, development planning in the 1980s spurred local residents to advocate for the protection of the area as a natural resource.

Archaeological Resources

There are no known archaeological sites.

Historic Resources

Trash Pile/Landfill. This feature is a large area near the western edge of the salt marsh with characteristics of an active dump site that, based on the contents and erosion, has most likely been used as a trash pile/landfill for at least several decades. The area features a concentration of ruts, presumably made by heavy equipment used to bury trash.

Road Network. Only one dirt roadway exists in the reservation, splitting around the effluent disposal lot and joining again before continuing east to the coast. This road was referred to as the “dump road.”

Stone Walls. West Island features few stone walls, understandable due to its primary historic use as open grazing and hunting land. One intact section of wall is located on Pine Neck, presumably to discourage cattle from wandering into the more active tides.

2.5.3. Recreation Resources

Due to the near absence of recreation infrastructure, most recreational activities are passive. Hiking and dog walking chiefly occur along the property’s limited forest roads and trails. Hunting and nature study take place throughout the forest, marsh, and shore. Fishing and shellfishing takes place along the northern and eastern shore. Geocaching also takes place off trail; there are four known geocaches. The salt marsh and near-shore waters are used for kayaking.

An unofficial swim area has been established along the northeast shore of Pine Neck. This unguarded waterfront is used by visitors arriving by both foot and boat. Unauthorized campsites are present in the forest immediately south of North Point; some are well established and contain multiple tent sites. They too may be associated with recreational boaters.

The Town of Fairhaven operates a guarded resident-only waterfront, Town Beach, along the reservation’s southern boundary. This beach is contiguous with the reservation’s southeast shore and both properties are perceived by the public as a single municipal recreation area. Access to the DCR portion of the beach is either through Town Beach or by boat.

Campfire rings, with evidence of frequent use, are present at multiple locations throughout the reservation, both along the shore and in the woods.

The largest observed campfire site was on the Town of Fairhaven’s effluent disposal lot. Charred remains of furniture, doors, and alcohol bottles were present in the ash during a visit in 2011. All of these fire rings and associated activities pose a threat to the reservation’s resources and public safety.

Unauthorized OHV use also occurs along the forest roads and trails and, to a lesser degree, along the shore.

2.5.4. Infrastructure

Property Boundary. West Island State Reservation consists of a single parcel (Lot C-3) with a single in-holding (i.e., Town of Fairhaven effluent disposal lot). Only the boundaries of the in-holding are marked.

The reservation’s western boundary is approximated by Fir Street. A 20-foot-wide public way, owned by the Town of Fairhaven, lies to the east of Fir Street along much of the boundary. This public way begins at the southern end of Fir Street, adjacent to Town Beach. It extends northward to the southern edge of a municipal ball field. At this point it turn east along the ball field’s southern boundary, then north along the ball field and WWTF’s eastern boundaries, and finally west along the treatment facility’s northern boundary. The public way then continues along the eastern edge of Fir Street until the northeast corner of the Causeway Road intersection. From this point northward, the reservation boundary follows Fir Street (Figure 2.5.1).

The northern and eastern boundaries are largely defined by Nasketucket Bay. Under the Massachusetts Public Waterfront Act, the seaward boundary of the reservation is the historic mean low water line. (See Chapter 91; Appendix D.)

The southern boundary occurs along a line consistent with the northern edge of the parking lot at Town Beach.

The southeastern boundary is in question. A map associated with the property’s deed indicates that the point of land northeast of Town Beach is part of Lot C-3 and therefore part of the reservation. However, the Town of Fairhaven’s Open Space and Recreation Plan identifies the neck as part of an 8.9 acre expansion of Town Beach, acquired in a 1967 taking (Fairhaven Planning & Economic Development

Department and Southeastern Regional Planning and Economic Development District 2010).

The Town of Fairhaven holds two easements, both associated with the municipal sewage treatment system. The first is on approximately 18.1 acres surrounding the town's effluent disposal lot. This easement was granted to "install, maintain, repair, replace and operate water quality wells and similar testing devices" (Chapter 259 of the Acts of 1995; Appendix D). The second allowed the town to "build, maintain, repair and replace" an 1,100-foot-long by 20-foot-wide (i.e., 0.5 acres) right of way, providing access and egress to the effluent disposal lot. It also granted the right to "install, maintain, repair, replace and operate underground utility services ... such as sewer, water, electric, telephone and other similar underground utility equipment." Both easements, and the transfer of 4.991 acres to the Town of Fairhaven, were authorized by Chapter 259 of the Acts of 1995. (See Appendix D.)

Buildings and Structures. There are no buildings on this property.

Fifteen monitoring wells, associated with the West Island WWTF, are on the reservation. Four are located in the salt marsh and 11 are located in the uplands. Some are missing caps and/or locks. In addition to monitoring wells on DCR property, the town has seven monitoring wells on the effluent disposal site, three on the ball fields, two at the treatment facility, and three at Town Beach; all municipal lands.

Roads. There are no paved public or administrative roads.

Parking. There is no parking lot; visitors park along the eastern shoulder of Fir Street. The abundance and structure of vegetation along the shoulder limits potential parking.

Trails. Preliminary data indicate a total of 3.24 miles of trails; including forest roads, trails along the shore, and visitor-created social trails (Figure 3.5.1).

The main park entrance is located on the east side of Fir Street, approximately 250 feet north of its intersection with Causeway Road. This is also the main connection to the reservation's trails. Historic topographic maps reveal the presence of a trail at this location as early as 1941 and a dirt road at this location in 1949.

Kiosks and Signs. A Main Identification Sign (DCR n.d.a) is located on the Town of Fairhaven's public way, on the east side of the Fir Street and Causeway Road intersection. A kiosk and a single-panel Welcome Wayside Sign (DCR n.d.a) are located at the main entrance on Fir Street. The kiosk has a locking bulletin board for displaying rules and event notices. The Welcome Wayside Sign presents information on the reservation's history and resources. It is dedicated to the memory of community activist David Szeliga, one of the organizers of Save West Island.

There are no Lead-in Signs (DCR n.d.a) to direct visitors from routes 6 and 240 to the reservation.

Memorials and Markers. The only known memorial is the Welcome Wayside Sign at the park entrance. It bears the inscription "In memory of David Szeliga, 'Save West Island'; 1952-2002."



Throughout its history, this grassland at Nasketucket Bay State Reservation has been used for agriculture, storing construction materials, and recreation.

SECTION 3. MANAGEMENT RESOURCES AND PRACTICES

3.1. INTRODUCTION

Management of the planning unit's natural, cultural, and recreation resources is complex and subject to a variety of laws, regulations, and policies. It is also subject to available resources and staffing.

This section describes current management practices and identifies relevant regulations, policies, and legal considerations that guide this management. Select Massachusetts regulations relevant to the management of properties within the planning unit are presented in Appendix D.

3.2. FORT PHOENIX PLANNING UNIT

3.2.1. Natural Resources

Physical Features

Activities on barrier beaches must be consistent with policies identified in Massachusetts' Executive Order No. 181. Among these policies are: the prohibition of the use of state funds for construction projects in barrier beach areas; the preparation of barrier beach management plans for state-owned properties; and the prohibition of development in the velocity zone or primary dune areas of barrier beaches.

Water Resources

Storm Water Management. Activities in the Fort Phoenix Planning Unit that affect the quantity or quality of storm water are regulated by a National Pollutant Discharge Elimination System (NPDES) storm water management plan (DCR 2007a). This plan describes control measures that the DCR uses to satisfy NPDES Phase II permit requirements for transportation and non-traditional Municipal Separate Storm Sewer Systems (MS4s).

The plan identifies Best Management Practices (BMPs) and measurable goals for each of the six following control measures: public education and outreach; public involvement/participation; illicit discharge detection and elimination; construction site runoff controls; post-construction runoff controls; and pollution prevention/good housekeeping. Many of these BMPs are implemented at the agency-level (e.g., the detection and elimination of illicit discharges, catch basin cleaning), while others are implemented at the facility-level (e.g., the stenciling of catch basins).

Wetlands Protection. Activities within a wetland resource area or buffer are regulated by the Massachusetts Wetland Protection Act. (See

Appendix D for additional information.) There are no active Notices of Intent or Orders of Conditions for any properties in the planning unit.

Vegetation

There is no single management plan for the planning unit's vegetation. The *de facto* management policy is to permit populations of most species of plants to increase or decrease without human intervention. Exceptions to this include the turf areas at Fort Phoenix and the grass and herbaceous vegetation along the Bridle Trail at Nasketucket Bay State Reservation.

Wildlife

There is no single wildlife management plan for the reservations. The *de facto* management policy is to permit most wildlife populations to increase or decrease without human intervention. The exception is the hunting of game species at Nasketucket Bay and West Island state reservations.

Wildlife research is regulated through Special Use Permits issued by the DCR's Department of Special Events and by Scientific Collecting Permits issued by the Massachusetts Division of Fisheries and Wildlife (MassWildlife). Hunting, trapping, and fishing are managed through a variety of regulations. (See Section 3.2.3, below.)

In 2011, the Massachusetts Audubon Society established bird monitoring stations at 19 locations around Nasketucket Bay (Newlands 2011a). Three of these stations are located on DCR properties; two at Nasketucket Bay State Reservation and one at West Island State Reservation. Point count surveys were conducted at these locations in 2011; there are currently no plans for future surveys. There was no Special Use Permit issued for these activities.

The Massachusetts Division of Marine Fisheries (DMF) conducts "sanitary surveys of shellfish growing areas to determine their suitability as shellfish sources for human consumption" (DMF n.d.). These surveys evaluate: pollution sources, "hydrographic and meteorological characteristics that may affect the distribution of pollutants," and water quality. Each shellfish growing area must have a complete sanitary survey every 12 years, a triennial evaluation every three years, and an annual review (DMF n.d.). These surveys are conducted in

near-shore waters adjacent to every property in the planning unit.

3.2.2. Cultural Resources

The DCR's Office of Cultural Resources (OCR) provides technical assistance on issues relating to archaeology and the preservation of landscapes, buildings, structures, and objects. It also conducts a coordinated program of basic and applied research to support planning for, and management of, cultural resources on DCR properties through project management and resource management planning. Among these activities is the nomination of properties for inclusion in the State and National registers.

The OCR is also responsible for overseeing the historic preservation regulatory compliance responsibilities of the agency. It assesses regulatory needs and, when applicable, notifies the Massachusetts Historical Commission (MHC) through the filing of a Project Notification Form or Environmental Notification Form for any projects undertaken, funded, permitted, or licensed in whole or in part by the agency. This is done so that the MHC may make a Determination of Effect of the project on historic and archaeological resources. Finally, the OCR coordinates all archaeological survey, testing, and excavation with the State Archaeologist at the MHC through an archaeological permit.

Buildings, structures, landscapes, sites, and objects that are a minimum of 50 years old, retain historic integrity and are of significance on the local, statewide, or national level may be listed in the National Register of Historic Places (NPS n.d.a). Repairs, rehabilitation, and other preservation activities on listed and eligible resources follow guidelines in the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (Weeks and Grimmer 1995).

Massachusetts law requires the review of all sub-surface disturbances on state property. Although most projects within the Fort Phoenix Planning Unit receive this review some, such as the installation of sign posts or the planting of trees and flowers, often do not. The DCR's archaeologist holds a general archaeology permit from the MHC that allows them to provide initial review of activities that result in sub-surface disturbance. They are the primary

reviewer of such projects and activities in the Fort Phoenix Planning Unit.

The inspection, investigation, or removal of underwater archaeological resources is also regulated under Massachusetts law (M.G.L. 6:179–180). No person may remove, displace, damage, or destroy any underwater archaeological resource except in conformity with permits issued by the Massachusetts Board of Underwater Archaeological Resources. This applies to both inland and coastal waters. All archaeological resources in the waters adjacent to the planning unit are subject to this law.

3.2.3. Recreation Resources

Regulations guiding the recreational use of forests and parks may be found in 304 CMR 12.00. (See Appendix D for a summary of these regulations.)

In general, all public use of reservations must take place from dawn through dusk; nighttime activities are prohibited.

Special Use Permits. Special Use Permits are required for “any commercial or special activity or event upon the lands or waters” of all properties within the planning unit (304 CMR 12.17; Appendix D). Non-commercial activities requiring a Special Use Permit include, but are not limited to the following: sporting activities and tournaments; concerts; charity walks; road races; group boating activities; cultural festivals; community service projects; small wedding ceremonies; and group gatherings that include amusements, barbecues, and/or amplified sound (DCR n.d.b). Natural history group field trips and scientific research also require Special Use Permits; although these activities are not specifically identified on the DCR’s Special Use Permits and Fees web page (DCR n.d.b). Commercial filming, photography, and videography are regulated through Filming and Photography Special Use Permits.

Camping. Camping on DCR property is restricted to designated campsites or cabins; there are none in the planning unit.

Geocaching. There is no Massachusetts regulation or agency policy on the placement of geocaches on DCR property. In their absence, geocaches may be placed at any location not identified as closed to the use.

Hunting, Fishing, and Shellfishing. Hunting is regulated through Massachusetts Regulations (304 CMR 12.00 and 321 CMR 3.00), DCR Forests and Parks Rules (304 CMR 12.00), and also through the official Massachusetts Hunting, Freshwater Fishing, and Trapping Regulations that are promulgated annually. In general, all DCR properties are open to hunting, fishing, and trapping unless otherwise specified in the Forests and Parks Rules (304 CMR 12.00). Summaries of these and other applicable regulations are presented in Appendix D.

A Recreational Saltwater Fishing Permit is required of all “persons engaged in the recreational fishing ... in or from the coastal waters of the Commonwealth,” with the exception of disabled persons and persons under the age of 16 years (322 CMR 7.10).

The harvesting of lobster offshore is regulated through 322 CMR 6.00 and 322 CMR 7.00.

Officers from the Executive Office of Energy and Environmental Affairs’ Office of Law Enforcement (i.e., Massachusetts Environmental Police officers) enforce hunting, fishing, and lobster harvesting regulations.

Trail Use. Dogs may accompany trail users provided the animals are kept under control and do not interfere with any other park patron’s enjoyment of DCR property (304 CMR 12.00; Appendix D).

With the exception of DCR, emergency, and utility vehicles, motor vehicles are not permitted on trails. Off-Highway Vehicles are not permitted on any property in the planning unit. However, a March 15, 2011 Department of Justice ruling allows individuals with mobility disabilities to use “other power-driven mobility devices” on trails. Such devices include any device powered by batteries, fuel, or other engines that are used by individuals with mobility disabilities for the purpose of locomotion. Use of such devices may be restricted on trails due to factors such as: the type, size, weight, and speed of the device; the volume of pedestrian traffic; the design and operational characteristics of the device; whether or not the device may be operated safely; and the potential for substantial risk of serious harm to the environment or natural and cultural resources. None of the trails within the planning unit have been assessed for their compatibility with these devices.

3.2.4. Infrastructure

Property Boundary. The Management Forester or Assistant Management Forester attempts to locate and mark property boundaries at least once every 10 years. This marking is often associated with forest inventory activities.

Buildings and Structures. The management of DCR-owned buildings is performed by DCR employees or contractors.

Roads. The DCR maintains and repairs park roads and parkways. Management of traffic and related systems is supervised by the Parkways Section of the DCR's Bureau of Engineering and guided by American Association of State Highway and Transportation Officials standards, the Manual on Uniform Traffic Control Devices (FHA 2009), and the Historic Parkway Preservation Treatment Guidelines (DCR 2006). Public roads adjacent to DCR properties are maintained and repaired by local municipalities.

Snow removal is performed by the DCR and local municipalities. In general, municipalities plow public roads adjacent to DCR property and the DCR is responsible for plowing internal park roads.

Parking. The DCR maintains and repairs its own parking areas. Most snow removal is performed by the DCR.

Trails. A variety of regulations and policies guide the management of trails. The design, management, and marking of trails are guided by the DCR's *Trails Guidelines and Best Practices Manual* (DCR 2010a). Additional regulations, such as the Massachusetts Endangered Species Act and Wetlands Protection Act, and DCR cultural resources policy may also apply, depending on location. These regulations and policies apply to both DCR employee and volunteer activities.

Kiosks and Signs. The format and placement of regulatory and informational signs are governed by the *Manual of Uniform Traffic Control Devices* (MUTCD; FHA 2009) and guided by the DCR's *Graphic Standards Manual* (DCR n.d.a). The design and construction of kiosks are solely governed by the graphics manual.

Informational kiosks are managed by regional and district staff (e.g., the Visitor Services Specialist) as new information becomes available. The Southeast

Region's mobile maintenance crew performs kiosk installation and repair.

Memorials and Markers. The placement of markers or plaques is not explicitly addressed in the Forests and Parks Rules (304 CMR 12.00; Appendix D).

3.2.5. Interpretive Services

Regional interpretive staff provides programming in the planning unit. There are no programs offered throughout the entire planning unit.

3.2.6. Operational Resources

Administrative Structure

All three state reservations in the planning unit are part of a group of DCR facilities within the South Coast District of the Southeast Region. In addition to properties included in this RMP, the South Coast District includes such properties as Fall River Heritage State Park, Demarest Lloyd Memorial State Park, Dighton Rock State Park, Massasoit State Park, Horseneck Beach State Reservation, Borderland State Park, and F. Gilbert Hills State Park.

DCR Staffing

The operation and management of properties within the planning unit requires the participation of regional and district personnel, as well as DCR staff from the Bureau of Forestry Fire Control, Bureau of Ranger Services, Bureau of Engineering, Bureau of Planning and Resource Protection, and Office of Partnerships. Supplemental staffing is provided by personnel from the Executive Office of Energy and Environmental Affairs, as well as public safety agencies. Descriptions of these entities and their roles in the Fort Phoenix Planning Unit are provided below.

Southeast Region. Most year-round operation and management duties are performed by regional staff (Table 3.2.1). Five Mobile Maintenance personnel maintain roads and grounds, and perform light carpentry and other facility maintenance and repair activities throughout the year. They also cut grass and empty trash barrels from September through May. The Business Management Specialist performs a variety of fiscal and administrative duties important to the operation of properties within the planning unit. The Regional Director supervises regional personnel and the District Manager.

Table 3.2.1. Southeast Region personnel with direct responsibility for the operation and management of the Fort Phoenix Planning Unit.

Job Title	Number of Positions	Area of Responsibility ^a
<i>Year-round Personnel</i>		
Business Management Specialist	1	R
District Manager	1	D
Regional Director	1	R
Mobile Maintenance – Carpenter	2	R
Mobile Maintenance – Repairer	2	R
Mobile Maintenance – Laborer II	1	R
<i>Seasonal Personnel</i>		
Forest and Parks Supervisor I ^b	1	P
Forest and Parks Supervisor I ^c	2	P
Lifeguard I ^c	2	F
Lifeguard II ^c	1	F

a. D = District, F = Fort Phoenix Beach State Reservation, P = Planning Unit, and R = Southeast Region.

b. Long-term seasonal; employed May–September.

c. Short-term seasonal; employed June–September.

South Coast District. The South Coast District Manager reports to the Regional Director and is responsible for the management of all properties within the planning unit and the supervision of seasonal staff (Table 3.2.1).

Planning Unit. Fort Phoenix Beach State Reservation is staffed with six seasonal personnel, one long-term and five short-term, from approximately June through early September (Table 3.2.1). Lifeguards work only at Fort Phoenix, while the Forest and Parks Supervisors work at all properties in the planning unit. These positions are supervised by the District Manager.

Bureau of Forestry and Fire Control. Bureau employees provide technical assistance on forest management and health, and fire control. Representatives of this bureau that contribute to the management of properties in the Fort Phoenix Planning Unit include the Assistant Program Manager, Assistant Management Forester, Service Forester, Forest Health Supervisor, District Fire Wardens, and other Fire Control staff.

The Assistant Program Manager inventories resources, analyzes and summarizes forest data through the use of GIS, inventories other resources

(e.g., wildlife habitat), creates Forest Resource Management Plans, models potential silvicultural treatments, and manages Continuous Forest Inventory (CFI) data.

The Assistant Management Forester is responsible for marking each property’s boundaries every 10 years; conducting CFI inventories every 10 years, on average; investigating “timber trespass” (i.e., the unauthorized removal of forest resources); overseeing mechanical treatment in preparation for prescribed burns; and developing forest cutting plans. For properties in the Fort Phoenix Planning Unit, such plans would likely address storm damage (e.g., post-hurricane clean-up) or managing forests for the purpose of improving wildlife habitat. All forest cutting plans, including those prepared for DCR properties, must be reviewed by the Service Forester.

The Forest Health Supervisor monitors plant pests and diseases in the region, offers technical assistance on combating these pests and diseases, and is also responsible for the removal of hazard trees from the three reservations in the planning unit.

Finally, Fire Control staff members plan and conduct prescribed burns, identify potentially dangerous forest conditions that may contribute to forest fires, and assist municipal fire departments in responding to fires on DCR properties. Personnel and assets are organized into districts that, for the Fort Phoenix Planning Unit, follow county boundaries. Bristol County, including all of Fort Phoenix and West Island state reservations and approximately two acres of Nasketucket Bay State Reservation are within Fire Control District 2, which is based in Fall River. The majority of Nasketucket Bay State Reservation, which is in Plymouth County, is supported by Fire Control District 3, based at Myles Standish State Forest in the Town of Carver.

Bureau of Ranger Services. As of 2011, there are seven rangers, three full-time and four seasonal, assigned to the Southeast Region. Of these, two provide support to the operation of properties within the Fort Phoenix Planning Unit. A Ranger II is assigned to patrol all properties in the South Coast District. This ranger is supervised by a Ranger III stationed at Myles Standish State Forest in Carver.

The Visitor Services Specialist (VSS) position is also part of Ranger Bureau. This position is based at Myles Standish State Forest and reports to the Regional Director.

Bureau of Engineering. This bureau is responsible for the engineering and construction of parkways, dams, buildings, and park and recreation facilities. It also provides a resident Regional Engineer to oversee maintenance and construction projects in the South Coast District and the Southeast Region. The Regional Engineer for projects in the Fort Phoenix Planning Unit is based at Myles Standish State Forest.

Bureau of Planning and Resource Protection. This bureau prepares RMPs and Trail System Plans; develops and updates GIS data; provides technical assistance with the management of archaeological and historic resources; identifies and acquires properties to be added to the DCR system; maintains an archive of park documents; provides technical support on ecological resources and the monitoring of CRs, and designs and manages projects to enhance DCR properties.

Office of Partnerships. The Office of Partnerships works to enhance the DCR's constituency of supporters and users by: working in partnership with park users and supporters to develop and sustain community-based stakeholder groups; facilitating external financial assistance for the planning, design, and construction of capital projects; managing the DCR partnerships Matching Funds Program, which leverages private contributions to improve DCR-owned and managed facilities; and serving as a dedicated point of contact for individuals and non-profit, institutional, and community-based organizations. It is this office that is responsible for identifying and coordinating private and institutional giving and partnerships within the Fort Phoenix Planning Unit.

Supplemental Staffing

There are no formal volunteer programs within the planning unit, nor were there any volunteer activities in 2011.

Executive Office of Energy and Environmental Affairs (EOEEA) Staffing

Information Technology (IT) support is provided by a Network Technician employed by the EOEEA and

based at Myles Standish State Forest. Their activities in the planning unit are limited to Fort Phoenix, as the other two reservations lack IT infrastructure.

Public Safety

The Massachusetts State Police has primary law enforcement authority on state-owned lands. Local police provide additional law enforcement on the reservations, within their respective jurisdictions. The Executive Office of Energy and Environmental Affairs' Office of Law Enforcement (i.e., the Massachusetts Environmental Police) provides primary enforcement of hunting and fishing regulations.

DCR rangers are not law enforcement officers, but have limited authority to issue citations on the reservation (i.e., parking tickets, dogs off leash.)

Fire control is provided by municipalities and by Districts 2 and 3 of the DCR's Forest Fire Control. Municipalities also provide emergency fire and medical response. DCR rangers and lifeguards provide first aid.

Recreational boating regulations are enforced by the U.S. Coast Guard, the Massachusetts Environmental Police, and at the municipal level, local harbor masters.

General Budgetary Information

Three major types of funds support the operation, maintenance, and capital improvement of DCR facilities.

Operating Budget. The annual operating budget supports daily operation and maintenance, including utilities, supplies, equipment leases, administration, and the maintenance and minor repair of facilities, vehicles, and equipment. All regions and districts receive these funds.

In 2011, the Fort Phoenix Planning Unit's operating budget, including maintenance, utilities, and seasonal staffing was an estimated \$75,000. In prior years, when there was year-round staffing, the estimated operating budget was \$155,000.

Capital Budget. The capital budget supports projects (e.g., construction, repair) and items (i.e., equipment) with a per-unit cost of at least \$5,000 and an expected lifespan of at least seven years.

Capital projects are identified and funded through a five-year capital plan. These plans identify proposed capital projects, their costs, and the year in which they are to be funded.

Capital plans are extensively reviewed within the DCR, approved by the Commissioner, and included in the DCR's annual budget. This budget is then reviewed by the Executive Office of Energy and Environmental Affairs, the Executive Office of Administration and Finance, and the Governor. Additional capital initiatives may be identified and added to the budget by the Commissioner of Conservation and Recreation, Secretary of Energy and Environmental Affairs, or the Governor during this review process.

Deferred Maintenance. These funds are used for infrastructure repair that exceed typical maintenance, but do not rise to the level of a capital project. They may also be used to address emergency capital projects for which funding has not been programmed. Each region is allotted deferred maintenance funds on an annual basis; the Regional Director determines how these funds are to be used.

There were no deferred maintenance funded projects in the planning unit in fiscal year 2011.

Supplemental Funding

In addition to operations, capital, and deferred maintenance funds, DCR facilities may receive funding through grants, legislative earmarks, the State Parks Trust Fund, dedicated funding, or retained revenues.

Grants. Federal and private funds, in the form of grants, are periodically awarded on a competitive basis to the DCR for park maintenance and operation activities (e.g., recreational trails grants). There have been no recent grant funded projects in the planning unit.

Earmarks. Earmarks are funds directed to specific projects by the Massachusetts General Court via the annual state budget. There have been no recent earmarks for properties in the Fort Phoenix Planning Unit.

State Parks Trust Fund. This trust fund uses donations to support special initiatives, within the Division of State Parks and Recreation, above and beyond basic property maintenance. It is funded through charitable contributions to the DCR,

including those donations placed into the "iron ranger" (i.e., a secure metal donation box) located near the Lower Lot at Fort Phoenix.

The Division of State Parks and Recreation is currently being merged with the Division of Urban Parks and Recreation, which also had its own trust fund. An agency-wide trust fund will likely result.

Dedicated Funds. Dedicated property funds may come from a variety of sources (e.g., telecommunication tower fees) and are limited to use at the property on which they are derived. There are no dedicated funds for properties within the planning unit.

Retained Revenues. These funds are generated at a property and all or a portion of these funds remain at that property for operating expenses and facility improvement, but not for personnel costs. There are no retained revenues associated with any of the properties in the planning unit.

In-kind Contributions. In-kind contributions are the donation of goods or services, rather than funds. Such donations are uncommon. The Fairhaven Tennis Association (FTA) donated tennis nets and straps to the DCR for use at the courts at Fort Phoenix. There are no other examples of in-kind donations elsewhere in the planning unit.

3.3. FORT PHOENIX BEACH STATE RESERVATION

A general schedule for the maintenance of DCR properties in the South Coast District has been identified by the DCR (DCR 2009b). This schedule assumes typical conditions. The actual frequencies of activities are subject to change throughout the year in order to respond to current conditions and to meet maintenance needs.

There is no previous management plan for this property.

3.3.1. Natural Resources

Water Resources

The oil spill response plan for Buzzards Bay (Hayes et al. 2004) calls for the protection of water resources and wildlife in the New Bedford Outer Harbor area. Deflection booms are to be deployed across the harbor entrance, to the west of Fort Phoenix, and across Priest's Cove, to the east of Fort Phoenix. Oil is to be directed to, and collected at,

four locations in the region, including two at Fort Phoenix Beach State Reservation. An area designated Collection Point 2 is located south of the sun shelter and bathhouse; Collection Point 3 is located south of the Lower Lot. Although not explicitly stated in the plan, response actions would likely result in the closure of the entire reservation.

The DCR's role in developing and implementing this response action are unclear. The DCR contact information contained in the plan is incorrect.

The Town of Fairhaven's NPDES PII Small MS4 General Permit has a number of Best Management Practices (BMPs) in common with the DCR's General Permit, such as stenciling catch basins, sweeping streets, and cleaning catch basins (e.g., Charbonneau 2009). The town has implemented these throughout Fairhaven, including on the reservation. In addition, the town's permit includes BMPs to educate dog owners about picking up waste and conducting annual beach clean-up days.

The Bristol County Mosquito Control Project maintains a drainage ditch in the southeast corner of the reservation and on adjacent private property. This ditch, which drains wetlands both on and off the reservation, is maintained on an as needed basis. Heavy equipment and staff access to these ditches is through the reservation's Lower Lot.

Vegetation

The lawn is mown, and flower beds weeded, once per week during the spring and summer. Trees, shrubs, and flower beds are pruned every two weeks, or as needed. Weeds are removed from paved areas, as needed. Irrigation is only used to establish vegetation when seeding or transplanting.

The Town of Fairhaven mows the grass at historic Fort Phoenix and also the section of DCR-owned lawn immediately south of the parking area for the historic fort.

In 2006, the DCR proposed the use of herbicide to control 3.9 acres of common reed along the dunes (Aquatic Control Technologies 2006). The project did not receive local approval during the permitting process and was not conducted. There have been no invasive species inventory, monitoring, or management activities proposed or implemented since that time.

Wildlife

The Lloyd Center for the Environment, operating under a contract between Mass Audubon and the DCR, conducts American oystercatcher surveys.

See Water Resources, above, for information on the regional spill response plan (Hayes et al. 2004).

3.3.2. Cultural Resources

There are no management activities unique to this property.

The Town of Fairhaven manages and maintains the adjacent historic Fort Phoenix.

3.3.3. Recreation Resources

Fort Phoenix Waterfront

The Fort Phoenix waterfront is staffed with lifeguards from 10:00 A.M. to 6:00 P.M., Wednesday through Sunday, from mid-June through early September. Outside of these dates and times, unguarded swimming is available "at your own risk." Regulations governing swimming are posted in English at the beach and are also available on the DCR web page.

Operation of this waterfront is governed by the DCR's *Waterfront Program Procedure Manual* (DCR 2007b). This manual covers topics such as designated swimming areas, water quality standards, emergency response and preparedness, management of designated swimming areas and lifeguard recruitment and testing guidelines. All lifeguards at coastal beaches, such as Fort Phoenix, must be certified in Lifeguard Training, Standard First Aid, Waterfront Module, and CPR for the Professional Rescuer (DCR 2007c). Supervisory lifeguards must also be certified in Lifeguards Management Training.

Water quality is monitored at the Fort Phoenix waterfront area. In accordance with the State Sanitary Code, water samples are obtained and analyzed within five days of the beach's opening and then once per week throughout the swimming season. Test results determine whether or not the beach is open for swimming. Samples with greater than 104 Colony Forming Units of Enterococci per 100 milliliter are indicative of unhealthy swim conditions. The waterfront area is closed to

swimming when this occurs; sunbathing and other uses of the beach continue.

The waterfront area is the focus of intensive maintenance activities. Bathrooms, which are open from late May through early September, are cleaned on an ongoing basis every day that the beach is open. Litter is picked up, and trash barrels emptied, every day, or as needed, during the swimming season. Beach public areas are raked as needed and the beach is sanitized annually.

Dogs are excluded from the immediate beach area during the swimming season. This is done to help maintain water quality (DCR 2007*b*). Wildfowl are not actively excluded; however, regulations prohibit the feeding of waterfowl within 200 feet of a designated swim area (304 CMR 12.08).

In accordance with regulations, the launching or use of any watercraft of any nature or type is prohibited at all times at Fort Phoenix Beach State Reservation (304 CMR 12.35; Appendix D). Surf boards are prohibited from the swim area, but may be used elsewhere along the shore.

Athletic Courts and Playground

The FTA coordinates the use of the tennis courts. Although there is no written agreement between the DCR and the FTA, the latter provided the Fort Phoenix tennis nets and straps. DCR staff install the nets and straps in mid-May or early June and take them down in mid- to late October. Although the FTA offers lessons at other courts in town, they are not offered at Fort Phoenix.

Picnic Facilities

Grills and picnic tables are available on a first-come first-served basis. They are maintained as needed. Associated trash barrels are emptied daily during the beach season.

The sun shelter, which is classified as a small picnic pavilion, may be reserved for a fee of \$35/day. Although this fee structure is longstanding, it has rarely been enforced at Fort Phoenix. When the sun shelter is not reserved, it is available on a first-come first-served basis.

Special Use Permits

There are currently no Special Use Permits for commercial activity at Fort Phoenix. From 2000 to 2010, a Special Use Permit was issued for a mobile

food concession (i.e., Bluebird Ice Cream) at Fort Phoenix. This permit allowed the vendor to operate on park grounds in exchange for a \$350 annual fee. When the permit expired, bids were solicited for a new concessionaire; there were no bids. As a result, there are no mobile food concessions operating legally on the reservation.

In 2011, Special Use Permits were issued for several large, annual events. A “Fort Phoenix Polar Plunge” is conducted on New Year’s Day. This event is a fundraiser for the Fort Phoenix Polar Plunge Scholarship, which is in memory of victims of domestic violence. There were approximately 200 participants. In May, Saint Joseph School holds a “Blessing of the Bikes;” there were approximately 400 attendees. In July, the Buzzards Bay Coalition held its 18th annual “Swim Buzzards Bay” event. This event begins in New Bedford and ends at Fort Phoenix. There were 216 participants and approximately 350 spectators. DCR staff is required to be present for all of these events.

3.3.4. Infrastructure

Buildings and Structures

Bathhouse. The bathhouse at Fort Phoenix is open on a seasonal basis, from June through September. It is closed, and unheated, the rest of the year. This requires winterizing the building in October and reopening the building in the spring. These activities are performed by Mobile Maintenance.

Winterizing the building involves draining and stabilizing water pipes and fixtures to prevent freezing, turning off utilities to decrease costs, and setting the alarm. Preventing frozen pipes and fixtures involves a complex maintenance routine. Water to the building is turned off and the pipes are bled. Any water remaining in these pipes is vacuumed out with a shop vacuum. Non-toxic anti-freeze is placed in all toilets and urinals; the water valves in the urinals are dismantled and treated with anti-freeze. Showerheads are removed from the outdoor showers and the pipes are bled. Water is then drained from the water heater. The Fairhaven Water Department shuts down the supply to the building at the main. A glass window above the office door is boarded up, the natural gas supply to the building is turned off, the alarm system is set, and the building is locked for the season.

In the spring, the utilities are turned on, valves and shower heads reinstalled, pipes and the water heater filled and inspected for leaks, and the plywood removed from the window over the office door.

Storm Water Management System. Maintenance recommendations were developed for the reservation's drainage system in 2011, following a cleaning and video survey. The segment of pipe that connects the catch basin along the administrative road to the manholes should be cleaned, and roots cut and removed, every two years (Valton 2011). Alternatively, relining the pipes would prevent roots from entering the pipes and decrease the need for maintenance.

The Town of Fairhaven Public Works Department (PWD) sweeps all parking lots and conducts annual cleanings of catch basins located at the intersection of Green Street and Old Fort Road. Both activities decrease the amount of sediment and litter entering the Fort Phoenix storm water management system.

Roads

The administrative road is maintained through the combined efforts of the DCR and the Town of Fairhaven PWD. DCR employees patch potholes using materials provided by the PWD. The PWD also sweeps this road. In the winter, this road is plowed by the DCR. Because it is closed to the public, this road may not get plowed until several days after a snowstorm.

Parking

Maintenance of the reservation's parking area is performed by DCR staff with support from the town. The Fairhaven PWD sweeps all parking areas and provides cold patch for pavement repairs. It has sole responsibility for snow removal in the historic Fort Phoenix parking lot. The DCR is responsible for all other parking lot maintenance and repair.

3.3.5. Interpretive Services

There are no DCR programs or materials specific to interpreting the natural or cultural histories of Fort Phoenix Beach State Reservation.

The Fairhaven Office of Tourism offers two interpretive programs at historic Fort Phoenix. A "Fort Phoenix Minuteman Tour" is offered on Thursday afternoons at 2:00 P.M., from June through September. The second program,

"Goodwife Spooner's Fort Phoenix Tour" is offered on Tuesday afternoons at 2:00 P.M. in July and August. Both programs educate the public about the history of the fort; the former from the perspective of a minuteman and the latter from the perspective of an 18th century woman.

3.3.6. Public Safety

The Fairhaven Police Department (FPD) maintains a regular presence throughout the year. During the daytime, the frequency of patrols varies with the weather, with more patrols on sunny (i.e., high use) days and fewer patrols on rainy and overcast days. During evening and overnight hours, the park is patrolled up to nine times per night. Areas patrolled include all parking lots and the administrative road. Patrols are typically performed from a police cruiser, although bicycle patrols may also occur. Officers regularly unlock and lock the gate on the administrative road in order to patrol the Lower Lot after the park has closed for the evening or for the season. The FPD locks the gates on the historic Fort Phoenix parking lot and Upper Lot at 10:00 P.M.

The FPD maintains records of their activities at Fort Phoenix. Activities for the 2011 fiscal year are presented in Table 3.3.1. The most common activities are conducting property checks (e.g., locking gates, checking on the bathhouse), general services (e.g., providing public information), and assisting motorists. Violent crimes, property crimes, and drug-related crimes are uncommon.

Table 3.3.1. Fairhaven Police Department activities at Fort Phoenix Beach State Reservation, FY 2011.

Activity ^a	Calls ^b	Unfounded ^c
Property check	209	53
General services	26	7
Assist motorist	24	4
Suspicious auto/person/other ^d	24	23
Alarm, burglar	7	5
Animal complaint	6	4
Community policing	6	2
Disturbance – noise/general ^d	6	4
Ambulance request	4	1
Property – lost/found ^d	4	0
Assist other agency	3	1
Drug investigation/violation ^d	3	2
Motor vehicle complaint	3	3
Welfare check	3	2
Parking violation	2	1

a. In addition to individual activities identified above, the FPD had one call each, all valid, for the following activities: Domestic violence, Fire, Illegal dumping, Motor vehicle violations, Safety/road hazard, Soliciting, and Transport; and one call each, unfounded, for the following activities: Arrest, Assist other police department, Larceny, Open door/window, Trespassing, and Vandalism.

b. Calls may be generated reactively, in response to information provided by the public, or proactively by officers in response to observed conditions.

c. Not all calls are founded. For example, of the 24 assist motorist calls, the investigating officers indicated that assistance was needed in only 20 instances (i.e., four calls were unfounded).

d. Related activities have been grouped for presentation in this table; the FPD records these activities individually.

DCR rangers reported 10 incidents at Fort Phoenix between March 2009 and July 2011 (O'Bannon 2011). The type and number of incidents are identified in Table 3.3.2. Incidents that are criminal in nature, such as illegal dumping or theft, are also reported to the police and may be reflected in those statistics (Table 3.3.1). Violation of DCR regulations is more common than indicated in Table 3.3.2, because not all violations are observed by or reported to DCR rangers and because Incident Reports are not prepared for every violation observed.

Table 3.3.2. Incidents reported for Fort Phoenix Beach State Reservation, 2009-2011.

Incident Type	Number of Incidents
Hazardous materials	1
Illegal dumping	1
Injury	1
Theft – Personal property	1
Theft – State property	1
Violation of DCR regulations	5

3.4. NASKETUCKET BAY STATE RESERVATION

An initial plan, including results from an ecological inventory and stewardship recommendations, was prepared shortly after the reservation was acquired in 1999. This report offered recommendations on the development of the property, including restoration and monitoring of disturbed areas, habitat management and monitoring, establishment of a trail system, and interpretive opportunities (Epsilon Associates, Inc. 2000). (See Appendix H for a complete list of recommendations.)

A master plan, based on recommendations in the Epsilon report (Epsilon Associates, Inc. 2000), was issued in 2000 (DEM 2000). This plan articulated “the agency’s consensus on goals, objectives, and strategies for restoring the property, protecting the reservation’s natural and cultural resources, and firmly establishing the Nasketucket Bay State Reservation as a welcoming, attractive, safe, scenic destination for the general public.” It identified 11 short-term and nine long-term strategies for managing the property (DEM 2000). Nine of the 11 recommended short-term strategies have been implemented, but only three of the recommended long-term strategies. (See Appendix I for a complete list of recommendations.)

3.4.1. Natural Resources

There is no barrier beach management plan for the reservation’s sole barrier beach.

Because over 97% of the reservation has been identified as Priority Habitat, virtually all projects and activities (e.g., vista pruning, trail work, restoring the cultural grassland, and other wildlife habitat improvements) must be reviewed by the NHESP prior to the commencement of any physical work or action. (See Appendix D for additional information.) There are currently no reviewed and approved projects, nor are there any approved Habitat Management Plans (HMPs).

The Fairhaven Land Preservation Trust (FLPT) holds a Conservation Restriction on 1.55 acres (identified as “1.3 acres, more or less” in the CR) of the portion of the reservation located in the Town of Fairhaven. This area is largely salt marsh. The purpose of the CR is to “retain the Premises predominantly in its natural, scenic and open condition; to protect and promote the conservation

of forests, wetlands, soils, natural watercourses, coastal habitat, water supplies and wildlife thereon; to protect the horticultural resources of the Premises; to protect and enhance the value of the abutting conservation areas, and to allow public access for enjoyment of the natural and open space resources of the Premise.” Prohibited and permitted activities, as identified in this CR, are described in the following sections.

Water Resources

The oil spill response plan for Buzzards Bay calls for the deployment of booms and skimmers at multiple locations throughout Nasketucket Bay (Hayes et al. 2004). Two of these locations are adjacent to Nasketucket Bay State Reservation.

Over 9,300 feet of deflection booms and two skimmers are to be deployed between the Joseph B. Goulart, Jr. Boat Ramp on Sconticut Neck and the southernmost portion of the reservation. This is intended to keep oil from moving farther north and west into the bay.

A smaller configuration of protection and deflection booms is intended to protect salt marshes along the eastern and western shores of Shaw’s Cove, including those on the reservation. Under this proposed response action, a deflection boom would be anchored just offshore of the reservation and the creek that drains the salt marsh would be diked to prevent tidal exchange. Oil would be directed toward the beach along Shaw’s Road, at the north end of the cove.

The DCR’s role in developing and implementing this response action is unclear. The DCR contact information contained in the plan is incorrect.

Vegetation

Mobile Maintenance cuts the grassy shoulder of the Bridle Path Trail and a portion of the cultural grassland on an annual basis, typically in August. The mowing is timed to avoid or minimize impacts to eastern box turtles, a Species of Special Concern that occurs throughout the reservation. However, there is no approved HMP for these activities. A draft HMP for these activities has been prepared as part of the RMP planning process (Appendix J).

There are two CFI plots; one is located on the edge of the cultural grassland and the other is located between the Bridle Path and the shore. These plots

are surveyed once per decade to measure forest growth and monitor forest health.

The FLPT’s CR prohibits the “removal, destruction or cutting of trees in connection with commercial harvesting or lumbering activities” unless performed in accordance with an approved cutting plan or “Forestry Management Plan.” It specifically permits “the cutting and planting of trees, shrubs and other vegetation” for normal improvements and maintenance, to create or maintain trails or foot paths, prevent the threat of injury or damage, and to further the conservation interests of the CR.

Wildlife

The Lloyd Center for the Environment, operating under a contract between Mass Audubon and the DCR, conducts American oystercatcher surveys.

See Water Resources, above, for information on the regional spill response plan (Hayes et al. 2004).

3.4.2. Cultural Resources

There are no cultural resources management activities unique to this property.

3.4.3. Recreation Resources

The Town of Mattapoisett (2011) regulates the taking and possession of shellfish from most waters surrounding the reservation and the Town of Fairhaven regulates within its municipal boundary. All harvesting, both commercial and recreational, requires a license issued by one of these towns. The frequency of monitoring by municipal shellfish wardens is unknown.

The FLPT’s CR prohibits a variety of recreational activities including camping, hunting, or trapping, “except to the extent provided for in a management plan ... developed and agreed upon by” the DCR and FLPT. It also prohibits the use of “power-driven vehicles of any kind” with the following exceptions: motorized wheelchairs, vehicles used for the purposes of upkeep and maintenance, vehicles used in connection with sound forest management, and emergency vehicles. Permitted activities include “use by the public, for passive recreation activities.”

3.4.4. Infrastructure

Buildings and Structures

Culverts. The reservation's salt marsh is located in two towns and two counties. Ditches associated with the northern portion of the marsh, in Fairhaven, are maintained by the Bristol County Mosquito Control Project. There are no culverts in this portion of the marsh. Those in the southern portion of the marsh, in Mattapoisett, are maintained by the Plymouth County Mosquito Control Project (PCMCP). The reservation's box culvert and corrugated culvert are located in this portion of the marsh. Neither the PCMCP nor the DCR has maintained these culverts in recent years.

The FLPT's CR prohibits the construction or placing of a variety of buildings, structures, and signs. Exceptions are made for "those structures reasonably required or necessary to undertake the permitted activities ... or to carry out the purposes of the CR."

Monitoring Wells. There are no known activities related to the sampling or maintenance of monitoring wells.

Roads

There are no ongoing activities for maintaining the road's surface.

Trails

There are no ongoing reservation-wide trail maintenance or repair activities.

The FLPT's CR specifically allows for the "maintenance and use of existing ways, trails, fences, bridges, gates, and stone walls." It also permits the cutting and planting of trees, shrubs and other vegetation as needed for trail creation or maintenance.

Kiosks and Signs

The "erection and maintenance of signs" identifying ownership, CR status, regulations, trail information, and interpretive information are permitted under the FLPT's CR.

3.4.5. Interpretive Services

There are no interpretive programs or materials specific to this property. A "Full Moon Hike," which is a recreational program with interpretive elements,

took place in both February and October, 2011. Over 20 participants took part in the first hike and 24 participants took part in the second hike.

3.4.6. Public Safety

The Massachusetts Environmental Police enforce hunting regulations at Nasketucket Bay State Reservation.

During the beach season, the Mattapoisett Police Department is required to patrol every beach in town at least twice per shift. This includes Brant Beach, at the southern end of Brandt Island Road. Officers in transit to patrol Brant Beach visually check the parking lot at Nasketucket Bay State Reservation as they pass by. The parking lot is checked less frequently at other times of year.

3.5. WEST ISLAND STATE RESERVATION

A management plan for West Island State Reservation was developed by the DEM in 1997. The plan's stated purpose was to provide "guidance for sound environmental management and resource protection of the significant natural resources of the publicly owned land on West Island" (DEM 1997). This report offered recommendations on water quality, access, resource protection, recreation and environmental education, and maintenance. (See Appendix K for a complete list of recommendations.) Many of these recommendations were not implemented.

3.5.1. Natural Resources

There is no barrier beach management plan for the reservation's five barrier beaches.

Projects and activities occurring within the portion of the reservation identified as Priority Habitat must be reviewed by the NHESP prior to the commencement of any physical work or action. (See Appendix D for additional information.) There are currently no reviewed and approved projects, nor are there any approved HMPs.

Water Resources

Monitoring Wells. The Fairhaven PWD samples water obtained from four monitoring wells; two on the state reservation and two on Town Beach. The following parameters or contaminants are identified from these samples: pH, nitrogen, phosphorous, oil and grease, sodium, chloride, conductance, solids,

and 39 volatile organic compounds. Results of laboratory analyses are submitted electronically to the Massachusetts Department of Environmental Protection.

Oil Spill Response Plans. Portions of West Island are included in oil spill response activities developed to protect the resources of Nasketucket Bay (Hayes et al. 2004). The plan calls for a series of booms extending from North Point, westward to Deacon's Cove on Sconticut Neck. The salt marshes along the northwest shore of the reservation are among the resources to be protected by this response. A separate deflection boom is to be deployed at the entrance to East Cove, to protect the extensive salt marsh along the reservation's east side.

The DCR's role in developing and implementing this response action is unclear. The DCR contact information contained in the plan is incorrect.

Vegetation

The DCR does not actively manage vegetation at this property. Fairhaven PWD maintains vegetation along the east side of Fir Street and along easements associated with the WWTF and the effluent disposal lot. (See Section 3.5.4 for additional information.)

There are two CFI plots located at West Island; one is located along the trail from the main entrance and the other is located in the salt marsh.

Wildlife

The Lloyd Center for the Environment, operating under a contract between Mass Audubon and the DCR, monitors and manages populations of piping plovers and American oystercatchers. Most plover nests are on adjacent Town of Fairhaven land; the DCR's contract supports monitoring and management of these nests. Specific monitoring and management activities are identified in Table 3.5.1. These activities are performed in accordance with state standards (DFW 1993).

Table 3.5.1. Chronology of beach-nesting bird monitoring and management activities performed at West Island State Reservation by The Lloyd Center for the Environment.^a

Activity	Species ^b	Month(s)
Identify territories	PIPL	March–April
Locate nests	AMOY	March–July
Install/maintain fencing	PIPL AMOY	March–July
Locate nests	PIPL	April–July
Install predator exclosures	PIPL	May–July
Public education	AMOY PIPL	May–July
Count fledglings	PIPL	July–August
Survey post-breeding birds	AMOY	July–August
Remove fencing and predator exclosures	PIPL	August

a. Based on Bogart et al. (2010).

b. AMOY = American oystercatcher; PIPL = piping plover.

There are no other ongoing inventories or monitoring activities.

See Water Resources, above, for information on the regional spill response plan (Hayes et al. 2004).

3.5.2. Cultural Resources

There are no cultural resource management activities unique to this property.

3.5.3. Recreation Resources

Hunting, Fishing, and Shellfishing

Hunting on West Island State Reservation is regulated through Massachusetts Regulations (304 CMR 12.00 and 321 CMR 3.00; Appendix D) and also through the official Massachusetts Hunting, Freshwater Fishing, and Trapping Regulations that are promulgated annually.

The Town of Fairhaven (2011) regulates the take and possession of shellfish from waters surrounding West Island State Reservation. All harvesting, both commercial and recreational, requires a license issued by the town. The taking of shellfish from the waters along the eastern side of North Cove is restricted to commercial fisherman. The taking of shellfish from East Cove is restricted to recreational license holders. The Fairhaven Shellfish Constable periodically enters the reservation, via the main gate along Fir Street, for the purpose of monitoring the taking of shellfish.

Recreational Boating

The Town of Fairhaven does not allow transit boaters to anchor overnight within Fairhaven waters, except in cases of emergency (Town of Fairhaven, Office of the Harbormaster n.d.). However, ambiguity in the regulations makes the prohibition of overnight anchoring difficult to enforce. The harbormaster allows people to anchor in East Cove overnight, with the presumption that they will remain on their boats throughout the night (Darmofal 2011). The waters off the northern portion of the reservation are not regularly patrolled for boats anchoring overnight.

3.5.4. Infrastructure

Boundary

The Town of Fairhaven holds two easements on portions of West Island State Reservation. The first is an easement to install, maintain, repair, replace and operate water quality wells and other similar testing devices on an 18.1 acre section of the reservation. The second easement allows the town to build, maintain, repair, and replace a right of way providing access to the town's effluent disposal lot and an underground easement to install, maintain, repair, replace, and operate utility services to the same lot. There are no restrictions on the timing or duration of access by the town, nor are there any requirements to report to, or coordinate access with, the DCR.

Roads

Fir Street, a public road, is maintained by the Fairhaven PWD. They also maintain vegetation along the road's east shoulder, from the West Island Waste Water Treatment Facility (WWTF) southward. This includes cutting back branches and woody vegetation from the road side once each winter and mowing grass along the shoulder throughout the summer. They do not maintain vegetation along the road shoulder to the north of the WWTF. The PWD grades the gravel surface of Fir Street between two and six times per year, dependent on weather. They are solely responsible for snow plowing. Finally, they pick up trash that has been dumped along the road's shoulder.

Trails

The trail from the main gate to the sewage infiltration beds is largely maintained by the Fairhaven PWD. They remove fallen trees, cut back brush, and plow the trail in the winter.

3.5.5. Interpretive Services

There are no interpretive programs or materials specific to this property.

3.5.6. Public Safety

The Massachusetts Environmental Police enforce hunting regulations at West Island.

Fairhaven Police monitor the western boundary of the reservation up to three times per night during the beach season. After patrolling the adjacent Town Beach parking lot, they travel north along Cottonwood Street, Misty Bay Road, and Fir Street to reach Causeway Road. While doing so they look for activity on the reservation.

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The historic Souza home site at Nasketucket Bay State Reservation is being damaged by vegetation and is in need of management.

SECTION 4. RECOMMENDATIONS

4.1. INTRODUCTION

This RMP provides a framework for achieving a sustainable balance between the provision of quality outdoor recreation opportunities and the conservation of important natural and cultural resources. This requires knowledge of a property's natural and cultural resources and identification of compatible recreational activities.

Previous sections of this plan have described the natural, cultural, and recreation resources of Fort Phoenix, Nasketucket Bay, and West Island state reservations and their management (Sections 2 and 3, respectively). This section considers the future of these properties and provides recommendations that, when implemented, will conserve and enhance natural and cultural resources while offering sustainable nature-based recreation.

This section includes two types of recommendations, Land Stewardship Zoning and specific recommendations. Land Stewardship Zoning provides general guidance on compatible land uses throughout the planning unit. Specific recommendations address existing and developing issues, challenges, and opportunities. Collectively,

these recommendations are the means by which this plan's management principle and goals are realized.

4.2. LAND STEWARDSHIP ZONING

Resource Management Plans must protect natural and cultural resources and ensure consistency between recreation, resource protection, and sustainable forest management (M.G.L. Chapter 21: Section 2F). The zoning of properties at the landscape-level and Land Stewardship Zoning at the planning unit-level are the mechanisms through which this is achieved.

4.2.1. Landscape-level Zoning

DCR Landscape Designations

As an overarching template for organizing its land management activities, the DCR is adopting a management structure that sub-divides its lands into three landscape designations: (1) Reserves, (2) Parklands, and (3) Woodlands. The three landscape designations are intended to enhance the provision of ecosystem services by segregating incompatible activities and allowing for prioritization of goals.

Reserves. Areas designated as Reserves are representative of the Commonwealth's least

fragmented, diverse forest settings, where the dominant ecosystem service objectives are biodiversity maintenance and the underlying supporting services of nutrient cycling and soil formation, watershed protection, and long-term carbon sequestration; important secondary services include provision of wilderness values and recreation.

Parklands. In Parklands, the primary ecosystem service objectives are the provision of public recreational opportunities that depend on natural areas, preservation of ecologically significant areas and special places, and promotion of cultural values (aesthetic, historical, educational, and tribal).

Woodlands. Woodlands emphasize the provision of ecosystem services that require management prescriptions with intensities that are less compatible with the activities in the Parklands or Reserves. One role for Woodlands would be demonstrating, to private and municipal landowners and the general public, the practice of sustainable forestry through active forest management.

Landscape Designation Application to the Fort Phoenix Planning Unit

The proposed landscape designation for all properties within the planning unit is Parklands. The DCR sponsored a public meeting on June 7, 2011 in Dighton to describe the proposed landscape designations for state forests, parks, and reservations in southeastern Massachusetts and to receive public comments on the proposed designations. There were no public comments related to the proposed Parklands designation for properties in the Fort Phoenix Planning Unit.

4.2.2. Planning Unit-level Zoning

The development and application of Land Stewardship Zoning at the planning unit-level is the result of a step-by-step analysis of the unit's natural and cultural resources, compatible public access, and recreational uses. It allows for the management of properties at a finer scale, and with greater specificity, than is possible with landscape-level zoning.

Land Stewardship Zoning Guidelines

Land Stewardship Zoning Guidelines provide a framework that guides the long-term management of parks, reservations, and forests. These guidelines define three standard zones, which are identified for all properties in an RMP. They also define significant feature overlays that are applied on a supplemental basis. The development and application of these guidelines is the result of a systematic analysis of the natural and cultural resources of each reservation, compatible public access, and recreational uses.

Zone 1. Highly sensitive natural and cultural resources that require special management approaches to protect and preserve their features and values. Examples include rare species habitat identified as being highly sensitive to human activities, archaeological or cultural sites, and rare and sensitive natural communities.

Zone 2. Areas containing commonly encountered yet important natural and cultural resources on which standard forestry practices and dispersed recreational activities occur at sustainable levels without damaging the potential for improved ecological health, productivity, or protection through active management. Examples include ecosystems characterized by a diversity of wildlife and plant habitats, rare species habitat that is compatible with vegetation management and dispersed recreation, agricultural resources, and resilient cultural sites and landscapes.

Zone 3. Developed administrative, maintenance, and recreational sites, structures, and landscapes that accommodate concentrated use by staff and visitors, and require intensive maintenance. Examples include park headquarters and maintenance areas, parking lots, swimming pools and skating rinks, paved bikeways, swimming beaches, campgrounds, playgrounds and athletic fields, parkways, golf courses, picnic areas and pavilions, and concessions.

Significant Feature Overlays. The three Land Stewardship Zones may be supplemented with significant feature overlays that identify specific formally designated or otherwise recognized resources. These overlays recognize, maintain, protect, or preserve unique and significant values, regardless of the zone in which they occur, and provide more precise management guidance.

Examples of significant feature overlays include areas subject to public drinking water regulations or areas subject to historic preservation restrictions. Specific management guidelines are provided by resource specialists or by the government agency that has recognized and listed the resource or site.

A more detailed description of the Land Stewardship Zoning Guidelines is available at: <http://www.mass.gov/dcr/stewardship/rmp/lsguidelines.htm>.

Applied Land Stewardship Zoning for the Fort Phoenix Planning Unit

Application of the Land Stewardship Zones is the result of an analysis of natural and cultural resources in the context of compatible public recreation and park management activities.

Recommended Land Stewardship Zoning Fort Phoenix Beach State Reservation (Figure 4.2.1)

Zone 1

- There are no sections of the reservation zoned as Zone 1.

Zone 2

- The man-made dune system between the beach and the parking areas.
- The forested northern portion of reservation.

Zone 3

- Portions of the reservation that support the most intensive levels of use, including the beach, bathhouse, parking lots, athletic courts, picnic areas, and adjacent lawns.

Significant Feature Overlay

There are no Significant Feature Overlays for this property.

Recommended Land Stewardship Zoning Nasketucket Bay State Reservation (Figure 4.2.2)

Zone 1

- The salt marshes and adjacent Maritime Dune community along the shore of Nasketucket Bay.

Zone 2

- All terrestrial forests and forested wetlands.
- The cultural grassland.

Zone 3

- The reservation's parking lot.

Significant Feature Overlay

- Use of the Significant Feature Overlay is applied to the mosaic of forest and forested wetlands identified by the NHESP as Priority Habitat, for eastern box turtles.

Recommended Land Stewardship Zoning West Island State Reservation (Figure 4.2.3)

Zone 1

- The entire salt marsh on the eastern side of the reservation.
- Sections of the reservation identified as barrier beaches by Massachusetts Office of Coastal Zone Management.
- The point of land north of Town Beach and east of Bass Creek, which is used as nesting habitat by the federally- and state-listed piping plover.

Zone 2

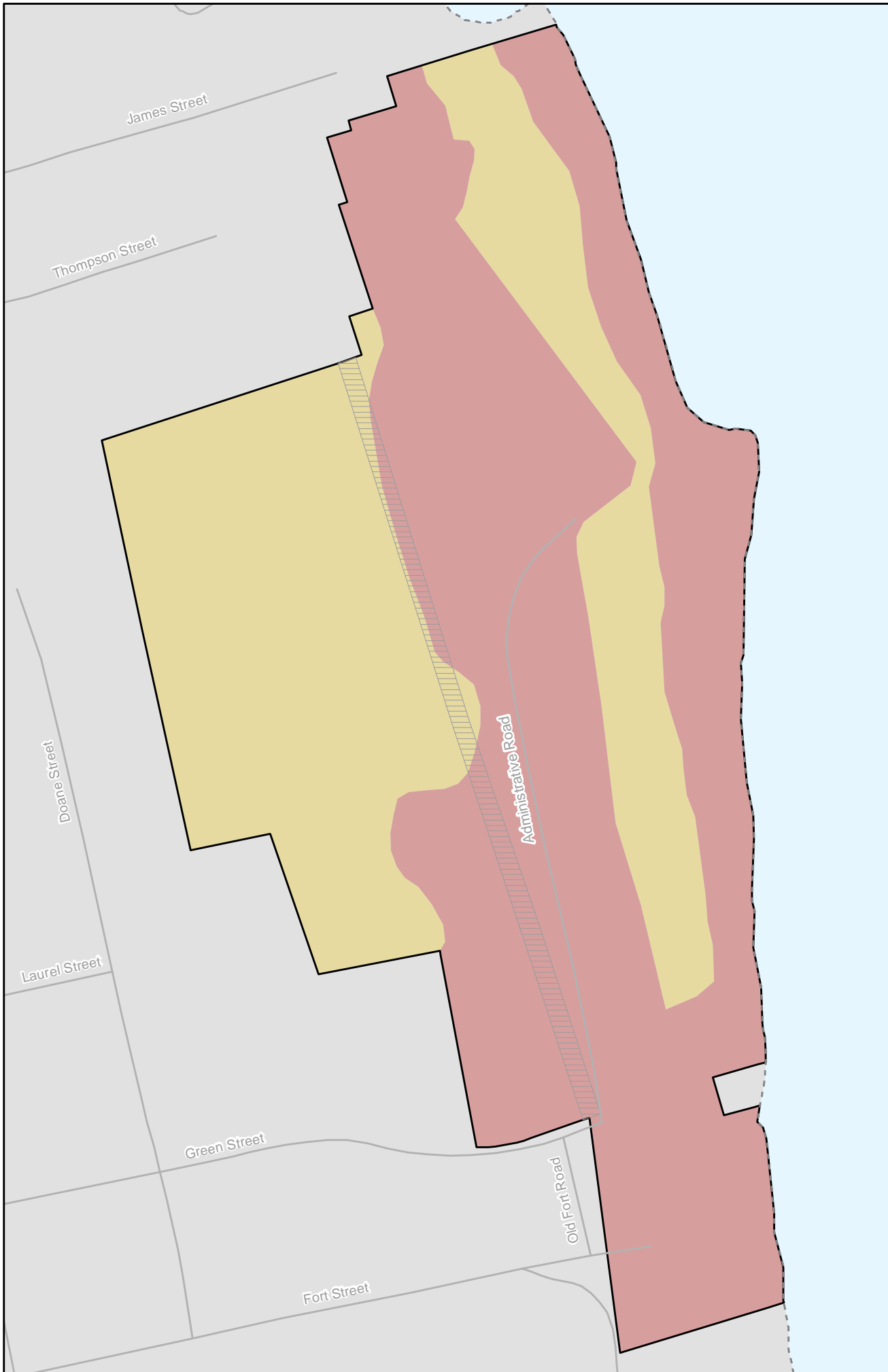
- Upland forests and forested wetlands.

Zone 3


Due to the lack of developed recreation, administrative, and operations infrastructure no portions of the reservation have been designated Zone 3.

Significant Feature Overlay



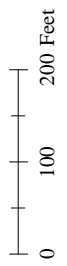
- Priority Habitat as designated by the Massachusetts Natural Heritage and Endangered Species Program.



Fort Phoenix Beach State Reservation
Figure 4.2.1. Recommended Land Stewardship Zoning



DCR GIS Map 12

Geographic data supplied by the Office of Geographic Information (MassGIS) and DCR GIS.

Public Road —

Town Boundary - - -

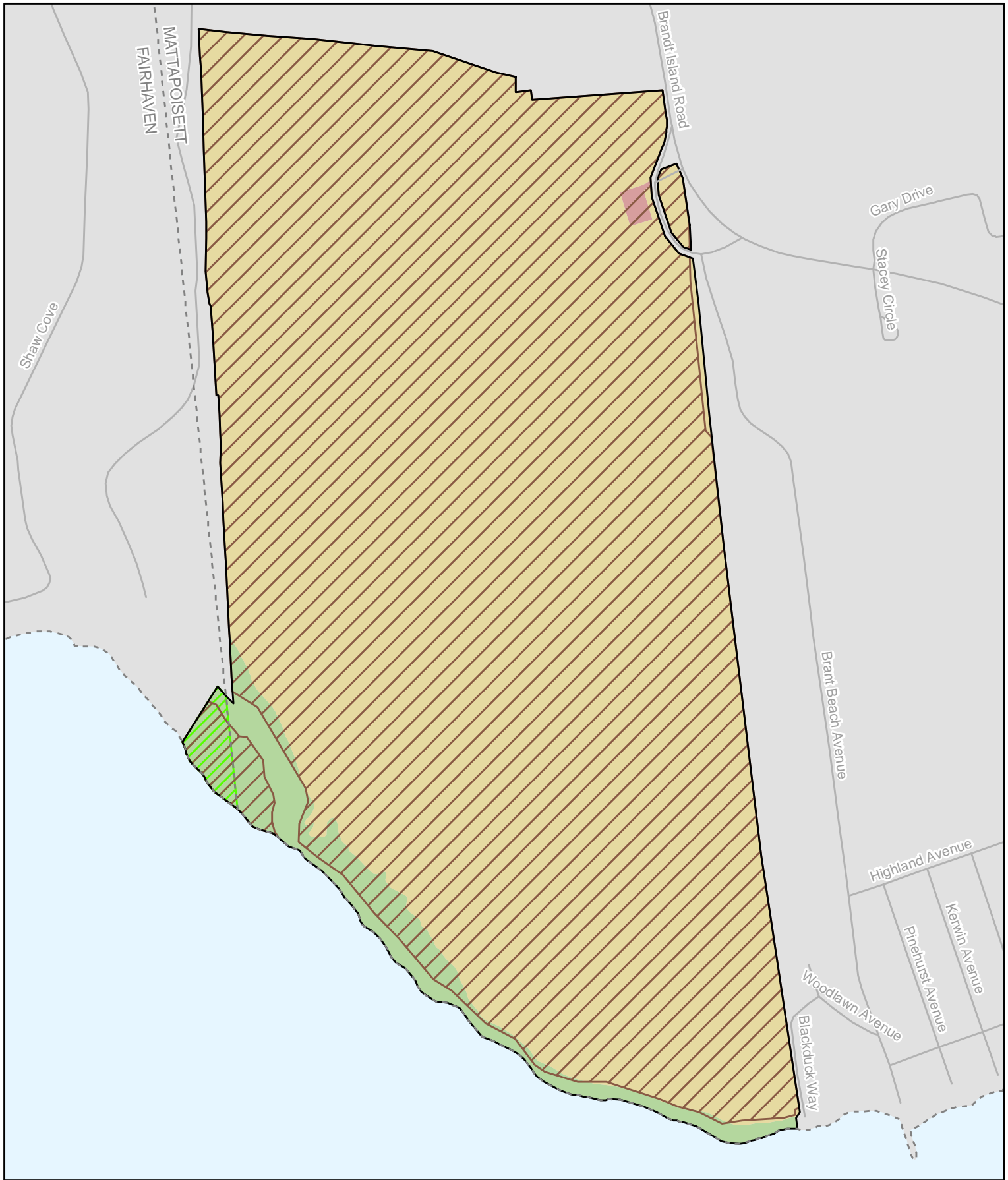
Fort Phoenix State Reservation [Red outline]

Fee Interest [Hatched box]

Utility Easement [Thin lines box]

Land Stewardship Zoning

[Green box]	Zone 1
[Yellow box]	Zone 2
[Red box]	Zone 3



Land Stewardship Zoning

- Zone 1
- Zone 2
- Zone 3
- Significant Feature Overlay
- Nasketucket Bay State Reservation
- Fee Interest
- Conservation Restriction

Nasketucket Bay State Reservation

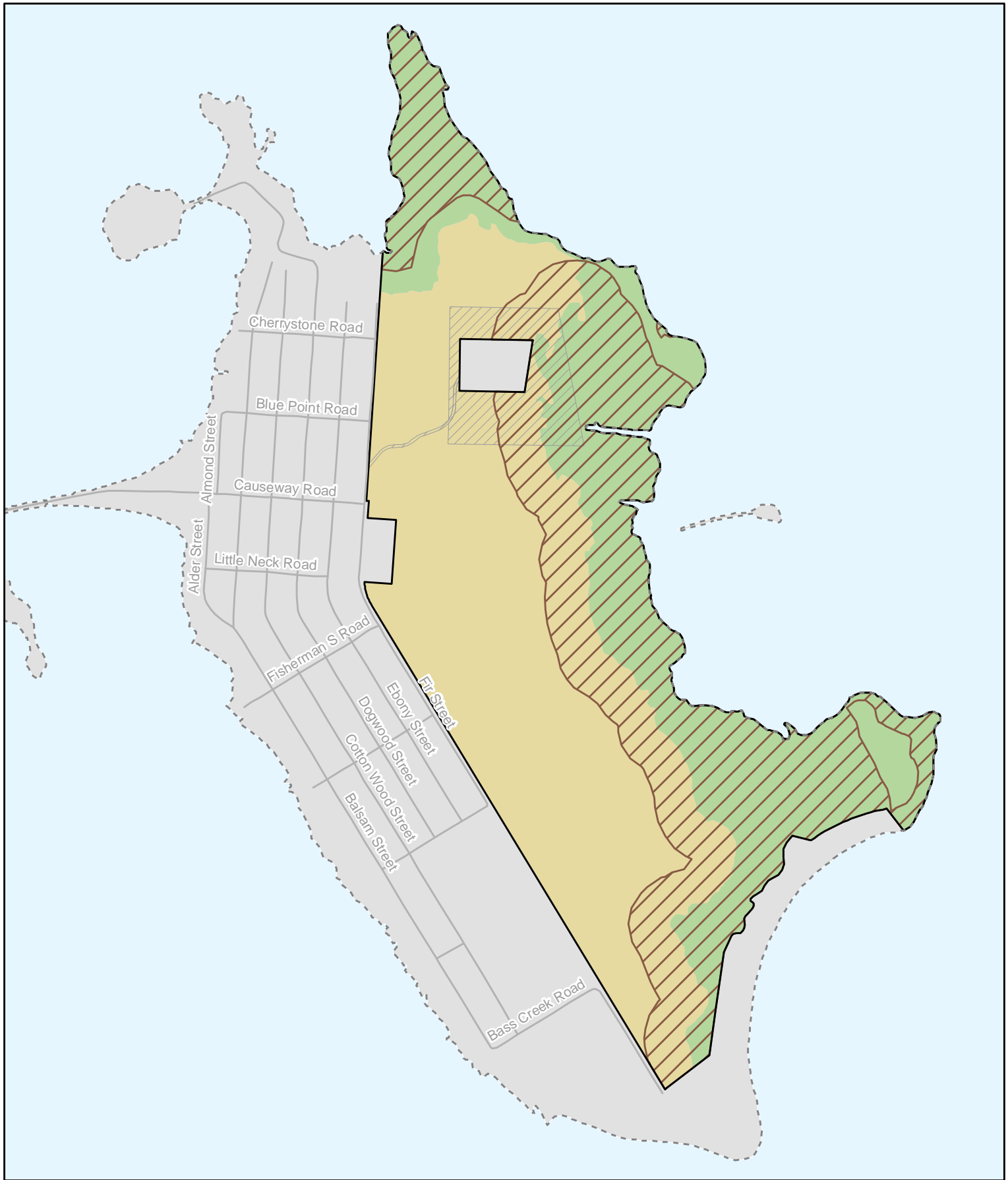
Figure 4.2.2. Recommended Land Stewardship Zoning

0 250 500 Feet

dc
Massachusetts

DCR GIS May-12

Geographic data supplied by the Office of Geographic Information (MassGIS) and DCR GIS.



Land Stewardship Zoning

- Zone 1
- Zone 2
- Zone 3
- Significant Feature Overlay
- West Island State Reservation
- Fee Interest
- Utility Easement

West Island State Reservation

Figure 4.2.3. Recommended Land Stewardship Zoning

0 250 500 Feet

dc
Massachusetts

DCR GIS May-12

Geographic data supplied by the Office of Geographic Information (MassGIS) and DCR GIS.

4.3. MANAGEMENT RECOMMENDATIONS

Management Principle

The resource management planning process for Fort Phoenix, Nasketucket Bay, and West Island state reservations has resulted in the following management principle: *Provide coastal access while actively managing the built environment for recreation and the natural environment for conservation.*

Management Goals

The following five management goals have been identified to achieve the management principle. These goals are of equal importance, and are not presented in order of priority.

Goal 1. Maintain and enhance existing recreation facilities and experiences.

Goal 2. Prepare for rising sea level and storm surge through methods appropriate for each property.

Goal 3. Enhance communication with park visitors to promote the increased awareness, appreciation, and protection of natural and cultural resources and to improve the visitor experience.

Goal 4. Preserve and protect existing cultural resources and expand the level of public understanding of the cultural history of the reservation and region.

Goal 5. Enhance conservation by acquiring additional natural resources information and by actively managing rare species, uncommon natural communities, and populations of invasive plants.

Recommendations

These management recommendations have been organized first by the planning unit in its entirety, for those that apply to all three state reservations, and then by individual facility. The set of recommendations that apply to each are presented by the five management goals identified for the Fort Phoenix Planning Unit

Fort Phoenix Planning Unit

Management recommendations applicable to the entire planning unit are presented in Table 4.3.1.

Fort Phoenix Beach State Reservation

Management recommendations for Fort Phoenix Beach State Reservation are presented in Table 4.3.2.

Nasketucket Bay State Reservation

Management recommendations for Nasketucket Bay State Reservation are presented in Table 4.3.3.

West island State Reservation

Management recommendations for West Island State Reservation are presented in Table 4.3.4.

Table 4.3.1. Recommendations for Fort Phoenix Planning Unit.

Recommendation	Priority^a	Resources^b	Implementation^c
Goal 1. Maintain and enhance existing recreation facilities and experiences.			
Obtain demographic information on park visitors.	M	3	P
Goal 2. Prepare for rising sea level and storm surge through methods appropriate for each property.			
Install markers that identify projected sea level elevations, over time, to increase awareness of the potential impacts of sea level rise on coastal resources and properties.	M	2	O, R, V
Goal 3. Enhance communication with park visitors to promote the increased awareness, appreciation, and protection of natural and cultural resources and to improve the visitor experience.			
Increase pet owners' awareness of their responsibility to control and clean up after their dogs; enforce regulations as appropriate.	H	2	B, R
Create a guide to the common animals of the Buzzards Bay shore that is applicable to all DCR properties on the bay.	M	3	B, R
Goal 4. Preserve and protect existing cultural resources and expand the level of public understanding of the cultural history of the reservation and region.			
Ensure that, early in the planning process, all projects involving ground disturbance and/or any potential impact to the cultural resources identified in this RMP are submitted to the Office of Cultural Resources for review and comment. Following this review, some projects may require the preparation of a Massachusetts Historical Commission Project Notification Form.	H	1	R
Identify staff training opportunities to increase operational awareness of cultural resource management (e.g., scheduling a session of OCR's Stone Wall Management training module).	M	2	P
Research and document extant stone walls. Avoid impacts to the walls by park operations activities and park visitors. Provide signs to prevent visitors from disturbing or removing stone walls or other stone features.	M	3	P, R
Goal 5. Enhance conservation by acquiring additional natural resources information and by actively managing rare species, uncommon natural communities, and populations of invasive plants.			
<i>There are no recommendations associated with this goal for the entire planning unit.</i>			

a. Priorities are High (H), Medium (M), or Low (L).

b. Availability of resources for implementing recommendations: 1 = funding is currently available; 2 = funding is currently unavailable, but may become so in the near future; 3 = funding is currently unavailable, but may become so in more than five years.

c. The following codes identify the party responsible for implementing the recommendation: B = Ranger Bureau; C = Contractor or consultant; E = Bureau of Engineering; L = Legal Services; O = Other; P = Bureau of Planning and Resource Protection; R = Regional and district staff; S = Department of Special Events; V = Volunteer or partner; X = Office of External Affairs and Partnerships.

Table 4.3.2. Recommendations for Fort Phoenix Beach State Reservation.

Recommendation	Priority^a	Resources^b	Implementation^c
Goal 1. Maintain and enhance existing recreation facilities and experiences.			
Maintain the administrative road during the winter so that public safety agencies have regular access to the bathhouse and Lower Lot.	H	1	R
Pursue discussions with NSTAR about acquiring the property between the reservation and Doane Street.	H	1	P
Re-line the drainage pipe between the administrative road and the manhole.	H	2	C, E
Repair cracks, resurface, and repaint tennis courts.	H	2	C, E
Provide appropriate striping and signs for the HP Lot at the bathhouse.	H	2	C, P
Remove weeds and seal cracks to extend the life of the Lower Lot.	H	2	C, R
Replace rotted gates with new gates bearing standard DCR markings.	H	2	C, E, R
Correct pavement markings and signs at designated HP parking spaces in the lot at the historic fort.	H	2	R
Install mobi-mat from the existing boardwalk to the beach in order to create universal access to the beach; seasonally install and remove this mat.	H	2	O, R
Increase pet owners' awareness of the exclusion of dogs from Fort Phoenix Beach during the swimming season; enforce regulations as appropriate.	H	2	B, R
Correct the drainage problem at the bathhouse so that water from the outside showers flows away from, rather than into, the building.	H	3	C, E, R
Prepare a facility master plan.	H	3	C, P
Solicit for a municipal, non-profit, or for profit entity to operate the tennis courts, provide tennis lessons, and perform minor facility maintenance.	M	1	L, S, X
Charge for reserved use of the sun shelter, as allowed in 801 CMR 4.02 (302); post signs that indicate how this shelter may be reserved.	M	1	R
Work with abutters to resolve encroachment issues along James Street.	M	1	L, P, R
Raise the ground level around the existing grills to eliminate the ponding of water during and after rain storms.	M	1	R
Work with the Town of Fairhaven and SRPEDD to post signs directing Phoenix Bike Trail users to and from the reservation.	M	1	R, V
Revise DCR regulations to allow the launching of car-top water craft, such as kayaks, from the shore adjacent to the southeast corner of the Lower Lot.	M	1	O
Install security lighting at the Upper Lot.	M	2	C, R
Revise locations and markings of Regulatory Signs in the Upper and Lower Lots to meet DCR graphic standards and the Manual of Uniform Traffic Control Devices.	M	2	R
Remove existing contact station and install guardrail in its place to prevent vehicle access.	M	2	R
Assess the potential for reinstituting parking fees, as allowed in 801 CMR 4.02 (302).	M	2	O, R

Continued on next page.

Table 4.3.2. Recommendations for Fort Phoenix Beach State Reservation. (Continued)

Recommendation	Priority^a	Resources^b	Implementation^c
Goal 1. Maintain and enhance existing recreation facilities and experiences. (Continued)			
Obtain information on the number and demographic characteristics of park visitors.	M	3	P
Add one van accessible space and one other HP space to the southeast corner of the Upper Lot.	M	3	C, R
Reduce the paved area of the multi-use courts and install an accessible sun shelter, picnic tables, and grills. Provide an accessible path to this facility from the existing HP Lot.	M	3	C, E, P
Add security lighting to the existing sun shelter and bathhouse; assess the potential for solar power.	M	3	C, E, R
If access to Doane Street has been acquired, create a formal pedestrian and bicycle entrance to the park on Doane Street, along the historic carriage road.	M	3	P, R
Add traffic control devices, such as stop signs and lines, to the Upper Lot and administrative road.	M	3	C, E, P
Add parking for up to 30 additional bicycles.	M	3	R
Goal 2. Prepare for rising sea level and storm surge through methods appropriate for each property.			
Raise and expand the existing dunes to decrease the potential frequency and severity of coastal storm impacts to the bathhouse, Lower Lot, and playground, while allowing for continued universal access to the beach.	H	3	P, R, W
Goal 3. Enhance communication with park visitors to promote the increased awareness, appreciation, and protection of natural and cultural resources and to improve the visitor experience.			
Install multi-lingual “Gate Closes at” signs that meet DCR and MUTCD standards.	H	1	R
Install multi-lingual beach regulation signs.	H	1	R
Install “Do Not Feed Wildlife” signs in the parking lots; enforce as appropriate.	M	1	R
Add additional Lead-in Signs from routes 6 and 240 to the reservation.	M	1	R
Replace DEM park system map on the east side of the Upper Lot kiosk with a current, DCR property map.	M	2	R
Install an appropriate marker on the bathhouse in honor of former property manager Lewis Hannigan.	M	2	O, R

Continued on next page.

Table 4.3.2. Recommendations for Fort Phoenix Beach State Reservation. (Continued)

Recommendation	Priority^a	Resources^b	Implementation^c
Goal 4. Preserve and protect existing cultural resources and expand the level of public understanding of the cultural history of the reservation and region.			
Continue to perform annual maintenance on bathhouse, including preventing encroachment by sand and vegetation, ensuring that the roof and paved areas maintain proper drainage, repaint areas marred by vandalism and making any repairs with like materials.	H	1	E, P, R
Prepare MHC inventory form for the reservation. Prepare building forms for the bathhouse and concrete playground equipment.	M	1	P
Restore the main carriage road through the wooded area of the reservation, clearing overgrown vegetation and reinforcing drainage control systems. Provide additional site and archival research to determine location of other carriage roads at the Rogers Estate.	M	2	E, P, R
Provide interpretive material (panel, brochures, or other) on the history of the site, including, at a minimum, dated photographs of the reservation in its multiple stages of development.	M	3	C, O
Clean, restore, and install abandoned playground equipment at bathhouse as an interpretive opportunity, highlighting the history of the state's management of the site.	L	3	C, O, P, R
Work with the Town of Fairhaven to coordinate on joint interpretive programming that would help visitors understand the shared history of the two sites.	L	3	C, P, V
Goal 5. Enhance conservation by acquiring additional natural resources information and by actively managing rare species, uncommon natural communities, and populations of invasive plants.			
Control new occurrences and isolated patches of invasive plants (e.g., Japanese knotweed) to limit their spread throughout the reservation.	H	1	C, R, V
Conduct a botanical inventory, with emphasis on the unaltered portions of the reservation.	L	3	C

a. Priorities are High (H), Medium (M), or Low (L).

b. Availability of resources for implementing recommendations: 1 = funding is currently available; 2 = funding is currently unavailable, but may become so in the near future; 3 = funding is currently unavailable, but may become so in more than five years.

c. The following codes identify the party responsible for implementing the recommendation: B = Ranger Bureau; C = Contractor or consultant; E = Bureau of Engineering; L = Legal Services; O = Other; P = Bureau of Planning and Resource Protection; R = Regional and district staff; S = Department of Special Events; V = Volunteer or partner; W = Waterways; X = Office of External Affairs and Partnerships.

Table 4.3.3. Recommendations for Nasketucket Bay State Reservation.

Recommendation	Priority^a	Resources^b	Implementation^c
Goal 1. Maintain and enhance existing recreation facilities and experiences.			
Continue efforts to expand the reservation and to establish connections with nearby protected open space and the Phoenix Bike Trail/Mattapoisett Rail Trail.	M	1	P
Once grassland has been restored, cut brush and limbs along the western boundary of the field to reveal stone wall and to create a scenic vista.	M	2	R
Work with the Town of Mattapoisett and SRPEDD to post signs directing Mattapoisett Rail Trail users to and from the reservation.	M	2	P, R
Mark all trail intersections in a manner consistent with DCR trail guidelines and best practices (DCR 2010); add reassurance blazes.	M	2	R
Following regulatory review, install appropriate structures, such as bog bridges or puncheons, along muddy sections of the Shore Trail to allow for sustainable year-round use.	M	3	P, R
Place natural stone “benches” near intersections of the Bridle and Holly trails, and the Bridle and Shore trails.	L	3	R
Goal 2. Prepare for rising sea level and storm surge through methods appropriate for each property.			
Allow the landward migration of salt marshes in response to coastal storms and sea level rise.	H	1	P, R
Prepare a barrier beach management plan.	M	3	P
Goal 3. Enhance communication with park visitors to promote the increased awareness, appreciation, and protection of natural and cultural resources and to improve the visitor experience.			
Educate visitors about shared use of the reservation during hunting season. Create and post improved signs informing the public of actions that they may take to improve their safety (e.g., wearing safety orange, keeping dogs leashed).	H	1	B, R
Add Nunes memorial plaque to granite marker adjacent to entrance kiosk.	M	2	P
Goal 4. Preserve and protect existing cultural resources and expand the level of public understanding of the cultural history of the reservation and region.			
Stabilize foundation of Souza home site by clearing destructive vegetation. Maintain as a preserved ruin.	H	2	C, R, P
Clear viewshed associated with Souza home site and farm.	H	2	E, R
Prepare MHC area form for Souza home site.	M	1	P
Preserve cleared cul-de-sac turn rotary at the southern intersection of the Holly and Bridle trails.	L	3	C, P
Provide interpretive signs to describe to the public how close the property was to being cleared for residential development.			
Provide further research on the agricultural history of the site for use in interpretive signs.	L	3	C

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Table 4.3.3. Recommendations for Nasketucket Bay State Reservation. (Continued)

Recommendation	Priority^a	Resources^b	Implementation^c
Goal 5. Enhance conservation by acquiring additional natural resources information and by actively managing rare species, uncommon natural communities, and populations of invasive plants.			
Maintain cultural grasslands in accordance with the MassWildlife approved Habitat Management Plan.	H	1	P
Clear cultural grassland to tree-line and maintain in herbaceous vegetation, in accordance with the MassWildlife approved Habitat Management Plan.	H	3	C, R
Control new occurrences and isolated patches of invasive plants (e.g., spotted knapweed) to limit their spread throughout the reservation.	H	3	C, R, V
Work with Plymouth County Mosquito Control Project to maintain culverts and mosquito ditches in order to reduce the abundance of common reed.	M	1	P, R
Secure monitoring well caps.	M	2	E, R
Conduct a botanical inventory, with an emphasis on rare species identified by the NHESP.	M	3	C
Survey potential vernal pools; submit certification paperwork to the NHESP for qualified pools.	L	2	P, R, V

a. Priorities are High (H), Medium (M), or Low (L).

b. Availability of resources for implementing recommendations: 1 = funding is currently available; 2 = funding is currently unavailable, but may become so in the near future; 3 = funding is currently unavailable, but may become so in more than five years.

c. The following codes identify the party responsible for implementing the recommendation: B = Ranger Bureau; C = Contractor or consultant; E = Bureau of Engineering; L = Legal Services; O = Other; P = Bureau of Planning and Resource Protection; R = Regional and district staff; S = Department of Special Events; V = Volunteer or partner; X = Office of External Affairs and Partnerships.

Table 4.3.4. Recommendations for West Island State Reservation.

Recommendation	Priority^a	Resources^b	Implementation^c
Goal 1. Maintain and enhance existing recreation facilities and experiences.			
Survey the state reservation/Town Beach boundary east of Bass Creek; set permanent bounds and post informational signs.	L	3	C, E
Goal 2. Prepare for rising sea level and storm surge through methods appropriate for each property.			
Allow the landward migration of salt marshes in response to coastal storms and sea level rise.	H	1	P, R
Prepare a barrier beach management plan.	M	3	P
Goal 3. Enhance communication with park visitors to promote the increased awareness, appreciation, and protection of natural and cultural resources and to improve the visitor experience.			
Educate visitors about shared use of the reservation during hunting season. Create and post improved signs informing the public of actions that they may take to improve their safety (e.g., wearing safety orange, keeping dogs leashed).	H	1	B, R
Install Main Identification, Rules and Regulation, and Unguarded Waterfront signs facing the water at the unofficial beach along the northeast shore of Pine Neck.	H	2	R
Work with the Town of Fairhaven to develop and install a joint Town of Fairhaven/DCR educational kiosk at Town Beach, along the eastern trail to the beach, to include information on property ownership, resource protection, and rules and regulations.	H	2	P, R, V, X
Work with MassWildlife, Massachusetts Environmental Police, and hunters to resolve hunting activity issues (e.g., baiting, running dogs off leash) along Fir Street within 500 feet of dwellings in use.	M	1	B, O, R
Install a Rules and Regulations Sign along the northern shore adjacent to the boater access trail and illicit campsites.	M	2	R
Goal 4. Preserve and protect existing cultural resources and expand the level of public understanding of the cultural history of the reservation and region.			
<i>There are no recommendations associated with this goal for West Island State Reservation.</i>			

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Table 4.3.4. Recommendations for West Island State Reservation. (Continued)

Recommendation	Priority^a	Resources^b	Implementation^c
Goal 5. Enhance conservation by acquiring additional natural resources information and by actively managing rare species, uncommon natural communities, and populations of invasive plants.			
Continue monitoring and management of rare beach-nesting birds on DCR and Town of Fairhaven property.	H	1	P, V
Seasonally exclude dogs from the portion of the reservation to the north and east of Town Beach, in order to increase protection of rare beach-nesting birds.	H	1	B, P, V
Conduct preliminary investigation of trash pile/landfill.	H	2	C, E
Conduct a botanical inventory, with emphasis on seaside (i.e., seabeach) knotweed, cypress (i.e., Mattamuskeet) panic-grass, and other rare species identified by the NHESP.	H	3	C
Control new occurrences and isolated patches of invasive plants (e.g., paleyellow iris in salt marsh) to limit their spread throughout the reservation.	H	3	C, R, V
Request that the Fairhaven PWD inspect and secure all of their monitoring wells on DCR property.	M	1	R
Conduct wildlife inventories, including surveys of the use of West Island's forests and shrublands as resting and feeding habitat for migratory landbirds.	M	3	O, V
Conduct breeding season survey for the state Endangered American bittern.	M	3	O, V
Survey potential vernal pools; submit certification paperwork to the NHESP for qualified pools.	L	2	P, R, V

a. Priorities are High (H), Medium (M), or Low (L).

b. Availability of resources for implementing recommendations: 1 = funding is currently available; 2 = funding is currently unavailable, but may become so in the near future; 3 = funding is currently unavailable, but may become so in more than five years.

c. The following codes identify the party responsible for implementing the recommendation: B = Ranger Bureau; C = Contractor or consultant; E = Bureau of Engineering; L = Legal Services; O = Other; P = Bureau of Planning and Resource Protection; R = Regional and district staff; S = Department of Special Events; V = Volunteer or partner; X = Office of External Affairs and Partnerships.

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Appendix A. Plan Contributors.

Name	Affiliation	Area of Expertise
<i>Department of Conservation and Recreation</i>		
Allen, Kevin	Office of Cultural Resources	Historic resources
Backman, Andy	RMP Program	Planning
Baecker, Jim	RMP Program	Planning
Berkland, Ellen	Office of Cultural Resources	Archaeological resources
Bertrand, Dan	Office of the Commissioner (formerly)	Legislative relations
Carter, Jeff	Acting District Manager (former)	Park operations
Cavanagh, Paul	RMP Program	Planning
Doherty, Jean	Director of External Affairs and Partnerships	External affairs
Fiesinger, Anne	Office of External Affairs and Partnerships	Outreach
Fisher, Sean	Office of Cultural Resources	Archival material
Fox, Wendy	Office of External Affairs and Partnerships (former)	Media relations
Geigis, Priscilla	Director of State Parks and Recreation	Park operations
Goodwin, David W.	Management Forestry Program	Trails data
Greene, Judy	Office of Cultural Resources	Historic property maps and plans
Gregory, Paul	Assistant Management Forester	Forest resources
Hunt, Daniel	Director of Government Affairs	Legislative relations
Jahnige, Paul	Greenways and Trails Program	Trail planning and maintenance
Lowell, Rob	Bureau of Engineering	Storm water management
Lowry, Kathleen	Universal Access Program	Universal access
McCarthy, Tom	Universal Access Program	Universal access
Moran, Barbara	Office of External Affairs and Partnerships	Web content
O'Bannon, Michelle	South Coast District Ranger	Incident reporting, recreation
Orfant, Joe	Bureau of Planning and Resource Protection	Planning
Ouellette, Steve	Bureau of Ranger Services	Incident reporting, recreation
Pearly, Brian	Permit Program Manager (former)	Use agreements
Plocinski, Loni	GIS Program	GIS and planning
Port, S. J.	Office of External Affairs and Partnerships	Media relations
Provencher, Shaun	Land Acquisition Specialist	Land protection
Shanahan, Brian	Regional Director (former)	Park operations
Skalski, John	Mail clerk	Printing of RMPs
Valton, Thomas	Construction Inspector	Fort Phoenix drainage system
Warchalowski, Heather	Coastal Ecologist (former)	Ecology
Wilmot, Amy	Regional Interpretive Coordinator	Interpretive programming

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Appendix A. Plan Contributors. (Continued)

Name	Affiliation	Area of Expertise
<i>Other Affiliations</i>		
Annett, Brendan	Buzzards Bay Coalition	Land protection
Ashley, Sarah	Buzzards Bay Coalition	BBC document archives
Bouvier, Michael; Sergeant	Fairhaven Police Department	Public Safety
Bogart, Jamie	Lloyd Center for the Environment	Beach-nesting birds
Botelho, Michael; Detective Sergeant	Fairhaven Police Department	Public Safety
Burns, Steve	Bristol County Mosquito Control Project	Mosquito control activities
Cabral, Lilia	SRPEDD	Transportation planning
Charbonneau, John M.	Fairhaven Highway Superintendent	Fairhaven road maintenance
Churchill, Neil	Massachusetts Division of Marine Fisheries	Shellfish
Darmofal, D. S.	Harbormaster, Town of Fairhaven	Fairhaven mooring regulations
Drouin Jr., Rene H.	Town of Mattapoisett Conservation Agent	Mattapoisett wetland regulations
Foster, Robert	Fairhaven Tennis Association	Tennis courts at Fort Phoenix
Foster, Stephen; Sergeant	Fairhaven Police Department	Public Safety
Gillette Steve	Plymouth County Mosquito Control Project	Mosquito control activities
Harper, Lynn	Natural Heritage & Endangered Species Program	Rare species, MESA compliance
Janik, Dave	Office of Coastal Zone Management	Buzzards Bay Coastal Zone issues
Kobza, Kevin Sergeant	Fairhaven Police Department	Public Safety
Kripps, Kaisa	Fairhaven Tennis Association	Tennis courts at Fort Phoenix
Longworth, Carolyn	Millicent Library	Public meeting facility
Lyons, Mary; Chief	Mattapoisett Police Department	Public safety
Melvin, Scott	Natural Heritage & Endangered Species Program	Beach-nesting birds
Meyers, Michael J.; Chief	Fairhaven Police Department	Public safety
Napolitano, Bill	SRPEDD	Environmental planning
Newlands, Liz	Massachusetts Audubon Society, Ecological Extension Services	Birds of Nasketucket Bay
Quintal, Sara	Buzzards Bay Coalition	Buzzards Bay restoration
Recchia, Adam	SRPEDD	Transportation planning
Richard, Chris	Fairhaven Director of Tourism	History of Fort Phoenix
Roth, Bill	Town of Fairhaven	Fairhaven planning issues
Schick, Linda L.	Fairhaven Sewer Superintendent	West Island Sewage Treatment Plant
Sheynin, Yelena	N/A	Nasketucket Bay S.R., trails, boundaries, and resources.
Souza, Timothy; Sergeant	Fairhaven Police Department	Public Safety
Swain, Pat	Natural Heritage & Endangered Species Program	Natural communities
Williams, Tony	Buzzards Bay Coalition	Baywatchers' water quality data
Zimmer, Jason	MassWildlife	Hunting practices and regulations

Appendix B. Public Participation.

In accordance with M.G.L. Chapter 21: Section 2F, the Resource Management Plan (RMP) for the Fort Phoenix Planning Unit was developed in conjunction with a public participation process to ensure that interested parties had an opportunity to review the draft RMP and offer input in its development. This appendix identifies the public participation process used to inform and review this RMP.

B.1. THE PUBLIC PARTICIPATION PROCESS

Input into Development of the RMP

Public input into the development of the Fort Phoenix RMP began in the spring of 2011. A notice of a public meeting and of the DCR's intent to prepare a Resource Management Plan for the Fort Phoenix Planning Unit was published in the April 6, 2011 Environmental Monitor. Additional announcements were made on the DCR web page, and press releases were provided to local newspapers.

An initial public meeting was convened in the Rita E. Steele Auditorium of the Millicent Library, Fairhaven, on April 13, 2011. Twenty-one people attended the meeting, which ran from 6:30 to 8:00 PM.

Written input on the plan was solicited at the initial public meeting, through the Environmental Monitor announcement, on the DCR web page, and in press releases. Between April 14 and May 13, 2011, five individuals, organizations, or agencies submitted written comments.

Comments made at public meetings and those submitted in writing are not independent. Some speakers at the public meeting also submitted written comments, often to reiterate or expand upon their verbal comments.

Public Comment on Draft RMP

Notice of a public meeting to present the draft Resource Management Plan for the Fort Phoenix Planning Unit, and of the draft plan's availability, was published in the December 21, 2011 Environmental Monitor. The meeting was held on January 11, 2012 in the Rita E. Steele Auditorium; 15 people attended.

As part of the review process, the draft RMP was provided to the Massachusetts Historical Commission (MHC), Massachusetts Office of Coastal Zone Management (CZM), and Massachusetts Natural Heritage and Endangered Species Program (NHESP). Each agency was provided the draft RMP because of their mission, expertise, and statutory responsibility for resources in the Fort Phoenix Planning Unit. In addition, the Massachusetts Endangered Species Act (310 CMR 10.05(2)(c)), requires that the NHESP review land management plans for state owned properties where state listed species are known to occur. There are no similar statutory requirements for the MHC or CZM review of land management plans.

The public comment period on the draft Resource Management Plan ran from January 12, 2012 through February 13, 2012; 12 sets of written comments were received.

B.2. CHANGES TO THE FINAL DRAFT OF THE FORT PHOENIX PLANNING UNIT RESOURCE MANAGEMENT PLAN

Public comment covered a variety of infrastructure, natural resource, and operations issues with no single topic dominating. Only four issues were raised by more than one commenter: the acquisition of undeveloped land adjacent to Fort Phoenix Beach State Reservation; connecting Fort Phoenix and Nasketucket Bay state reservations to local bike paths; the need to restrict dogs from plover and tern nest sites at West Island; and honoring Lewis Hannigan, the former property manager at Fort Phoenix.

All comments received during the public comment period were given consideration. Those consistent with federal and state law, and the DCR's mission, regulations, and policies were used to guide revisions. In some instances the revision process required the gathering of additional information, generation of new data, or discussions with regulators.

The following changes were made to the draft RMP. Normal editing activities, such as correcting typographical errors or revising formatting, are not identified.

Executive Summary

The Executive Summary was revised to reflect new recommendations incorporated into the plan as a result of public input. Recommendations in the Action Plan have been revised to reflect updates to Tables 4.3.1 through 4.3.4.

Section 2. Existing Conditions

2.2.1. Natural Resources

Information has been added on the Buzzard Bay Coalition's 2011 State of the Bay report (Buzzards Bay Coalition 2011).

Information on projected sea level rise was expanded.

2.3. Fort Phoenix Beach State Reservation

The term "NSTAR" has replaced "Commonwealth Electric" when referring to the owner of the property between Doane Street and the reservation's northern boundary and also to the holder of the utility right-of-way through the reservation.

2.3.1. Natural Resources

Information on lands susceptible to sea level rise was modified to reflect general guidance and field observations rather than specific model projections included in Titus and Richman (2001).

2.3.2. Cultural Resources

Information on the bathhouse's construction material was clarified.

2.3.3. Recreation Resources

Geocaching information was updated.

2.3.4. Infrastructure

The number of pipes discharging storm water was clarified.

2.4.1. Natural Resources

Information on lands susceptible to sea level rise was modified to reflect general guidance and field observations rather than specific model projections included in Titus and Richman (2001).

New information on a two acre aquaculture grant proposed for the waters of Nasketucket Bay, just offshore of the reservation, has been added.

2.4.3. Recreation Resources

Geocaching information was updated.

2.5.1. Natural Resources

Information on lands susceptible to sea level rise was modified to reflect general guidance and field observations rather than specific model projections included in Titus and Richman (2001).

Text on piping plovers was updated to include 2011 data.

Information on the location of roseate tern colony sites was corrected.

2.5.3. Recreation Resources

Information has been added on the Town of Fairhaven's resident-only beach at the south end of West Island and its impact on adjacent portions of the reservation.

Information was added that identifies the occurrence of illegal OHV use along the shoreline east of Bass Creek.

Geocaching information was updated.

Section 3. Management Resources and Practices

3.2.1. Natural Resources

The full name "Massachusetts Division of Fisheries and Wildlife" was added immediately prior to the first use of the term "MassWildlife."

3.4.1. Natural Resources

The lack of a barrier beach management plan for the reservation's sole barrier beach has been identified.

3.5.1. Natural Resources

The lack of a barrier beach management plan for the reservation's five barrier beaches has been identified.

Section 4. Recommendations

Table 4.3.1; Goal 2. The following recommendation was added.

- Install markers that identify projected sea level elevations, over time, to increase awareness of the potential impacts of sea level rise on coastal resources and properties.

Table 4.3.2; Goal 1. The following two recommendations were added.

- Increase pet owners' awareness of the exclusion of dogs from Fort Phoenix Beach during the swimming season; enforce regulations as appropriate.
- Assess the potential for reinstituting parking fees, as allowed in 801 CMR 4.02 (302).

Three recommendations, addressing the tennis courts, sun shelter, and security lighting were broadened. The revised versions of these recommendations are:

- Repair cracks, resurface, and repaint tennis courts.
- Charge for reserved use of the sun shelter, as allowed in 801 CMR 4.02 (302); post signs that indicate how this shelter may be reserved.
- Add security lighting to the existing sun shelter and bathhouse; assess the potential for solar power.

Table 4.3.2; Goal 2. The recommendation to "Raise and expand the existing dunes ..." was modified to emphasize the limited nature of this recommendation and the need to balance increased protection of infrastructure with continued ADA accessibility to the beach. The revised recommendation now reads "Raise and expand the existing dunes to decrease the potential frequency and severity of coastal storm impacts to the bathhouse, Lower Lot, and playground, while allowing for continued universal access to the beach."

Table 4.3.2; Goal 3. One recommendation was added and another was modified. The new recommendation is to:

- Install an appropriate marker on the bathhouse in honor of former property manager Lewis Hannigan.

The modified recommendation is "Install 'Do Not Feed Wildlife' signs in the parking lots; enforce as appropriate."

Table 4.3.2; Goal 5. One recommendation was added and another modified. The new recommendation is to:

- Conduct a botanical inventory, with emphasis on the unaltered portions of the reservation.

The recommendation to "Control new populations of Japanese knotweed ..." was modified to apply to all invasive species on the reservation. The revised recommendation is to "Control new occurrences and isolated patches of invasive plants (e.g., Japanese knotweed) to limit their spread throughout the reservation." This recommendation does not specify management strategies, which differ among species, abundance, and location (i.e., upland versus wetland edge). Management actions to implement this recommendation will be determined on a case by case basis.

Table 4.3.3; Goal 1. Two existing recommendations were modified. The first, to "Continue efforts to expand the reservation ...," was expanded to include connecting to the local bike path. The revised recommendation is to "Continue efforts to expand the reservation and to establish connections with nearby protected open space and the Phoenix Bike Trail/Mattapoisett Rail Trail."

In the second recommendation, to "Work with the Town of Mattapoisett ...," the name of the local bike path was corrected. The revised recommendation is to "Work with the Town of Mattapoisett and SRPEDD to post signs directing Mattapoisett Rail Trail users to and from the reservation."

Table 4.3.3; Goal 2. The following recommendation was added:

- Prepare a barrier beach management plan.

Table 4.3.3; Goal 5. Two new recommendations were added and two existing recommendations were revised to reflect MassWildlife's recent approval of the Habitat Management Plan for cultural grasslands at Nasketucket Bay State Reservation (Appendix J).

The new recommendations are to:

- Control new occurrences and isolated patches of invasive plants (e.g., spotted knapweed) to limit their spread throughout the reservation.
- Conduct a botanical inventory, with an emphasis on rare species identified by the NHESP.

The revised recommendations are to:

- Maintain cultural grasslands in accordance with the MassWildlife approved Habitat Management Plan.
- Clear cultural grassland to tree-line and maintain in herbaceous vegetation, in accordance with the MassWildlife approved Habitat Management Plan.

Table 4.3.4; Goal 1. The recommendation to “Survey the state reservation/Town Beach boundary ...” was modified to address the need for regulatory and informational signs along that boundary. The revised recommendation is to “Survey the state reservation/Town Beach boundary east of Bass Creek; set permanent bounds and post informational signs.”

Table 4.3.4; Goal 2. The following recommendation was added:

- Prepare a barrier beach management plan.

Table 4.3.4; Goal 3. The following recommendation was added to reflect the need for a cooperative approach to resource management along the shared beach:

- Work with the Town of Fairhaven to develop and install a joint Town of Fairhaven/DCR educational kiosk at Town Beach, along the eastern trail to the beach, to include information on property ownership, resource protection, and rules and regulations.

Table 4.3.4; Goal 5. Four new recommendations were added to increase protection of the reservation’s natural resources. They are:

- Conduct a botanical inventory, with emphasis on seaside (i.e., seabeach) knotweed, cypress (i.e., Mattamuskeet) panic-grass, and other rare species identified by the NHESP.
- Control new occurrences and isolated patches of invasive plants (e.g., paleyellow iris in salt

marsh) to limit their spread throughout the reservation.

- Conduct wildlife inventories, including surveys of the use of West Island’s forests and shrublands as resting and feeding habitat for migratory landbirds.
- Conduct breeding season survey for the state Endangered American bittern.

In addition, the priority of the recommendation to “Seasonally exclude dogs from the portion of the reservation to the north and east of Town Beach, in order to increase protection of rare beach-nesting birds” was increased to High in response to piping plover management needs.

Appendices

Appendix A. Minor additions were made to include the names of those who contributed information during the revision process.

Appendix B. Changes to the final draft RMP were identified.

Appendix H. The status of stewardship recommendations contained in the Epsilon Associates, Inc. (2000) report was updated to reflect conditions as of March 2012.

Appendix I. The status of stewardship recommendations contained in the DEM (2000) report was updated to reflect conditions as of March 2012.

Appendix J. Changes were made to reflect that the draft Habitat Management Plan (HMP) included in the draft RMP had been approved, with one condition, by MassWildlife. MassWildlife’s approval letter, which identifies the condition, has been added to the appendix and the HMP has been annotated to reference that letter.

Appendix L. References associated with revisions to this RMP were added or deleted, as appropriate.

Appendix C. GIS Supplemental Information.

C.1. METHODOLOGY

The following is a summary of the GIS methodology used by the DCR GIS Program to generate and present data within the Fort Phoenix Planning Unit Resource Management Plan (RMP).

Property Boundaries

A DCR GIS Specialist extensively researched the digital boundaries of each property in the Fort Phoenix Planning Unit. As a result of this research, nearly all (97%) of the planning unit's boundaries were edited with highly accurate data, e.g. surveys and/or hydrographic or town boundaries. The planning unit's remaining boundaries, approximately 2%, were edited with reasonably accurate data, e.g. draft parcel data, georeferenced plans and/or orthophotography.

Demographics

The RMP's demographic information was generated using the following methodology within ArcGIS. First, Fort Phoenix Reservation was buffered by 0.5, 1, 5, and 10 miles using the buffer tool. Next, the Massachusetts 2000 Census Block Group datalayer was analyzed to determine the characteristics of the population surrounding the reservation. Each Census Block Group that intersected with the 0.5, 1, 5, or 10 mile buffer was selected using the select by location tool. The information for the selected Census Block Groups is summarized in Table C.1.

Table C.1. Summary of 2000 Census Block Groups within 0.5, 1, 5 and 10 miles of Fort Phoenix Beach State Reservation.

	½ mi	1 mi	5 mi	10 mi
Sample Pop.	3,222	13,080	139,826	188,537
Households	1,253	5,302	55,465	73,311
Age^{a, b}				
M Children	455	1,757	16,575	22,788
M Adults	911	3,748	40,441	55,489
M Seniors	159	773	9,368	11,945
F Children	450	1,502	15,601	21,459
F Adults	1,007	4,011	42,873	58,343
F Seniors	240	1,289	14,968	18,513

Table C.1. Summary of 2000 Census Block Groups within 0.5, 1, 5 and 10 miles of Fort Phoenix Beach State Reservation. (Continued)

	0.5 mi	1 mi	5 mi	10 mi
<i>Total</i>	905	3,259	32,176	44,247
<i>Total Adults</i>	1,918	7,759	83,314	113,832
<i>Total</i>	399	2,062	24,336	30,458
Race				
White	2,384	11,028	117,656	163,391
Black or	151	373	4,326	4,918
American	8	49	544	625
Asian	12	36	1,095	1,581
Native	0	0	75	75
Some Other	487	920	9,888	10,794
Two or	180	674	6,242	7,153
Ethnicity				
Hispanic	456	1,055	9,366	10,241
Not	2,766	12,025	130,460	178,296
Language				
English	724	3,490	36,473	50,653
Spanish	148	351	2,851	3,258
European	375	1,432	15,739	18,801
Asian	6	19	278	398
Other	0	10	124	201
Income^c				
Low	586	2,357	22,033	25,427
Medium	467	2,246	24,995	33,906
High	200	699	8,437	13,978
Education^{a, d}				
M Pop. >25	883	3,861	42,978	58,696
M < H.S.	328	1,477	15,811	18,982
M H.S.	253	1,162	12,346	17,171
M < Bach.	168	720	8,186	11,868
M Bach.	89	327	4,167	6,522
M > Bach.	45	175	2,468	4,153
F Pop. >25	1,080	4,660	50,958	68,373
F < H.S.	349	1,650	17,730	20,895
F H.S.	273	1,429	14,536	19,772
F < Bach.	276	1,038	11,117	15,721
F Bach.	112	361	5,031	7,927
F > Bach.	70	182	2,544	4,058

Table C.1. Summary of 2000 Census Block Groups within ½, 1, 5 and 10 miles of Fort Phoenix Beach State Reservation. (Continued)

	0.5 mi	1 mi	5 mi	10 mi
Total >25	1,963	8,521	93,936	127,069
Total < H.S.	677	3,127	33,541	39,877
Total H.S.	526	2,591	26,882	36,943
Total < Bach.	444	1,758	19,303	27,589
Total Bach.	201	688	9,198	14,449
Total > Bach.	115	357	5,012	8,211

a. M = male and F = female.

b. Children = <18; Adults = 18-64; and Seniors = 65 and older.

c. Annual income, where Low = <\$10K - \$24,999; Medium = \$25K - \$74,999; and High = \$75K - >\$200K.

d. The highest level of education is identified by the following codes: <H.S. = no school, < 11th grade, or 12th grade no diploma; HS = high school diploma; < Bach. = < 1 year of college, > 1 of college without a diploma, or an Associate's Degree; Bach. = Bachelor's Degree; and > Bach. = a Master's Degree, professional school degree, or PhD.

It is important to note that by using the select by location tool, an acceptable amount of error was introduced into the demographic information presented in the RMP. Census Block Groups that extended beyond each buffer, similar to what is depicted below in Figure C.1, were included in the analysis. As a result, the demographic information for each buffer likely includes individuals who live farther away from the reservation than indicated.

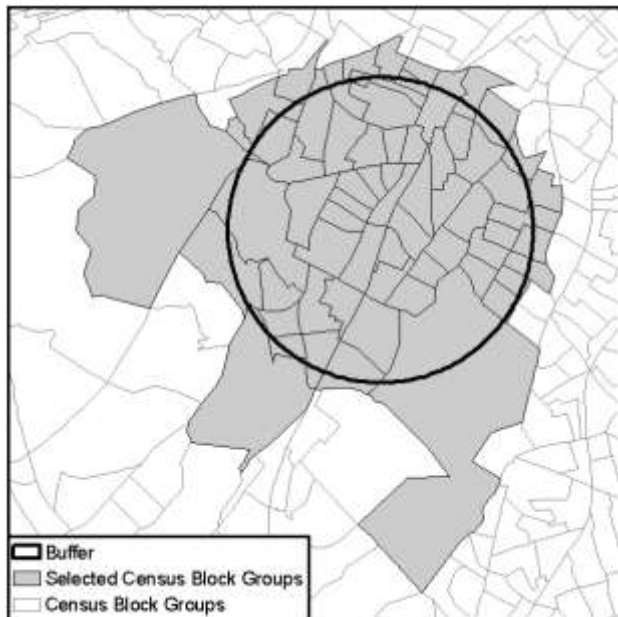


Figure C.1. Selected Census Block Groups.

Report-sized Maps

Figure 2.3.1 Fort Phoenix Beach State Reservation. A DCR GIS Specialist digitized the infrastructure points (e.g. contact station, playground and cooking grills) and polygons/footprints (e.g. building, parking area, and athletic courts) in ArcGIS using field verified documentation of the resources and the 2008–2009 Color Orthophotography datalayer as references.

Figure 2.4.1 Nasketucket Bay State Reservation. A DCR GIS Specialist digitized the reservation's gate, kiosk, and certified vernal pool in ArcGIS using field verified documentation of the resources and the 2008–2009 Color Orthophotography datalayer as references.

Historic resource data were collected by the DCR Office of Cultural Resources in the summer of 2011. A GPS application developed by the DCR GIS Program was used to inventory and standardize these data.

The reservation's trail data were collected by consultants in the summer of 2007. A GPS application was developed by the DCR GIS Program in an attempt to standardize the data. However, it is important to note that several of the trails attributes are qualitative and subjective, e.g. trail width and condition. It is assumed that the individual collecting the data used their best judgment when populating these attributes.

Figure 2.5.1 West Island State Reservation. A DCR GIS Specialist digitized the reservation's gate and kiosk in ArcGIS using field verified documentation of the resources and the 2008–2009 Color Orthophotography datalayer as references.

The reservation's trail data were collected by consultants in the summer of 2007. A GPS application was developed by the DCR GIS Program in an attempt to standardize the data. However, it is important to note that several of the trails attributes are qualitative and subjective, e.g. trail width and condition. It is assumed that the individual collecting the data used their best judgment when populating these attributes.

A DCR GIS Specialist used ArcGIS to edit the Fairhaven town line, in the vicinity of Bass Creek, for cartographic purposes.

Figures 4.2.1–4.2.3 Land Stewardship Zoning. A DCR GIS Specialist digitized the Zone 1, Zone 2, Zone 3, and Significant Feature Overlay datalayers in ArcGIS. The 2008–2009 Color Orthophotography and Hydrography datalayers were used as a guide for defining Zone 1 within the Fort Phoenix Planning Unit. The 2008–2009 Color Orthophotography datalayer was also used to determine the existing developed areas and in turn, the planning unit’s Zone 3. Finally, the Natural Heritage and Endangered Species Program’s (NHESP) Priority Habitats of Rare Species datalayer was used to delineate the Significant Feature Overlay. Every attempt was made to use “on the ground features,” such as trails or streams, as the boundary for each zone and/or significant feature overlay in an effort to make the areas easily identifiable for DCR field staff.

Figure J-1 Nasketucket Bay State Reservation Habitat Management Plan. A DCR GIS Specialist digitized the certified vernal pools in ArcGIS using field verified documentation of the resources and the 2008–2009 Color Orthophotography datalayer as

references. The vernal pools were buffered by 100 feet, using the ArcGIS buffer tool.

The location of the Souza home site was collected by the DCR Office of Cultural Resources in the summer of 2011. A GPS application developed by the DCR GIS Program was used to inventory and standardize the data.

The reservation’s trail data were collected by consultants in the summer of 2007. A GPS application was developed by the DCR GIS Program in an attempt to standardize the data. The Bridle Path Trail was buffered by 50 feet, using the ArcGIS buffer tool.

A DCR GIS Specialist digitized the extent of the cultural grassland and shrub encroachment in ArcGIS using the 2008–2009 Color Orthophotography datalayer as a reference.

C.2. DATALAYERS

A summary of the GIS datalayers used by the DCR GIS Program to generate and display data within the Fort Phoenix Planning Unit RMP is presented below, in Table C.2.

Table C.2. Summary of datalayers used to create the Fort Phoenix Planning Unit RMP.

Datalayer Name	Source	Additional Information
100-Year Flood Zone	MassGIS	http://www.mass.gov/mgis/q3.htm
2000 Census Block Groups	MassGIS	http://www.mass.gov/mgis/census2000.htm
2008-2009 Color Orthophotography	MassGIS	http://www.mass.gov/mgis/colororthos2008.htm
500-Year Flood Zone	MassGIS	http://www.mass.gov/mgis/q3.htm
Barrier Beach	MassGIS	http://www.mass.gov/mgis/barrierb.htm
Cultural Grassland	DCR GIS	
Fort Phoenix Beach State Reservation	DCR GIS	
Historic Resource	DCR GIS	
Hydrography	MassGIS	http://www.mass.gov/mgis/wetdep.htm
Infrastructure (Points and polygons)	DCR GIS	
Nasketucket Bay State Reservation	DCR GIS	
NHESP Certified Vernal Pool	DCR GIS	
NHESP Potential Vernal Pool	MassGIS	
NHESP Priority Habitats of Rare Species	MassGIS	http://www.mass.gov/mgis/prihab.htm
Public Roads	MassGIS	http://www.mass.gov/mgis/eotroads.htm
Shrub Encroachment	DCR GIS	
Significant Feature Overlay	DCR GIS	
Town Boundary	MassGIS	http://www.mass.gov/mgis/townssurvey.htm
Trail	DCR GIS	
West Island State Reservation	DCR GIS	
Zone 1, 2 and 3	DCR GIS	

Appendix D. Select Regulations Applicable to the Fort Phoenix Planning Unit.^a

CMR ^b	Title	Comments
105 CMR 445.00	Minimum Standards for Bathing Beaches (State Sanitary Code, Chapter VII)	Specifies water quality monitoring and closure posting requirements at bathing beaches.
257 CMR 2.00	Certification of Operators of Wastewater Treatment Facilities	Evaluates and certifies the operation of wastewater treatment facilities in order to ensure proper management, operation, and maintenance.
301 CMR 11.00	Massachusetts Environmental Policy Act (MEPA)	Requires the systematic review of any work or activity undertaken by an agency (e.g., the DCR); involving state permitting or financial assistance; or a transfer of state land.
301 CMR 20.00	Coastal Zone Management Program	Establishes a Coastal Zone Management Program in order to “secure for the inhabitants of the Commonwealth the objectives and benefits of the federal Coastal Zone Management Act.”
301 CMR 21.00	Coastal Zone Management Program Federal Consistency Review Regulations	Requires program review for all activities in the Coastal Zone, adjacent marine waters, adjacent state waters, or coastal watersheds of all activities that are federal activities or development projects, require a federal license or permit, involve Outer Continental Shelf exploration, or involve federal assistance to activities of state or local governments. This includes all activities that require permits issued by the Army Corps of Engineers (e.g., for dredging or filling wetlands) or the Environmental Protection Agency (e.g., NPDES permits).
302 CMR 11.00	Parkways, Traffic, and Pedestrian Rules	Requires construction and access permits for the digging up or physically modifying any DCR parkway or other property, or the dumping of material or planting of trees on the same.
304 CMR 7.00	Management Plans and Massachusetts Wildlands	Requires a management plan for each state reservation, park, and forest under the control of the Department of Environmental Management. This regulation was superseded by MGL Chapter 21: Section 2F, which requires management plans for all DCR “reservations, parks, and forests.”
304 CMR 11.00	Forest Cutting Practices Act	Regulates cutting on “all land devoted to forest growth owned or administrated by private persons, corporations or organizations” or governmental agency. A forest cutting plan is required for the cutting of more than 50 cords or 25,000 board-feet of wood.
304 CMR 12.00	Forests and Parks Rules	Extensive regulations governing all aspects of park operations including, but not limited to: hours of operation; public behavior; consumption of alcohol; the presence of pets; fires; special use permits; hunting, fishing, and trapping; traffic rules and parking; campsites; trail use; and wind and board surfing. These regulations specifically prohibit the “launching or use of any water craft of any nature or type, whether motor powered or not” at “Fort Phoenix State Reservation.”
310 CMR 9.00	Waterways	These regulations protect and promote the public’s interest in tidelands, Great Ponds, and non-tidal rivers; preserve and protect the public’s rights in tidelands; protect the public health, safety, and general welfare as it may be affected by any project in tidelands, Great Ponds, or non-tidal rivers; support efforts to revitalize unproductive property along urban waterfronts; and foster the rights of the people to values identified in Article XCVII of the Massachusetts Constitution. These regulations define Great Ponds, and assign their control to the DEP. Chapter 91 permits or licenses are required for the construction, alteration, or removal of both temporary and permanent structures, and the placement of fill. Licenses are also required for beach nourishment, dredging, disposal of unconsolidated material below the low water mark, burning rubbish upon the water, and lowering the water level.

Continued on next page.

Appendix D. Select Regulations Applicable to the Fort Phoenix Planning Unit.^a (Continued)

CMR ^b	Title	Comments
310 CMR 10.00	Wetlands Protection Act	Regulates many activities within 100 feet of wetlands and certified vernal pools, and within 200 feet of perennial streams and rivers.
314 CMR 4.00	Massachusetts Surface Water Quality Standards	These standards “secure to the Commonwealth the benefits of the Clean Water Act.” They designate the most sensitive uses for which the waters of the Commonwealth shall be enhanced, maintained and protected; prescribe minimum water quality criteria; and contain regulations necessary to achieve designated uses and maintain water quality. These standards include the identification and regulation of Outstanding Resource Waters.
314 CMR 5.00	Ground Water Discharge Permit Program	Regulates the discharge of pollutants, including sewage, into the groundwater.
314 CMR 9.00	401 Water Quality Certification for Discharge of Dredged or Fill Material, Dredging, and Dredged Material Disposal in Waters of the United States Within the Commonwealth	These regulations establish procedures and criteria for the discharge of dredged or fill material, dredging, and dredged materials in waters of the United States within the Commonwealth.
314 CMR 12.00	Operation and Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Dischargers	Ensures proper operation and maintenance of wastewater treatment facilities and sewer systems. Regulates the operation of wastewater treatment facilities, such as the Town of Fairhaven’s facility on West Island.
314 CMR 19.00	Oil Spill Prevention and Response	Provisions to prevent or reduce the risk of oil spills from tank vessels operating in Buzzards Bay and other designated areas of special interest within Massachusetts’ waters.
321 CMR 2.00	Miscellaneous Regulations Relating to Division of Fisheries and Wildlife	Addresses a variety of fish and wildlife issues, including scientific collecting permits and the importation, liberation, and transportation of fish, amphibians, reptiles, birds, and mammals.
321 CMR 3.00	Hunting	Regulates hunting and trapping in Massachusetts. Prohibits the construction, maintenance, occupation, or use of a permanent tree stand (i.e., a tree stand emplaced for more than 30 days) without the express written permission of the landowner or authorized agent.
321 CMR 10.00	Massachusetts Endangered Species Act (MESA)	MESA protects rare species and their habitats by prohibiting the “Take” of any plant or animal species listed as Endangered, Threatened, or Special Concern. Activities that may alter rare species habitat (e.g., trail maintenance, vista pruning, digging archaeological test pits) are subject to regulatory review. On state-owned land, “all practicable means and measures shall be taken to resolve conflicts between the protection, conservation, and restoration of state-listed species ... and other uses of such lands in favor of the listed species.”
322 CMR 6.00	Regulation of Catches	Establishes regulations for lobster, horseshoe crab, shellfish, finfish, and squid harvests.
322 CMR 7.00	Permits	Includes requirements for shellfish, lobster, and recreational saltwater fishing permits.
333 CMR 10.00	Certification and Licensing of Pesticide Applicators	Requires that anyone applying herbicides, insecticides, or other pesticides on non-residential property (i.e., all DCR properties) must be certified and licensed.

Continued on next page.

Appendix D. Select Regulations Applicable to the Fort Phoenix Planning Unit.^a (Continued)

CMR ^b	Title	Comments
521 CMR 19.00	Architectural Access Board; Recreational Facilities	Accessibility standards for rinks, pools, beaches, playgrounds, picnic areas, campsites, and other indoor and outdoor facilities. Requires that 5% of picnic facilities be accessible.
521 CMR 23.00	Architectural Access Board; Parking and Passenger Loading Zones	Specifies dimensional, pavement marking, and sign requirements for accessible parking spaces and passenger loading zones.
801 CMR 4.02	Fees for Licenses, Permits, and Services to be Charged by State Agencies	Specifies fees for camping; parking; use of picnic pavilions, athletic fields, ice rinks, golf courses; special use permits; timber harvests, forester licensing, well digging, dam safety permits, and other miscellaneous activities.
950 CMR 70.00	Massachusetts Historical Commission	Standardizes procedures for conducting archaeological investigations in Massachusetts by controlling activities that will disturb archaeological properties. Requires a permit from the State Archaeologist for conducting “field investigation activities on any land owned or controlled by the Commonwealth.”
950 CMR 71.00	Protection of Properties Included in the State Register of Historic Places	Requires Massachusetts Historical Commission notification of projects undertaken, funded, or licensed by a state body.

- a. A variety of state regulations apply to both the operation of state parks and the behavior of visitors to these parks. This table includes only those regulations directly related to topics addressed in the main body of this RMP.
- b. The Code of Massachusetts Regulations, or CMR, “contains regulations promulgated by state agencies” (Massachusetts Trial Court Law Libraries 2010). These regulations “have the force and effect of law like statutes.”

Appendix E. Pre-history of the Fort Phoenix Planning Unit

As part of the Massachusetts Historical Commission's (MHC's) Statewide Survey of Historic and Archaeological Resources they defined and studied what they called the Southeast Study Unit. The Fort Phoenix Planning Unit is located entirely within this study unit. The MHC study consisted of a review of past archaeological research, and collections analysis that culminated in the 1982 publication *Historic and Archaeological Resources of Southeast Massachusetts*. This information provides insight into the pre-history of the planning unit.

Paleo-Indian Period (ca. 12,000–9,500 Before Present (B.P.))

About 12,000 years ago, New England's first true colonists, Paleo-Indian hunters and gatherers, entered a post-glacial landscape similar to modern-day arctic tundra. This barren landscape was succeeded by a spruce parkland/spruce woodland vegetative community that dominated southern New England between ca. 12,000–9,500 B.P., when it was slowly replaced by a pine-oak forest.

Although sites from this period are few in New England, it is currently believed that the Paleo-Indian subsistence strategies reflected the high species diversity and unstable post-glacial ecosystems. These ecological conditions favored a flexible generalist subsistence strategy that focused on a wide range of available food resources, as opposed to exploiting a single or only a few food types.

Low site frequencies have been interpreted as a result of low Paleo-Indian population densities, with people organized into small, highly mobile groups, possibly familial units, that moved within large territories exploiting seasonally abundant plants and animals. Known site frequencies may be partly a function of sample error, as the inundation of much of the coastal plain caused by rising sea levels created by the melting glaciers, greatly reduced the land surface on which Paleo hunters and gatherers may have lived.

Evidence for the presence of Paleo-Indians in the vicinity of Fort Phoenix Planning Unit is sparse but compelling. One of the larger and better known Paleo sites in New England is located not too far

away at Wapanucket, on Assawompsett Pond, in Middleboro. This site featured a comprehensive tool kit of eastern fluted points, graters, scrapers, channel flakes and other flaking debris. Interestingly, most of the raw materials were exotic cherts and jaspers, suggesting long distance trade links, or exceptionally large territories. Isolated finds of diagnostic points have been reported in Marion, Wareham, Plymouth, Mattapoisett Harbor, and also to the east of Fairhaven.

Early Archaic Period (ca. 9,500–8,000 B.P.)

This period is also poorly represented in the archaeological record of southern New England, and there is little substantive data on which to make interpretations of Early Archaic life.

At this time the environment of southern New England had transformed into a mixed pine-hardwood forest. This forest classification is, however, highly generalized because at the smaller, local level, biotic communities would have varied as they do today according to elevation, slope, aspect, drainage, and soils. The complex topography and physiography of southeastern Massachusetts probably encouraged the growth of a mosaic of natural communities.

As with the preceding period, the low frequency of Early Archaic sites is interpreted as evidence of low populations. Further, it was believed that Early Archaic activity focused around a few core areas, such as the Taunton River drainage to the north. However, recent research has identified additional clusters, and many more sites with diagnostic bifurcate base points have been found scattered across the landscape as isolated occurrences, including one in North Dartmouth, Marion, and Middleborough. No other projectile points from this time period have been identified in the New Bedford area.

The wide variety of habitats in which Early Archaic sites are found suggests a settlement pattern based on the use of many different locations to exploit different types of available foods. The seasonal cyclical settlement pattern was a strategy that persisted throughout prehistory and was probably an

adaptive response to the seasonally defined resources of New England.

Middle Archaic Period (ca. 8,000–6,000 B.P.)

Middle Archaic Period sites are much more numerous in the region than those of the previous periods, with sites occurring in a wide range of habitats including margins of bogs, swamps, rivers, lakes and ponds. This diversity has led to the speculation that seasonal scheduling of subsistence activities was well established by this time. The spawning behavior of anadromous fish is also believed to have been reestablished around 8,000 years after having been disrupted by the Wisconsin Glacier. The intensified use of estuaries and streams connecting with interior spawning ponds is interpreted as a response to this newly available seasonal resource.

Although the majority of Middle Archaic sites tend to be located on streams, rivers, ponds and wetlands, a few have been found in what is today a coastal setting. When these sites were occupied between 8,000 and 6,000 years ago these locations were gradually changing from an interior setting to a maritime one, as Buzzards Bay became inundated as the shoreline began to reach its current configuration. North of the planning unit, in Carver, recent investigations revealed the largest assemblage of Middle Archaic artifacts in association with radiocarbon dates ranging from 7,880 to 7,290 B.P. In New Bedford, a projectile point was located in a marshy inland setting, and other points have been recovered from coastal settings in Marion and Wareham.

Late Archaic Period (6,000–3,000 B.P.)

As elsewhere in Massachusetts, more sites in the southeastern part of the state have yielded diagnostic materials than the preceding periods, and may document a population increase ca. 6,000 to 3,000 years ago. Late Archaic sites have been found in the widest range of habitats, and are larger and more complex than earlier periods. Studies that have included reconstructing past climatic conditions in the area suggest that recurrent or long lasting dry periods greatly reduced available open water, forcing intensive use of the larger and deeper bodies of water. Some very large sites have been identified

on the Taunton River and Assawompset Pond, which have been interpreted as base camps from which smaller groups made sorties into the surrounding countryside. Elaborate burials, the result of rich ceremonial activities, occurred in some of these interior core areas. By this time the coastline had stabilized, and large shell middens in the area indicate a shift to maritime resources.

In the Fairhaven area, Late Archaic sites have been identified in many different ecological settings including swamps, streams, marshes, rivers and associated terraces. Settlement patterns consisted of large, seasonal camps with small temporary sites, the larger camps often along major rivers. Late Archaic artifact types have been found in Marion, Rochester, Mattapoisett, Dartmouth, and Fairhaven.

Early, Middle, and Late Woodland Periods (ca. 3,000–450 B.P.)

During this period coastal resources continued to be exploited and marine mammals, such as seals and whales, were either actively hunted or butchered where they became stranded. Interior ponds, wetlands, streams and rivers continued to be occupied; each depending on the season of the year. Wooded sheltered lakes, ponds, and wetlands were favored during the winter. Large rivers and streams particularly at falls and rapids became springtime fishing stations, and estuaries and coastal marshes were occupied during the summer. With the coming of fall, groups returned inland getting ready to occupy their winter camps. Game birds, such as migratory fowl, and the larger fur bearing mammals became the focus of subsistence activities. By winter the groups had split into smaller family units and began to draw down on some of the food surpluses that they had cached in previous seasons.

In the Fairhaven area, Woodland Period settlements have been identified in both coastal and inland riverine locations. Late Woodland occupations have been recorded in Achushnet, Marion, Rochester, and Fairhaven.

Appendix F. Flora and Fauna

Table F.1. Plants of the Fort Phoenix Planning Unit. Taxonomy follows USDA (2010).

Family	Common Name	Scientific Name	MESA ^a	Invasive ^b	Fort Phoenix	Nasketucket Bay	West Island	Source
Aceraceae Maple Family	Red maple	<i>Acer rubrum</i>	-	-	X	X	X	1, 2, 3, 4, 6, 9, 10, 11, 13, 14
	Sycamore maple	<i>Acer pseudoplatanus</i>	-	I	X	-	-	12
	Silver maple	<i>Acer saccharinum</i>	-	-	-	X	-	4
Alismataceae Water Plantain Family	Broadleaf arrowhead	<i>Sagittaria latifolia</i>	-	-	-	X	-	1
Anacardiaceae Sumac Family	Winged sumac	<i>Rhus copallinum</i>	-	-	X	X	-	2, 4
	Unid. sumac	<i>Rhus</i> sp.	-	-	-	-	X	7
	Staghorn sumac	<i>Rhus typhina</i>	-	-	X	-	-	2
	Eastern poison ivy	<i>Toxicodendron radicans</i>	-	-	X	X	X	1, 2, 4, 6, 7, 10, 11, 13, 14
Apiaceae Carrot Family	Queen Anne's lace	<i>Daucus carota</i>	-	-	X	X	-	1, 4, 12
Aquifoliaceae Holly Family	Inkberry	<i>Ilex glabra</i>	-	-	-	X	-	1, 9
	American holly	<i>Ilex opaca</i>	-	-	X	X	X	1, 3, 4, 6, 7, 8, 13
	Common winterberry	<i>Ilex verticillata</i>	-	-	-	X	-	1, 9
Aracaceae Arum Family	Jack in the pulpit	<i>Arisaema triphyllum</i>	-	-	X	-	-	6
Asclepiadaceae Milkweed Family	Unid. milkweed	<i>Asclepias</i> sp.	-	-	X	X	-	2, 4, 11
	Common milkweed	<i>Asclepias syriaca</i>	-	-	-	X	-	1
	Louise's swallow-wort	<i>Cynanchum louiseae</i>	-	I	X	-	-	2, 11
Asteraceae Aster Family	Common yarrow	<i>Achillea millefolium</i>	-	-	X	X	-	1, 10, 11
	Annual ragweed	<i>Ambrosia artemisiifolia</i>	-	-	-	X	-	1
	Oldwoman	<i>Artemisia stelleriana</i>	-	-	-	-	X	7
	Eastern baccharis	<i>Baccharis halmifolia</i>	-	-	-	X	X	4, 7, 10
	Tyrol knapweed	<i>Centaurea nigrescens</i>	-	-	-	X	-	1
	Spotted knapweed	<i>Centaurea stoebe</i>	-	L	-	X	-	4
	Chicory	<i>Cichorium intybus</i>	-	-	-	X	-	1, 4
	Unid. thistle	<i>Cirsium</i> sp.	-	-	-	X	-	10
	Philadelphia fleabane	<i>Erigeron philadelphicus</i>	-	-	-	X	-	1
	Spotted trumpetweed	<i>Eupatoriadelphus maculatus</i>	-	-	-	X	-	1
	White wood aster	<i>Eurybia divaricata</i>	-	-	X	X	-	2, 4
	Slender goldetop	<i>Euthamia caroliniana</i>	-	-	-	X	-	1
	Flat-top goldentop	<i>Euthamia graminifolia</i> var. <i>graminifolia</i>	-	-	-	X	-	1, 10
	Jesuit's bark	<i>Iva frutescens</i>	-	-	-	X	-	1, 10
	Blackeyed Susan	<i>Rudbeckia hirta</i>	-	-	-	X	-	1
	Wrinkleleaf goldenrod	<i>Solidago rugosa</i>	-	-	-	X	-	1
	Seaside goldenrod	<i>Solidago sempervirens</i>	-	-	X	X	-	1, 2, 10, 11
Balsaminaceae Touch-me-not Family	Jewelweed	<i>Impatiens capensis</i>	-	-	X	-	-	11
Berberidaceae Barberry Family	Japanese barberry	<i>Berberis thunbergii</i>	-	I	X	X	X	2, 4, 6, 13
Betulaceae Birch Family	Yellow birch	<i>Betula alleghaniensis</i>	-	-	X	X	-	1, 11
	Gray birch	<i>Betula populifolia</i>	-	-	-	X	-	1, 4
	American hazelnut	<i>Corylus americana</i>	-	-	-	X	-	1
	Beaked hazelnut	<i>Corylus cornuta</i>	-	-	-	X	-	1

Continued on next page.

Appendix F. Flora and Fauna

Table F.1. Plants of the Fort Phoenix Planning Unit. (Continued) Taxonomy follows USDA (2010).

Family	Common Name	Scientific Name	MESA ^a	Invasive ^b	Fort Phoenix	Nasketucket Bay	West Island	Source
Brassicaceae Mustard Family	Garlic mustard	<i>Alliaria petiolata</i>	-	I	X	-	X	1, 6
	Sea rocket	<i>Cakile eduntula</i>	-	-	-	X	-	1
	Creeping yellowcress	<i>Rorippa sylvestris</i>	-	-	-	X	-	1
Caprifoliaceae Honeysuckle Family	Japanese honeysuckle	<i>Lonicera japonica</i>	-	I	X	-	X	6, 11
	Morrow's honeysuckle	<i>Lonicera morrowi</i>	-	I	-	X	-	1
	Unid. honeysuckle	<i>Lonicera</i> sp.	-	-	X	X	-	1, 2
	Dwarf honeysuckle	<i>Lonicera xylosteum</i>	-	-	-	X	-	1
	Mapleleaf viburnum	<i>Viburnum acerifolium</i>	-	-	-	X	-	8, 13
	Nannyberry	<i>Viburnum lentago</i>	-	-	-	X	-	8
	Southern arrowwood	<i>Viburnum recognitum</i>	-	-	X	X	X	1, 2, 4, 6, 7, 8
Caryophyllaceae Pink Family	Deptford pink	<i>Dianthus armeria</i>	-	-	-	X	-	1
	Salt sandspurry	<i>Spergularia salina</i>	-	-	-	X	-	10
	Common chickweed	<i>Stellaria media</i>	-	-	-	X	-	1
Celastraceae Bittersweet Family	Oriental bittersweet	<i>Celastrus orbiculatus</i>	-	I	X	X	X	1, 2, 4, 6, 8, 10, 11, 13
Chenopodiaceae Goosefoot Family	Lambsquarters	<i>Chenopodium album</i>	-	-	-	X	-	1
	Virginia glasswort	<i>Salicornia depressa</i>	-	-	-	X	-	10
	Slender glasswort	<i>Salicornia maritima</i>	-	-	-	X	-	1
	Unid. pickleweed	<i>Salicornia</i> sp.	-	-	-	X	-	10
	Russian thistle	<i>Salsola kali</i>	-	-	-	X	-	1
	Annual seepweed	<i>Suaeda linearis</i>	-	-	-	X	-	10
Clethraceae Clethra Family	Coastal sweetpepperbush	<i>Clethra alnifolia</i>	-	-	X	X	X	1, 2, 4, 6, 7, 9, 11, 14
Clusiaceae Mangosteen Family	Common St. Johnswort	<i>Hypericum perforatum</i>	-	-	-	X	-	1
Convolvulaceae Morning Glory Family	Hedge false bindweed	<i>Calystegia sepium</i> ssp. <i>sepium</i>	-	-	-	X	-	1
Cornaceae Dogwood Family	Unid. dogwood	<i>Cornus</i> sp.	-	-	X	-	-	2
	Blackgum	<i>Nyssa sylvatica</i>	-	-	X	X	X	2, 3, 4, 8, 11, 13
Cupressaceae Cypress Family	Atlantic white cedar	<i>Chamaecyparis thyoides</i>	-	-	-	X	-	13
	Eastern redcedar	<i>Juniperus virginiana</i>	-	-	-	X	X	1, 3, 4, 6, 7, 8, 13
	Common juniper	<i>Juniperus communis</i>	-	-	-	X	-	1
Cyperaceae Sedge Family	Greater bladder sedge	<i>Carex intumescens</i>	-	-	-	X	-	1
	Pennsylvania sedge	<i>Carex pensylvanica</i>	-	-	-	-	X	6
	Unid. sedge	<i>Carex</i> sp.	-	-	-	X	-	1
	Needle spikerush	<i>Eleocharis acicularis</i>	-	-	-	-	-	-
	Blunt spikerush	<i>Eleocharis obtusa</i>	-	-	-	X	-	1
	Chairmaker's bulrush	<i>Schoenoplectus americanus</i>	-	-	-	X	-	10
	Woolgrass	<i>Scirpus cyperinus</i>	-	-	-	X	-	1
Dennstaedtiaceae Bracken Fern Family	Western brackenfern	<i>Pteridium aquilinum</i>	-	-	X	-	-	2
	Eastern hayscented fern	<i>Dennstaedtia punctilobula</i>	-	-	-	X	-	1
Dryopteridaceae Wood Fern Family	Sensitive fern	<i>Onoclea sensibilis</i>	-	-	-	X	-	1
Eleagnaceae Oleaster Family	Unid. olive	<i>Eleagnus</i> sp.	-	-	X	-	-	2
	Autumn olive	<i>Eleagnus umbellata</i>	-	I	-	X	-	4
Equisetaceae Horsetail Family	Field horsetail	<i>Equisetum arvense</i>	-	-	X	-	-	6

Continued on next page.

Appendix F. Flora and Fauna

Table F.1. Plants of the Fort Phoenix Planning Unit. (Continued) Taxonomy follows USDA (2010).

Family	Common Name	Scientific Name	MESA ^a	Invasive ^b	Fort Phoenix	Nasketucket Bay	West Island	Source
Ericaceae	Black huckleberry	<i>Gaylussacia baccata</i>	-	-	-	X	X	3, 7, 8
Heath Family	Unid. huckleberry	<i>Gaylussacia</i> sp.	-	-	-	X	-	1
	Sheep laurel	<i>Kalmia angustifolia</i>	-	-	-	X	-	1
	Swamp azalea	<i>Rhododendron viscosum</i>	-	-	-	X	X	1, 7
	Highbush blueberry	<i>Vaccinium corymbosum</i>	-	-	X	X	X	1, 2, 3, 4, 6, 7, 8, 9, 13, 14
Fabaceae	Beach pea	<i>Lathyrus japonicus</i>	-	-	-	-	X	7
Pea Family	Red clover	<i>Trifolium pratense</i>	-	-	-	X	-	1
	Black locust	<i>Robinia pseudoacacia</i>	-	I	-	X	-	1
	Bird vetch	<i>Vicia cracca</i>	-	-	-	X	-	1
Fagaceae	American beech	<i>Fagus grandifolia</i>	-	-	-	X	X	1, 3, 4, 6
Beech Family	White oak	<i>Quercus alba</i>	-	-	X	X	X	1, 2, 3, 4, 6, 7, 11, 14
	Swamp white oak	<i>Quercus bicolor</i>	-	-	X	X	-	1, 11
	Scarlet oak	<i>Quercus coccinea</i>	-	-	-	X	X	1, 4, 14
	Northern red oak	<i>Quercus rubra</i>	-	-	-	X	X	1, 13, 14
	Unid. oak	<i>Quercus</i> sp.	-	-	-	X	-	10
	Black oak	<i>Quercus velutina</i>	-	-	X	X	X	1, 2, 3, 6, 7, 14
Haloragaceae	Marsh mermaidweed	<i>Proserpinaca palustris</i>	-	-	-	X	-	1
Water Milfoil Family								
Hamamelidaceae	American witchhazel	<i>Hamamelis virginia</i>	-	-	X	X	X	1, 2, 6, 8, 14
Witch-hazel Family								
Iridaceae	Paleyellow iris	<i>Iris pseudocorus</i>	-	I	-	-	X	6
Iris Family	Unid. iris	<i>Iris</i> sp.	-	-	-	X	-	1
Juglandaceae	Mockernut hickory	<i>Carya alba</i>	-	-	X	-	-	2
Walnut Family	Shagbark hickory	<i>Carya ovata</i>	-	-	-	X	-	1
	Unid. hickory	<i>Carya</i> sp.	-	-	X	X	-	2, 13
Juncaceae	Common rush	<i>Juncus effusus</i>	-	-	-	X	-	1
Rush Family	Soft rush	<i>Juncus gerardii</i>	-	-	-	X	-	1, 10
	Poverty rush	<i>Juncus tenuis</i>	-	-	-	X	-	1
Lamiaceae	Common motherwort	<i>Leonurus cardiaca</i>	-	-	-	X	-	1
Mint Family	Common selfheal	<i>Prunella vulgaris</i>	-	-	-	X	-	1
	Canada germander	<i>Teucrium canadense</i>	-	-	-	X	-	1, 10
Lauraceae	Northern spicebush	<i>Lindera benzoin</i>	-	-	-	X	-	1, 8
Laurel Family	Sassafras	<i>Sassafras albidum</i>	-	-	X	X	X	1, 2, 3, 4, 7, 11, 14
Liliaceae	Turk's-cap lily	<i>Lilium superbum</i>	-	-	-	X	-	1
Lily Family	Canada mayflower	<i>Maianthemum canadense</i>	-	-	X	X	X	1, 6
	Feathery false lily of the valley	<i>Maianthemum racemosum</i> ssp. <i>racemosum</i>	-	-	-	X	-	1
	Indian cucumber	<i>Medeola virginiana</i>	-	-	-	-	-	-
Lycopodiaceae	Rare clubmoss	<i>Lycopodium obscurum</i>	-	-	-	X	-	1
Club-moss Family	Deeproot clubmoss	<i>Lycopodium tristachyum</i>	-	-	-	X	-	1
Malvaceae	Crimson-eyed rosemallow	<i>Hibiscus moscheutos</i>	-	-	-	-	X	7
Mallow Family								
Melastomataceae	Maryland meadowbeauty	<i>Rhexia mariana</i>	-	-	-	X	-	1
Melastome Family								
Molluginaceae	Green carpetweed	<i>Mollugo verticillata</i>	-	-	-	X	-	1
Carpet-weed Family								
Monotropaceae	Indianpipe	<i>Monotropa uniflora</i>	-	-	-	X	-	1
Indian Pipe Family								

Continued on next page.

Appendix F. Flora and Fauna

Table F.1. Plants of the Fort Phoenix Planning Unit. (Continued) Taxonomy follows USDA (2010).

Family	Common Name	Scientific Name	MESA ^a	Invasive ^b	Fort Phoenix	Nasketucket Bay	West Island	Source
Myricaceae	Sweet fern	<i>Comptomia peregrina</i>	-	-	X	-	-	2
Bayberry Family	Northern bayberry	<i>Morella pensylvanica</i>	-	-	-	X	X	1, 4, 7, 8, 9, 10, 13
Orchidaceae	Moccasin flower	<i>Cypripedium acaule</i>	-	-	-	X	-	1
Orchid Family								
Onagraceae	Common evening primrose	<i>Oenothera biennis</i>	-	-	-	X	-	1
Evening Primrose Family								
Osmundaceae	Cinnamon fern	<i>Osmunda cinnamomea</i>	-	-	-	X	-	1
Royal Fern Family	Royal fern	<i>Osmunda regalis</i>	-	-	-	X	-	1
Phytolaccaceae	American pokeweed	<i>Phytolacca americana</i>	-	-	-	X	-	1
Pokeweed Family								
Pinaceae	Pitch pine	<i>Pinus rigida</i>	-	-	-	X	X	1, 3, 8
Pine Family	Eastern white pine	<i>Pinus strobus</i>	-	-	-	X	X	1, 3, 4, 6, 7, 9
	Eastern hemlock	<i>Tsuga canadensis</i>	-	-	-	X	-	1
Plantaginaceae	Narrowleaf plantain	<i>Plantago lanceolata</i>	-	-	-	X	-	1
Plantain Family	Common plantain	<i>Plantago major</i>	-	-	-	X	-	1
Poaceae	American beachgrass	<i>Ammophila breviligulata</i>	-	-	X	X	X	1, 2, 7, 10, 11
Grass Family	Orchardgrass	<i>Dactylis glomerata</i>	-	-	-	X	-	1
	Deertongue	<i>Dichanthelium clandestinum</i>	-	-	-	X	-	1, 4
	Cypress panic grass	<i>Dicanthelium dichotomum</i> var. <i>dichotomum</i>	E	-	-	-	X	5
	(Mattamuskeet panic-grass)							
	Salt grass	<i>Distichlis spicata</i>	-	-	-	X	-	1, 10
	Barnyardgrass	<i>Echinochloa crus-galli</i>	-	-	-	X	-	1
	Virginia wild rye	<i>Elymus virginicus</i>	-	-	-	X	-	10
	Red fescue	<i>Festuca rubra</i>	-	-	-	X	-	10
	Switchgrass	<i>Panicum virgatum</i>	-	-	-	X	X	1, 7, 10
	Reed canarygrass	<i>Phalaris arundinacea</i>	-	I	-	X	-	1
	Timothy	<i>Phleum pratense</i>	-	-	-	X	-	1
	Common reed	<i>Phragmites australis</i>	-	I	X	X	X	1, 2, 3, 4, 6, 8, 10, 11
	Little bluestem	<i>Schizachyrium scoparium</i>	-	-	-	X	-	4, 6
	Smooth cordgrass	<i>Spartina alterniflora</i>	-	-	-	X	-	1, 8, 10
	Saltmeadow cordgrass	<i>Spartina patens</i>	-	-	-	X	X	1, 6, 7, 8, 10
Polygonaceae	Japanese knotweed	<i>Polygonum cuspidatum</i>	-	I	X	-	-	6
Buckwheat Family	Seaside (sea-beach) knotweed ^d	<i>Polygonum glaucum</i>	SC	-	-	-	X	5
	Spotted lady's thumb	<i>Polygonum persicaria</i>	-	-	-	X	-	1
	Common sheep sorrel	<i>Rumex acetosella</i>	-	-	-	X	-	1
	Curly dock	<i>Rumex crispus</i>	-	-	-	X	-	1
Portulacaceae	Little hogweed	<i>Portulaca oleracea</i>	-	-	-	X	-	1
Purslane Family								
Primulaceae	Sea milkwort	<i>Glaux maritima</i>	-	-	-	X	-	10
Primrose Family	Starflower	<i>Trientalis borealis</i>	-	-	-	X	X	1, 6
Pyrolaceae	Striped prince's pine	<i>Chimaphila maculata</i>	-	-	-	-	X	6
Shinleaf Family	Pipsissewa	<i>Chimaphila umbellata</i>	-	-	-	-	X	7
Rhamnaceae	Glossy buckthorn	<i>Frangula alnus</i>	-	I	-	X	-	1
Buckthorn Family								
Rosaceae	Unid. serviceberry	<i>Amelanchier</i> sp.	-	-	-	-	X	6, 7, 14
Rose Family	Shrubby cinquefoil	<i>Dasiphora fruticosa</i>	-	-	-	X	-	9
	Unid. strawberry	<i>Frangaria</i> sp.	-	-	-	-	X	7
	Unid. apple	<i>Malus</i> sp.	-	-	X	X	-	2, 6

Continued on next page.

Appendix F. Flora and Fauna

Table F.1. Plants of the Fort Phoenix Planning Unit. (Continued) Taxonomy follows USDA (2010).

Family	Common Name	Scientific Name	MESA ^a	Invasive ^b	Fort Phoenix	Nasketucket Bay	West Island	Source
Rosaceae (continued)	Black chokeberry	<i>Photinia melanocarpa</i>	-	-	-	X	-	1
Rose Family	Red chokeberry	<i>Photinia pyrifolia</i>	-	-	-	X	-	1
	Beach plum	<i>Prunus maritima</i>	-	-	-	-	X	7
	Black cherry	<i>Prunus serotina</i>	-	-	-	X	X	1, 14
	Unid. cherry	<i>Prunus</i> sp.	-	-	X	X	X	2, 4, 6
	Chokecherry	<i>Prunus virginiana</i>	-	-	-	X	-	1
	Carolina rose	<i>Rosa carolina</i>	-	-	-	X	-	1
	Multiflora rose	<i>Rosa multiflora</i>	-	I	X	X	X	1, 4, 6, 8, 11, 13, 14
	Rugosa rose	<i>Rosa rugosa</i>	-	-	X	X	X	1, 7, 10, 12
	Unid. rose	<i>Rosa</i> sp.	-	-	X	-	X	2, 6
	Allegheny blackberry	<i>Rubus allegheniensis</i>	-	-	-	X	-	1, 4
	Northern dewberry	<i>Rubus flagellaris</i>	-	-	-	X	-	1
	Unid. blackberry	<i>Rubus</i> sp.	-	-	X	X	X	1, 2, 4, 6, 14
	White meadowsweet	<i>Spiraea alba</i> var. <i>latifolia</i>	-	-	-	X	-	10
	Unid. spiraea	<i>Spiraea</i> sp.	-	-	-	X	-	4
	Steeplebush	<i>Spiraea tomentosa</i>	-	-	-	X	-	1
Salicaceae	Quaking aspen	<i>Populus tremuloides</i>	-	-	-	X	-	4
Willow Family	White willow	<i>Salix alba</i>	-	-	-	X	-	1
Scrophulariaceae	Butter and eggs	<i>Linaria vulgaris</i>	-	-	-	X	-	1
Figwort Family	Allegheny monkeyflower	<i>Mimulus ringulus</i>	-	-	-	X	-	1
	Canada toadflax	<i>Nuttallanthus canadensis</i>	-	-	-	X	-	1
	Common mullein	<i>Verbascum thapsus</i>	-	-	-	-	X	7
Smilacaceae	Roundleaf greenbrier	<i>Smilax rotundifolia</i>	-	-	X	X	-	1, 2, 4
Catbrier Family	Unid. greenbrier	<i>Smilax</i> sp.	-	-	-	X	X	3, 6, 7, 10, 13, 14
Sphagnaceae	Sphagnum	<i>Sphagnum</i> sp.	-	-	-	X	-	1
Sphagnum Family								
Thelypteridaceae	New York fern	<i>Thelypteris noveboracensis</i>	-	-	-	X	-	1
Marsh Fern Family	Bog fern	<i>Thelypteris simulata</i>	-	-	-	X	-	1
Typhaceae	Narrowleaf cattail	<i>Typha angustifolia</i>	-	-	-	-	X	7
Cattail Family	Unid. cattail	<i>Typha</i> sp.	-	-	-	X	-	1, 10
Vitaceae	Virginia creeper	<i>Parthenocissus quinquefolia</i>	-	-	X	X	-	1, 2, 10, 11, 13
Grape Family	Unid. grape	<i>Vitis</i> sp.	-	-	X	X	X	1, 4, 6, 10, 11, 13
Zosteraceae	Sea wrack	<i>Zostera marina</i>	-	-	-	X	-	1, 8
Eel-grass Family								

a. Status of plants listed under the Massachusetts Endangered Species Act (MESA): E = Endangered; T = Threatened; and SC = Species of Special Concern.

b. These species have been evaluated by the Massachusetts Invasive Plant Advisory Group (MIPAG 2009) and determined to be invasive (I) or likely invasive (L).

c. Information contained in this table was obtained from the following sources:

1. Epsilon Associates, Inc. (2000).
2. Cavanagh. (2010a).
3. DEM (1997).
4. Cavanagh (2010b).
5. Harper (2010).
6. Cavanagh (2011a).
7. Cavanagh and Swain (2011).
8. Lash (1998).
9. Horiuchi and Solien (2002). Horticultural varieties of these species are identified as restoration plantings in site plans.
10. Epsilon Associates, Inc. (2002b).
11. Cavanagh (2011b).
12. RMP planner personal observation.
13. Data from 2011 CFI inventory of Plot # 3782; Nasketucket Bay State Reservation.
14. Data from 2011 CFI inventory of Plot # 3392; West Island State Reservation.

d. Although this species is listed, the population at West Island is not regulated under MESA.

Appendix F. Flora and Fauna

Table F.2. Birds of the Fort Phoenix Planning Unit. Family, common, and scientific names and the sequence in which they are presented follow American Ornithologists' Union (2011).

Family	Common Name	Scientific Name	MESA ^a	Fort Phoenix	Nasketucket Bay	West Island	Source ^b	BBA
Anatidae	Brant	<i>Branta bernicla</i>	-	X	-	X	10, 12, 15, 18	-
Geese, Swans, and Ducks	Canada goose	<i>Branta canadensis</i>	-	X	-	X	3, 6, 12, 15	X
	Mute swan	<i>Cygnus olor</i>	-	-	-	-	-	X
	Wood duck	<i>Aix sponsa</i>	-	-	-	-	-	X
	Gadwall	<i>Anas strepera</i>	-	-	-	-	-	X
	American black duck ^d	<i>Anas rubripes</i>	-	-	X	X	4, 10, 21	X
	Mallard	<i>Anas platyrhynchos</i>	-	X	-	X	11, 18	X
	Unid. scaup	<i>Aythya</i> sp.	-	-	-	-	15	-
	Common eider ^d	<i>Somateria mollissima</i>	-	X	-	X	9, 15, 19	X
	White-winged scoter	<i>Melanitta fusca</i>	-	-	-	X	6	-
	Long-tailed duck	<i>Clangula hyemalis</i>	-	X	-	-	12	-
	Bufflehead	<i>Bucephala albeola</i>	-	X	X	-	12, 15, 21	-
	Common goldeneye	<i>Bucephala clangula</i>	-	X	-	X	10, 15	-
	Red-breasted merganser	<i>Mergus serrator</i>	-	X	X	X	10, 12, 14, 15	-
	Red-throated loon	<i>Gavia stellata</i>	-	-	X	-	28	-
Gaviidae Loons								
Podicipedidae Grebes	Horned grebe	<i>Podiceps auritus</i>	-	X	-	X	10, 12, 15	-
Phalacrocoracidae Cormorants	Double-crested cormorant	<i>Phalacrocorax auritus</i>	-	X	X	X	3, 4, 11, 14, 22	X
Ardeidae Bitterns and Herons	Great cormorant	<i>Phalacrocorax carbo</i>	-	-	-	X	10	-
	Unid. cormorant	<i>Phalacrocorax</i> sp.	-	-	-	X	2	-
	American bittern	<i>Botaurus lentiginosus</i>	E	-	-	X	17	-
	Great blue heron	<i>Ardea herodias</i>	-	-	X	X	1, 2, 3	X
	Great egret	<i>Ardea alba</i>	-	-	-	X	2, 3, 9, 10	X
	Snowy egret ^d	<i>Egretta thula</i>	-	-	X	X	1, 2	-
	Green heron ^d	<i>Butorides virescens</i>	-	-	X	X	1, 10	X
	Black-crowned night-heron ^d	<i>Nycticorax nycticorax</i>	-	-	-	X	2	X
Cathartidae American Vultures	Yellow-crowned night-heron	<i>Nyctanassa violacea</i>	-	-	-	X	2	-
	Turkey vulture	<i>Cathartes aura</i>	-	-	X	-	14, 16, 21, 23	X
Pandionidae Osprey	Osprey	<i>Pandion haliaetus</i>	-	-	X	-	14, 23	X
Accipitridae Kites, Eagles, and Hawks	Sharp-shinned hawk ^d	<i>Accipiter striatus</i>	SC	-	X	-	14, 21	X
	Cooper's hawk	<i>Accipiter cooperii</i>	-	-	-	X	24	X
	Red-shouldered hawk	<i>Buteo lineatus</i>	-	-	-	-	-	X
	Red-tailed hawk	<i>Buteo jamaicensis</i>	-	-	X	X	3, 14, 15	X
Falconidae Falcons	American kestrel ^d	<i>Falco sparverius</i>	-	-	X	-	1	-
	Merlin	<i>Falco columbarius</i>	-	X	-	-	15	-
	Pergerine falcon ^d	<i>Falco peregrinus</i>	E	-	-	X	9	-
Charadriidae Plovers and Lapwings	Black-bellied plover	<i>Pluvialis squatarola</i>	-	-	-	X	2, 3, 9, 11	-
	American golden-plover	<i>Pluvialis dominica</i>	-	-	-	X	3	-
	Semipalmated plover	<i>Charadrius semipalmatus</i>	-	-	-	X	2, 11	-
	Piping plover ^d	<i>Charadrius melodus</i>	T	-	-	X	2, 10, 11, 17	X
	Killdeer	<i>Charadrius vociferus</i>	-	-	-	X	2, 10	X

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Appendix F. Flora and Fauna

Table F.2. Birds of the Fort Phoenix Planning Unit. (Continued) Family, common, and scientific names and the sequence in which they are presented follow American Ornithologists' Union (2011).

Family	Common Name	Scientific Name	MESA ^a	Fort Phoenix	Nasketucket Bay	West Island	Source	BBA
Haematopodidae Oystercatchers	American oystercatcher ^d	<i>Haematopus palliatus</i>	-	-	X	X	2, 4, 9, 11, 14, 24	X
Scolopacidae Sandpipers and Allies	Greater yellowlegs	<i>Tringa melanoleuca</i>	-	-	-	X	2	-
	Lesser yellowlegs	<i>Tringa flavipes</i>	-	-	-	X	11	-
	Willet	<i>Catoptrophorus semipalmatus</i>	-	-	X	X	1, 2, 4, 9, 11, 23	X
	Spotted sandpiper	<i>Actitis macularia</i>	-	-	-	X	4	X
	Ruddy turnstone ^d	<i>Arenaria interpres</i>	-	-	-	X	2, 9, 11	-
	Sanderling ^d	<i>Calidris alba</i>	-	-	-	X	2	-
	Semipalmated sandpiper	<i>Calidris pusilla</i>	-	-	-	X	2	-
	Least sandpiper	<i>Calidris minutilla</i>	-	-	-	X	2, 3	-
	Dunlin	<i>Calidris alpina</i>	-	-	-	X	2, 10	-
	Short-billed dowitcher	<i>Limnodromus griseus</i>	-	-	-	X	2, 24	-
	American woodcock ^d	<i>Scolopax minor</i>	-	-	X	-	20	-
Laridae Jaegers, Gulls, Terns, and Skimmers	Laughing gull ^d	<i>Larus atricilla</i>	-	-	-	X	3	X
	Ring-billed gull	<i>Larus delawarensis</i>	-	X	-	X	3, 10, 11, 12, 13, 15, 18	-
	Herring gull	<i>Larus argentatus</i>	-	X	X	X	1, 3, 4, 7, 9, 10, 11, 12, 13, 15, 18	X
	Great black-backed gull	<i>Larus marinus</i>	-	X	X	X	1, 7, 9, 10, 11, 15	X
	Unid. gull	<i>Larus</i> sp.	-	-	X	-	2	-
	Roseate tern ^d	<i>Sterna dougallii</i>	E	-	-	X	4, 17	-
	Common tern ^d	<i>Sterna hirundo</i>	SC	-	X	X	1, 2, 4, 9, 11, 17, 23	-
	Least tern	<i>Sterna antillarum</i>	SC	-	-	X	2, 9, 17	X
	Black skimmer	<i>Rhynchops niger</i>	-	-	-	X	5	-
Columbidae Pigeons and Doves	Rock pigeon	<i>Columba livia</i>	-	X	-	X	3, 12, 13, 18	X
	Mourning dove	<i>Zenaida macroura</i>	-	-	X	X	1, 3, 19, 23, 27, 28	X
Cuculidae Cuckoos and Allies	Yellow-billed cuckoo	<i>Coccyzus americanus</i>	-	-	X	-	16, 27, 28	-
Strigidae Typical Owls	Eastern screech-owl	<i>Megascops asio</i>	-	-	X	-	1	X
	Great horned owl	<i>Bubo virginianus</i>	-	-	-	-	-	X
	Snowy owl	<i>Nyctea scandiaca</i>	-	-	-	X	8	-
	Short-eared owl ^d	<i>Asio flammeus</i>	E	-	-	X	7	-
Apodidae Swifts	Chimney swift	<i>Chaetura pelagica</i>	-	-	-	-	-	X
Trochilidae Hummingbirds	Ruby-throated hummingbird	<i>Archilochus colubris</i>	-	-	-	-	-	X
Alcedinidae Kingfishers	Belted kingfisher	<i>Ceryle alcyon</i>	-	-	-	-	-	X
Picidae Woodpeckers	Red-bellied woodpecker	<i>Melanerpes carolinus</i>	-	X	X	X	3, 14, 15, 16, 23, 28	X
	Downy woodpecker	<i>Picoides pubescens</i>	-	X	X	X	1, 2, 9, 14, 15, 16, 21, 23, 28	X
	Hairy woodpecker	<i>Picoides villosus</i>	-	-	X	-	1	X
	Northern flicker	<i>Colaptes auratus</i>	-	X	X	X	1, 2, 11, 13, 14, 16, 22, 23, 28	X

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Appendix F. Flora and Fauna

Table F.2. Birds of the Fort Phoenix Planning Unit. (Continued) Family, common, and scientific names and the sequence in which they are presented follow American Ornithologists' Union (2011).

Family	Common Name	Scientific Name	MESA ^a	Fort Phoenix	Nasketucket Bay	West Island	Source ^b	BBA ^c
Tyrannidae	Eastern wood-pewee	<i>Contopus virens</i>	-	-	X	X	1, 2, 9, 27	X
Tyrant Flycatchers	Willow flycatcher ^d	<i>Empidonax trailii</i>	-	-	-	X	9	X
	Least flycatcher	<i>Empidonax minimus</i>	-	-	-	X	2	-
	Unid. empidonax flycatcher	<i>Empidonax</i> sp.	-	-	-	X	3	-
	Eastern phoebe	<i>Sayornis phoebe</i>	-	-	X	X	1, 2, 3, 28	X
	Great-crested flycatcher	<i>Miarchus crinitus</i>	-	X	X	X	1, 2, 9, 13, 27	X
	Eastern kingbird	<i>Tyrannus tyrannus</i>	-	-	-	X	2	X
Vireonidae	White-eyed vireo	<i>Vireo griseus</i>	-	-	X	-	28	X
Vireos	Blue-headed vireo	<i>Vireo solitarius</i>	-	-	X	-	28	-
	Warbling vireo	<i>Vireo gilvus</i>	-	-	-	-	-	X
	Red-eyed vireo	<i>Vireo olivaceus</i>	-	-	X	-	27	X
Corvidae	Blue jay	<i>Cyanocitta cristata</i>	-	-	X	X	1, 2, 3, 9, 14, 16, 19, 21, 23, 28	X
Jays, Magpies, and Crows	American crow	<i>Corvus brachyrhynchos</i>	-	X	X	X	1, 3, 9, 10, 13, 15, 18, 23, 27	X
Alaudidae	Horned lark	<i>Eremophila alpestris</i>	-	-	-	-	-	X
Larks								
Hirundinidae	Tree swallow	<i>Tachycineta bicolor</i>	-	-	X	X	2, 6, 23	X
Swallows	Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	-	-	-	X	2	X
	Bank swallow	<i>Riparia riparia</i>	-	-	-	X	2	-
	Barn swallow	<i>Hirundo rustica</i>	-	X	X	X	1, 2, 9, 11, 13, 22, 23	X
Paridae	Black-capped chickadee	<i>Poecile atricapilla</i>	-	X	X	X	1, 2, 3, 13, 14, 16, 21, 27, 28	X
Titmice	Tufted titmouse	<i>Baeolophus bicolor</i>	-	X	X	X	1, 2, 3, 9, 13, 14, 16, 21, 27, 28	X
Sittidae	Red-breasted nuthatch	<i>Sitta canadensis</i>	-	-	X	-	21	-
Nuthatches	White-breasted nuthatch	<i>Sitta carolinensis</i>	-	-	X	X	2, 14, 16, 21, 28	X
Certhiidae	Brown creeper	<i>Certhia americana</i>	-	-	X	-	16, 21	-
Creepers								
Troglodytidae	Carolina wren	<i>Thryothorus ludovicianus</i>	-	X	X	X	1, 2, 3, 12, 14, 21, 23, 28	X
Wrens	House wren	<i>Troglodytes aedon</i>	-	-	X	X	1, 2	X
Regulidae	Golden-crowned kinglet	<i>Regulus satrapa</i>	-	-	X	-	16, 21, 28	-
Kinglets	Ruby-crowned kinglet	<i>Regulus calendula</i>	-	-	X	-	28	-
Silviidae	Blue-gray gnatcatcher	<i>Poliophtila caerulea</i>	-	-	-	-	-	X
Gnatcatchers								
Turdidae	Veery	<i>Catharus fuscescens</i>	-	-	X	-	1, 23	X
Bluebirds and Thrushes	Hermit thrush	<i>Catharus guttatus</i>	-	-	-	X	2	-
	Wood thrush ^d	<i>Hylocichla mustelina</i>	-	-	X	X	1, 2, 27	X
	American robin	<i>Turdus migratorius</i>	-	X	X	X	1, 2, 3, 4, 14, 16, 18, 21, 22, 27, 28	X
Mimidae	Gray catbird	<i>Dumetella carolinensis</i>	-	X	X	X	1, 2, 3, 4, 9, 11, 13, 19, 23, 27, 28	X
Mimic Thrushes	Northern mockingbird	<i>Mimus polyglottos</i>	-	X	-	X	2, 3, 12, 13	X
	Brown thrasher ^d	<i>Toxostoma rufum</i>	-	-	X	X	2, 26	-

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Appendix F. Flora and Fauna

Table F.2. Birds of the Fort Phoenix Planning Unit. (Continued) Family, common, and scientific names and the sequence in which they are presented follow American Ornithologists' Union (2011).

Family	Common Name	Scientific Name	MESA ^a	Fort Phoenix	Nasketucket Bay	West Island	Source ^b	BBA ^c
Sturnidae Starlings	European starling	<i>Sturnis vulgaris</i>	-	X	-	X	3, 13, 15	X
Bombycillidae Waxwings	Cedar waxwing	<i>Bombycilla cedrorum</i>	-	-	-	X	2, 3	X
Parulidae Wood Warblers	Blue-winged warbler ^d	<i>Vermivora pinus</i>	-	-	X	-	1, 27	X
	Nashville warbler	<i>Vermivora ruficapilla</i>	-	-	-	-	-	X
	Northern parula ^d	<i>Parula americana</i>	T	-	-	X	2	-
	Yellow warbler	<i>Dendroica petechia</i>	-	X	X	X	1, 2, 3, 4, 9, 11, 13, 19, 23, 27	X
	Chestnut-sided warbler	<i>Dendroica pensylvanica</i>	-	-	-	-	-	X
	Yellow-rumped warbler	<i>Dendroica coronata</i>	-	-	X	X	2, 16, 28	-
	Black-throated green warbler	<i>Dendroica virens</i>	-	-	X	-	1	-
	Pine warbler	<i>Dendroica pinus</i>	-	-	X	X	1, 3, 14, 23, 28	X
	Prairie warbler ^d	<i>Dendroica discolor</i>	-	-	X	-	-	X
	Blackpoll warbler ^d	<i>Dendroica striata</i>	SC	-	-	X	3	-
	Black-and-white warbler	<i>Mniotilta varia</i>	-	-	X	X	1, 2	-
	American redstart	<i>Setophaga ruticilla</i>	-	-	-	X	2	-
	Ovenbird	<i>Seiurus aurocapillus</i>	-	X	X	-	1, 13, 27	X
	Common yellowthroat	<i>Geothlypis trichas</i>	-	X	X	X	1, 2, 4, 13, 16, 23, 27, 28	X
	Yellow-breasted chat	<i>Icteria virens</i>	-	X	-	-	15	-
Emberizidae Towhees, Sparrows, and Allies	Eastern towhee ^d	<i>Pipilo erythrophthalmus</i>	-	-	X	X	1, 3, 9, 11, 14, 23, 27, 28	X
	American tree sparrow	<i>Spizella arborea</i>	-	X	-	-	12, 15	-
	Chipping sparrow	<i>Spizella passerina</i>	-	-	X	-	1	X
	Field sparrow ^d	<i>Spizella pusilla</i>	-	-	X	-	14	-
	Nelson's sharp-tailed sparrow	<i>Ammodramus nelsoni</i>	-	-	-	-	-	X
	Saltmarsh sharp-tailed sparrow ^d	<i>Ammodramus caudacutus</i>	-	-	X	X	1, 4, 9, 11	X
	Song sparrow	<i>Melospiza melodia</i>	-	X	X	X	1, 3, 4, 9, 10, 11, 12, 14, 15, 21, 23, 28	X
	White-throated sparrow ^d	<i>Zonotrichia albicollis</i>	-	-	X	X	1, 14, 21, 28	-
	Dark eyed junco	<i>Junco hyemalis</i>	-	-	X	-	21, 28	-
Cardinalidae Tanagers, Grosbeaks, and Buntings	Scarlet tanager	<i>Piranga olivacea</i>	-	-	X	X	1, 2	-
	Northern cardinal	<i>Cardinalis cardinalis</i>	-	X	X	X	1, 2, 3, 13, 14, 16, 27, 28	X
	Rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	-	-	-	-	-	X
Icteridae Blackbirds, Orioles, and Allies	Red-winged blackbird	<i>Agelaius phoeniceus</i>	-	X	X	X	1, 2, 9, 10, 11, 13, 15, 19, 22, 23	X
	Common grackle	<i>Quiscalus quiscula</i>	-	X	X	X	1, 2, 9, 11, 21, 22	X
	Brown-headed cowbird	<i>Molothrus ater</i>	-	-	X	X	2, 11, 14, 23, 27	X
	Orchard oriole	<i>Icterus spurius</i>	-	-	-	-	-	X
	Baltimore oriole	<i>Icterus galbula</i>	-	-	X	X	1, 2, 18, 23, 27	X

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Appendix F. Flora and Fauna

Table F.2. Birds of the Fort Phoenix Planning Unit. (Continued) Family, common, and scientific names and the sequence in which they are presented follow American Ornithologists' Union (2011).

Family	Common Name	Scientific Name	MESA ^a	Fort Phoenix	Nasketucket Bay	West Island	Source ^b	BBA ^c
Fringillidae	Purple finch	<i>Carpodacus purpureus</i>	-	-	-	X	2	-
Fringilline Finches	House finch	<i>Carpodacus mexicanus</i>	-	X	X	X	1, 2, 11, 12, 14, 15	X
	Common redpoll	<i>Acanthis flammea</i>	-	-	-	X	25	-
	American goldfinch	<i>Carduelis tristis</i>	-	X	X	X	1, 2, 3, 4, 9, 10, 11, 13, 14, 15, 23, 27	X
Passeridae	House sparrow	<i>Passer domesticus</i>	-	X	-	-	15	X
Old World Finches								

- a. Status of birds listed under the Massachusetts Endangered Species Act (MESA): E = Endangered; T = Threatened; and SC = Species of Special Concern.
- b. Information contained in this table was obtained from the following sources:
1. Epsilon Associates, Inc. (2000).
 2. DEM (1997)
 3. Longworth (2008c).
 4. Longworth (2009a).
 5. Longworth (2008a).
 6. Longworth (2008b).
 7. Longworth (2009b).
 8. Longworth (2009c).
 9. Longworth (2010a).
 10. Longworth (2009d).
 11. Longworth (2009e).
 12. Longworth (2010b).
 13. Longworth (2010c).
 14. Longworth (2010d).
 15. Longworth (2011a).
 16. Morgan (2010).
 17. Harper (2011).
 18. Cavanagh (2011a).
 19. Cavanagh and Swain (2011).
 20. Zollo (2011).
 21. Lash (1998).
 22. Cavanagh (2011b).
 23. Newlands (2011b); includes all birds observed, both inside and outside the count circle, at points NB1, NB2, and WI1.
 24. Longworth (2010e).
 25. Longworth (2011b).
 26. Malin (2010).
 27. Morgan and Morgan (2011a).
 28. Morgan and Morgan (2011b).
- c. Breeding Bird Atlas (BBA) data for blocks 1606, 1613, 1714, and 1721 for the years 2007 through May, 2011 (USGS and Mass Audubon 2011). These data include some birds associated with habitats that do not occur in the planning unit.
- d. This species has been designated a Species in Greatest Need of Conservation (MassWildlife 2006, Table 4).

Appendix F. Flora and Fauna

Table F.3. Mammals of the Fort Phoenix Planning Unit. The following mammals occur, or may occur, on the reservations within the Fort Phoenix Planning Unit. Family, common, and scientific names and the sequence in which they are presented follow Cardoza et al. (2009).

Family	Common Name	Scientific Name	MESA ^a	Fort Phoenix ^b	Nasketucket Bay ^b	West Island ^b	Source ^c
Didelphidae New World Opossums	Virginia opossum	<i>Didelphis virginiana</i>	-	P	P	C	2
Sciuridae Tree Squirrels and Marmots	Eastern gray squirrel	<i>Sciurus carolinensis</i>	-	P	C	C	1, 2
	Red squirrel	<i>Tamiasciurus hudsonicus</i>	-	P	C	P	1
	Southern flying squirrel	<i>Glaucomys volans</i>	-	P	P	P	-
	Woodchuck	<i>Marmota monax</i>	-	P	P	P	-
	Eastern chipmunk	<i>Tamias striatus</i>	-	P	C	C	1, 2
Castoridae American Beaver	American beaver	<i>Castor canadensis</i>	-	U	U	C	2
Dipodidae Jumping Mice	Meadow jumping mouse	<i>Zapus hudsonius</i>	-	U	P	U	-
Cricetidae Mice, Voles, and Lemmings	Meadow vole	<i>Microtus pennsylvanicus</i>	-	U	P	C	3
	Woodland vole	<i>Microtus pinetorum</i>	-	P	P	P	-
	Southern red-backed vole	<i>Myodes gapperi</i>	-	P	P	P	-
	Common muskrat	<i>Ondatra zibethicus</i>	-	U	U	C	2
	White-footed deer mouse	<i>Peromyscus leucopus</i>	-	P	P	P	-
Muridae Old World Rats and Mice	House mouse	<i>Mus musculus</i>	-	P	P	P	-
	Brown rat	<i>Rattus norvegicus</i>	-	P	P	P	-
Erethizontidae New World Porcupines	North American porcupine	<i>Erethizon dorsatum</i>	-	U	U	U	-
Leporidae Hares and Rabbits	Snowshoe hare	<i>Lepus americanus</i>	-	U	U	U	-
	Eastern cottontail	<i>Sylvilagus floridanus</i>	-	P	C	C	1, 2
Soricidae Shrews	Northern short-tailed shrew	<i>Blarina brevicauda</i>	-	P	P	P	-
	Cinereus shrew	<i>Sorex cinereus</i>	-	P	P	P	-
Talpidae Moles and Shrew-moles	Star-nosed mole	<i>Condylura cristata</i>	-	P	P	P	-
	Eastern mole	<i>Scalopus aquaticus</i>	-	P	P	P	-
Vespertilionidae Vesper Bats	Big brown bat	<i>Eptesicus fuscus</i>	-	P	P	P	-
	Eastern red bat ^d	<i>Lasiurus borealis</i>	-	P	P	P	-
	Hoary bat ^d	<i>Lasiurus cinereus</i>	-	P	P	P	-
	Eastern pipistrelle	<i>Pipistrellus subflavus</i>	-	P	P	P	-
	Silver-haired bat ^d	<i>Lasionycteris noctivagans</i>	-	P	P	P	-
	Little brown myotis	<i>Myotis lucifugus</i>	-	P	P	P	-
	Northern myotis	<i>Myotis septentrionalis</i>	-	P	P	P	-
Felidae Cats	Domestic cat (feral)	<i>Felis catus</i>	-	P	P	P	-
Canidae Dogs, Foxes, and Wolves	Coyote	<i>Canis latrans</i>	-	P	P	C	2
	Domestic dog (feral)	<i>Canis lupus familiaris</i>	-	P	P	P	-
	Gray fox	<i>Urocyon cinereoargenteus</i>	-	P	P	P	-
	Red fox	<i>Vulpes vulpes</i>	-	P	P	C	2

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Appendix F. Flora and Fauna

Table F. 3. Mammals of the Fort Phoenix Planning Unit. (Continued) The following mammals occur, or may occur, on the reservations within the Fort Phoenix Planning Unit. Family, common, and scientific names and the sequence in which they are presented follow Cardoza et al. (2009).

Family	Common Name	Scientific Name	MESA ^a	Fort Phoenix ^b	Nasketucket Bay ^b	West Island ^b	Source ^c
Phocidae	Gray seal	<i>Halichoerus grypus</i>	-	P	P	P	-
Earless or Hairless Seals	Harbor Seal	<i>Phoca vitulina</i>	-	P	P	C	2
Mustelidae	North American river otter	<i>Lontra canadensis</i>	-	U	U	U	-
Weasels, Minks, Martens, and Otters	Fisher	<i>Martes pennanti</i>	-	U	P	P	-
	Ermine	<i>Mustela erminea</i>	-	P	P	P	-
	Long-tailed weasel	<i>Mustela frenata</i>	-	P	P	P	-
	American mink	<i>Neovison vison</i>	-	P	P	P	-
Mephitidae	Striped skunk	<i>Mephitis mephitis</i>	-	P	P	C	2
Skunks							
Procyonidae	Raccoon	<i>Procyon lotor</i>	-	P	C	C	1, 2
Raccoons, Coatis, and Ringtails							
Cervidae	White-tailed deer	<i>Odocoileus virginianus</i>	-	P	C	C	1, 3
Deer, Elk, and Moose							

a. Status of mammals listed under the Massachusetts Endangered Species Act (MESA): E = Endangered; T = Threatened; and SC = Species of Special Concern.

b. Occurrence of species is classified as follows: Confirmed (C) – species has been recorded on the reservation; Possible (P) – Species is known to occur in southeastern Massachusetts (Cardoza et al. 2009) and may occur on the reservation; and Unlikely (U) – species is known to occur in southeastern Massachusetts, but appropriate habitat is absent from the reservation. Only those marine mammals with the potential to occur on the reservation, as opposed to offshore of the reservation, are included in this table.

c. Information contained in this table was obtained from the following sources:

1. Epsilon Associates, Inc. (2000).
2. DEM (1997).
3. Cavanagh and Swain (2011).

d. This species has been designated a Species in Greatest Need of Conservation (MassWildlife 2006, Table 4).

Appendix F. Flora and Fauna

Table F.4. Reptiles of the Fort Phoenix Planning Unit. The following reptiles occur, or may occur, on the reservations within the Fort Phoenix Planning Unit. Family, common, and scientific names follow NatureServe (2010); the sequence in which they are presented follows Cardoza and Mirick (2009).

Family	Common Name	Scientific Name	MESA ^a	Fort Phoenix ^b	Nasketucket Bay ^b	West Island ^b	Source ^c
Chelydridae Snapping Turtles	Snapping turtle	<i>Chelydra serpentina</i>	-	P	P	P	-
Kinosternidae American Mud and Musk Turtles	Common musk turtle	<i>Sternotherus odoratus</i>	-	U	U	U	-
Emydidae Pond Turtles	Northern painted turtle	<i>Chrysemys picta</i>	-	U	U	U	-
	Spotted turtle ^d	<i>Clemmys guttata</i>	-	U	C	U	4
	Blanding's turtle ^d	<i>Emydoidea blandingii</i>	T	U	U	U	-
	Diamond-backed terrapin ^d	<i>Malaclemmys terrapin</i>	T	U	P	P	-
	Eastern box turtle ^{d,e}	<i>Terrapene carolina</i>	SC	U	C	C	1, 5
Cheloniidae Sea Turtles	Loggerhead Seaturtle ^d	<i>Caretta caretta</i>	T	U	U	U	-
Dermochelyidae Leatherback Turtle	Leatherback seaturtle ^d	<i>Dermochelys coriacea</i>	E	U	U	U	-
Colubridae Harmless Snakes	Racer ^d	<i>Coluber constrictor</i>	-	U	P	P	-
	Ring-necked snake	<i>Diadophis punctatus</i>	-	U	P	P	-
	Eastern hog-nosed snake ^d	<i>Heterodon platirhinos</i>	-	U	P	P	-
	Milksnake	<i>Lampropeltis triangulum</i>	-	U	P	P	-
	Northern watersnake	<i>Nerodia sipedon</i>	-	U	P	P	-
	Smooth greensnake	<i>Opheodrys vernalis</i>	-	U	P	U	-
	Brownsnake	<i>Storeria dekayi</i>	-	P	C	P	2
	Red-bellied snake	<i>Storeria occipitomaculata</i>	-	P	P	P	-
	Eastern ribbonsnake ^d	<i>Thamnophis sauritus</i>	-	U	P	P	-
	Common gartersnake	<i>Thamnophis sirtalis</i>	-	P	C	C	2, 3

a. Status of reptiles listed under the Massachusetts Endangered Species Act (MESA): E = Endangered; T = Threatened; and SC = Species of Special Concern.

b. Species are classified as follows: Confirmed (C) – species has been recorded on the reservation; Possible (P) – Species is known to occur in southeastern Massachusetts (Cardoza and Mirick 2009) and may occur on the reservation; and Unlikely (U) – species is known to occur in southeastern Massachusetts, but appropriate habitat is absent from the reservation.

c. Information contained in this table was obtained from the following sources.

1. Harper (2011).
2. Epsilon Associates, Inc. (2000).
3. Cavanagh (2011a).
4. Epsilon Associates, Inc. (2002a).
5. Sheynin (2011).

d. This species has been designated a Species in Greatest Need of Conservation (MassWildlife 2006, Table 4).

e. Although this species is listed, the population at West Island is not regulated under MESA (Harper 2011).

Appendix F. Flora and Fauna

Table F.5. Amphibians of the Fort Phoenix Planning Unit. The following amphibians occur, or may occur, on the reservations within the Fort Phoenix Planning Unit. Family, common, and scientific names follow NatureServe (2010); the sequence in which they are presented follows Cardoza and Mirick (2009).

Family	Common Name	Scientific Name	MESA ^a	Fort Phoenix ^b	Nasketucket Bay ^b	West Island ^b	Source ^c
Ambystomatidae	Spotted salamander	<i>Ambystoma maculatum</i>	-	U	C	P	1, 3
Mole Salamanders	Marbled salamander ^d	<i>Ambystoma opacum</i>	T	U	P	P	-
Salamandridae	Eastern newt	<i>Notophthalmus viridescens</i>	-	U	P	P	-
Newts							
Plethodontidae	Dusky salamander	<i>Desmognathus fuscus</i>	-	U	P	P	-
Lungless Salamanders	Redback salamander	<i>Plethodon cinereus</i>	-	P	C	P	1, 2
	Four-toed salamander ^d	<i>Hemidactylum scutatum</i>	-	U	P	U	-
	Northern two-lined salamander	<i>Eurycea bislineata</i>	-	U	P	U	-
Pelobatidae	Eastern spadefoot ^d	<i>Scaphiopus holbrookii</i>	T	U	P	P	-
Spadefoot Toads							
Bufonidae	American toad	<i>Bufo (Anaxyrus) americanus</i>	-	P	C	C	1, 4
True Toads	Fowler's toad	<i>Bufo (Anaxyrus) fowleri</i>	-	P	P	P	-
Hylidae	Spring peeper	<i>Pseudacris crucifer</i>	-	P	C	P	1
True Tree Frogs	Gray treefrog	<i>Hyla versicolor</i>	-	P	P	P	-
Ranidae	American bullfrog	<i>Rana catesbeiana</i> (<i>Lithobates catesbeianus</i>)	-	U	P	P	-
True Frogs	Green frog	<i>Rana (Lithobates) clamitans</i>	-	U	C	P	1, 3
	Pickerel frog	<i>Rana (Lithobates) palustris</i>	-	U	C	P	1
	Northern leopard frog ^d	<i>Rana (Lithobates) pipiens</i>	-	U	P	P	-
	Wood frog	<i>Rana (Lithobates) sylvaticus</i>	-	U	C	C	1, 2, 3

a. Status of reptiles listed under the Massachusetts Endangered Species Act (MESA): E = Endangered; T = Threatened; and SC = Species of Special Concern.

b. Species are classified as follows: Confirmed (C) – species has been recorded on the reservation; Possible (P) – Species is known to occur in southeastern Massachusetts (Cardoza and Mirick 2009) and may occur on the reservation; and Unlikely (U) – species is known to occur in southeastern Massachusetts, but appropriate habitat is absent from the reservation.

c. Information contained in this table was obtained from the following sources:

1. Epsilon Associates, Inc. (2000).
2. Cavanagh (2011a).
3. Sheynin (2011).
4. Longworth (2010e)

d. This species has been designated a Species in Greatest Need of Conservation (MassWildlife 2006, Table 4).

Appendix G. Acts of the Massachusetts Legislature that Directly Address the Fort Phoenix Planning Unit.

Year	Chapter	Title	Comments
1847	235	An Act ceding to the United States jurisdiction over a ledge of rocks lying off the island of Cuttyhunk, and over a lot of land in Fairhaven.	Granted jurisdiction on “a lot of land not exceeding one quarter of an acre, situate (sic) near the Old Fort, above high-water mark, in the Town of Fairhaven, upon which the United States coast surveyors have recently erected a temporary beacon.” Although ceded to the U.S. Government, the Commonwealth “does hereby retain, concurrent jurisdiction.” This lot is located along the shore, at the southern end of Green Street.
1885	298	An Act to authorize Horace S. Crowell to build a causeway or bridge from Fairhaven to Long and West islands.	This Act began the process of connecting West Island to the mainland, leading to the eventual development of the island.
1943	460	An Act granting the consent of the Commonwealth to the acquisition by the United States of America over certain lands for use as military reservations and granting and ceding jurisdiction over such lands.	Granted consent to the taking, by the federal government, of a 14.2 acre parcel of Fairhaven West Island Company-owned land on the southern tip of West Island; now Town Beach. The northern boundary of this parcel later defined the southern boundary of West Island State Reservation.
1959	604	An Act to provide for a special capital outlay program for the Commonwealth.	Allowed \$90,000 for “the acquisition by transfer, purchase or by eminent domain” of “certain land in the town of Fairhaven known as Fort Phoenix and Fort Phoenix Beach.”
1962	373	An Act making appropriations for the Fiscal Year ending June thirtieth, Nineteen Hundred and Sixty-two, to provide for supplementing certain existing appropriations and for certain new activities and projects.	Appropriated \$10,000 for the maintenance of “Fort Phoenix Beach.”
1962	637	An Act directing the Department of Public Works to provide recreational facilities at Fort Phoenix Beach in the Town of Fairhaven.	Authorized and directed the DPW’s Division of Waterways to “provide recreational facilities at Fort Phoenix Beach, and areas immediately adjacent thereto.” This Act also allowed the sale of bonds, “not exceeding in aggregate the sum of \$250,000” to fund these facilities.
1962	792	An Act relative to the terms of certain bonds and notes to be issued by the Commonwealth.	This Act identifies that bonds issued under Chapter 637 of the Acts of 1962 “shall be issued for maximum terms of thirty years and shall be payable not earlier than July first, 1963, nor later than June thirtieth, 1993.”
1963	837	An Act in addition to the general appropriations to supplement certain items contained therein, and for certain new activities and projects.	Appropriated \$1,050 “for the maintenance of Fort Phoenix Beach.”
1964	450	An Act providing additional funds to the Department of Public Works to cover the cost of providing recreational facilities at Fort Phoenix Beach in the Town of Fairhaven.	Amended Chapter 637 of the Acts of 1962 to increase the bond cap to \$350,000.
1964	543	An Act providing for the Commonwealth’s participation in co-operative federal-state navigation, beach erosion control and hurricane barrier projects.	Authorized the Department of Public Works, subject to appropriation, to pay the Secretary of the Army for a variety of coastal projects, including an erosion control project at Fort Phoenix Beach.
1964	705	An Act relative to certain bonds and notes to be issued by the Commonwealth.	This Act specified that bonds issued under Chapter 450 of the Acts of 1964 were to have a maximum term of 30 years and be payable no later than June thirtieth, 1993.

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Appendix G. Acts of the Massachusetts Legislature that Directly Address the Fort Phoenix Planning Unit. (Continued)

Year	Chapter	Title	Comments
1966	391	An Act making appropriations for the Fiscal Year ending June thirtieth, Nineteen Hundred and Sixty-six, to provide for supplementing certain existing appropriations and for certain new activities and projects.	Appropriated \$13,050 “for the maintenance of Fort Phoenix Beach.”
1966	686	An Act increasing the amount which may be borrowed to cover the cost of providing recreational facilities at Fort Phoenix Beach in the Town of Fairhaven.	Amended Chapter 637 of the Acts of 1962 to exclude “the construction or erection of a swimming pool” from facilities to be constructed at Fort Phoenix. “Said Chapter 637 is hereby further amended” to reflect Chapters 430 and 705 of the Acts of 1964.
1968	501	An Act transferring certain beaches in the Division of Waterways in the Department of Public Works and certain recreational facilities in said department to the Division of Forests and Parks in the Department of Natural Resources.	This Act transferred the “management, supervision, control and maintenance of all beaches and beach reservations under the control of the Division of Waterways,” including Fort Phoenix Beach, to the Division of Forests and Parks in the Department of Natural Resources.
1969	452	An Act making appropriations for the Fiscal Year Nineteen Hundred and Seventy, for the maintenance of the departments, boards, commissions, institutions and certain activities of the Commonwealth, for interest, sinking fund and serial bond requirements and for certain permanent improvements	Appropriated \$27,375 “for the maintenance of Fort Phoenix Beach.”
1969	811	An Act in addition to the General Appropriation Act making appropriations to supplement certain items contained therein, and for certain new activities and projects.	Appropriated \$13,000 “for the maintenance of Fort Phoenix Beach.”
1970	480	An Act making appropriations for the Fiscal Year Nineteen Hundred and Seventy-one, for the maintenance of the departments, boards, commissions, institutions and certain activities of the Commonwealth, for interest, sinking fund and serial bond requirements and for certain permanent improvements	Appropriated \$47,918 “for the maintenance of Fort Phoenix Beach.”
1971	719	An Act making appropriations for the Fiscal Year Nineteen Hundred and Seventy-two, for the maintenance of the departments, boards, commissions, institutions and certain activities of the Commonwealth, for interest, sinking fund and serial bond requirements and for certain permanent improvements	Appropriated \$46,890 “for the maintenance of Fort Phoenix Beach.”
1972	514	An Act making appropriations for the Fiscal Year Nineteen Hundred and Seventy-three, for the maintenance of the departments, boards, commissions, institutions and certain activities of the Commonwealth, for interest, sinking fund and serial bond requirements and for certain permanent improvements	Appropriated \$53,675 “for the maintenance of Fort Phoenix Beach.”

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Appendix G. Acts of the Massachusetts Legislature that Directly Address the Fort Phoenix Planning Unit. (Continued)

Year	Chapter	Title	Comments
1973	466	An Act making appropriations for the Fiscal Year Nineteen Hundred and Seventy-four, for the maintenance of the departments, boards, commissions, institutions and certain activities of the Commonwealth, for interest, sinking fund and serial bond requirements and for certain permanent improvements	Appropriated \$57,247 “for the maintenance of Fort Phoenix Beach.”
1974	431	An Act making appropriations for the Fiscal Year Nineteen Hundred and Seventy-five, for the maintenance of the departments, boards, commissions, institutions and certain activities of the Commonwealth, for interest, sinking fund and serial bond requirements and for certain permanent improvements	Appropriated \$55,105 “for the maintenance of Fort Phoenix Beach.”
1975	684	An Act making appropriations for the Fiscal Year Nineteen Hundred and Seventy-six, for the maintenance of the departments, boards, commissions, institutions and certain activities of the Commonwealth, for interest, sinking fund and serial bond requirements and for certain permanent improvements and increasing certain taxes to provide the means for defraying such appropriations.	Appropriated \$53,127 “for the maintenance of Fort Phoenix Beach.”
1976	283	An Act making appropriations for the Fiscal Year Nineteen Hundred and Seventy-seven, for the maintenance of the departments, boards, commissions, institutions and certain activities of the Commonwealth, for interest, sinking fund and serial bond requirements and for certain permanent improvements	Appropriated \$53,127 “for the maintenance of Fort Phoenix Beach.”
1977	363A	An Act making appropriations for the Fiscal Year Nineteen Hundred and Seventy-eight, for the maintenance of the departments, boards, commissions, institutions and certain activities of the Commonwealth, for interest, sinking fund and serial bond requirements and for certain permanent improvements	Appropriated \$58,926 “for the maintenance of Fort Phoenix Beach.”
1978	367	An Act making appropriations for the Fiscal Year Nineteen Hundred and Seventy-nine, for the maintenance of the departments, boards, commissions, institutions and certain activities of the Commonwealth, for interest, sinking fund and serial bond requirements and for certain permanent improvements	Appropriated \$66,700 “for the maintenance of Fort Phoenix Beach.”
1986	279	An Act making appropriations for the fiscal year ending June the thirtieth, nineteen hundred and eighty-six to provide for supplementing certain existing appropriations and for certain other activities and projects.	Appropriated \$200,000 for “reconstruction and repairs” at Fort Phoenix Beach State Reservation.

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Appendix G. Acts of the Massachusetts Legislature that Directly Address the Fort Phoenix Planning Unit. (Continued)

Year	Chapter	Title	Comments
1995	259	An Act authorizing the Division of Capital Planning and Operations to grant certain title, easements and right of way in certain parcels of land in the Town of Fairhaven.	Conveyed title to land and easements and a right of way in West Island State Reservation to the Town of Fairhaven for sewage treatment. Title in fee simple was transferred on approximately 4.991 acres for use as an effluent disposal area. Two easements were granted. The first for an 18.101 acre parcel for installing, maintaining, repairing, replacing, and operating water quality monitoring wells. The second easement, approximately 0.51 acres, for a right of way providing access and egress to the parcel transferred in title.
1999	55	An Act making certain supplemental appropriations for Fiscal Year 1999 and relative to certain capital spending and bonded debt of the Commonwealth	Appropriated “not less than \$125,000 ... for recreation facility renovations at Fort Phoenix State Park.”
2006	122	An Act making appropriations for the Fiscal Year 2006 to provide for supplementing certain existing, appropriations and for certain other activities and projects	Allowed “that \$250,000 shall be expended for capital improvements and renovations for the state park at Fort Phoenix in the Town of Fairhaven, including \$40,000 for preservation of and structural repairs to the fortification, gunpowder magazine and retaining walls of Fort Phoenix.
2002	236	An Act providing for the preservation and improvement of the environmental assets of the Commonwealth	Made available “\$200,000 ... for improvements at Fort Phoenix State Reservation.”
2008	312	An Act providing for the preservation and improvement of land, parks, and clean energy in the Commonwealth	“Not less than \$300,000 shall be expended at Fort Phoenix State Reservation.”

Appendix H. Stewardship Recommendations Contained in Nasketucket Bay State Reservation: Ecological Inventory and Stewardship Recommendations (Epsilon Associates, Inc. 2000).

Restoration and Monitoring of Recently Disturbed Areas. “Extensive clearing, grubbing, and grading for the primary access road and associated drainage system for the proposed subdivision have resulted in significant scars to the landscape, including the abandonment of stockpiled loam, stumps, subsoils and trap rock, and the introduction of stormwater detention basins adjacent to the proposed primary access road for the subdivision.”

“This subsection identifies and quantifies the extent of areas that have been impacted, the volume of material required to restore excavated areas to previous grades, the volume of materials in various stockpiles, opportunities to utilize disturbed areas for recreational or habitat enhancement purposes, recommended revegetation strategies, and prioritization of proposed restoration activities.”

1. Stabilization of the Entrance Roadway. Stake off the area of concern immediately. Employ a civil engineer to design a permanent solution for stabilizing the roadway. This work should be conducted as soon as possible to prevent a public hazard.
2. Earthwork. Reestablish grades to approximate the pre-development grades. Spread loam and top soil to reestablish the seed bank and encourage natural revegetation. Incorporate a portion of the development road into the NBSR trail system.
3. Road Corridor Vegetation Restoration. Restrict use of two parts of the roadway corridor – (1) from the entrance to the eastern side of the drumlin field, and (2) from the southern side of the drumlin field to the end of the cleared roadway – in order to allow for natural reforestation. Expand the existing field habitat by maintaining grass and field over the portions of the roadway that pass by the existing field. Consider options for establishing small areas of early successional habitat in a transitional area between the future forest and future field and discuss viability of this option with the MA Division of Fisheries and Wildlife. Regularly monitor areas of regrowth for invasive species and remove all species by hand before plants go to seed.
4. Stormwater Detention Basins. Keep the detention basins (rather than filling them to reestablish pre-development conditions) because they provide habitat for amphibians and reptiles. The sides of the basins could be reduced, however, the existing slopes and berms do not represent an impediment to wildlife use, so regarding is not required. Drainage structures and riprap should be removed from the ponds. Active revegetation on the property should be concentrated around the basins in order to stabilize the disturbed slopes and augment wildlife use. Selectively place some stockpiled stumps in the pools to provide habitat structure.

The plan identified the following sequence for proposed restoration activities:

- Bring in geotextile material or trap rock to fill to (sic) stabilize a hazardous low point in the access roadway between the entranceway and the drumlin field.
- Construct barriers to off-road vehicle access
- Remove the restrictive culvert in the salt marsh to reestablish tidal flow to the southern marsh and beat back phragmites.
- Reestablish grades on the roadway corridor to allow for forest regeneration. Stockpile areas need to be moved before they kill adjacent trees whose roots have been buried.
- Spread seed mix and plant shrubs and saplings around the detention ponds during seasonally wet periods, most optimal in spring.
- Remove the horse barn and barbed wire surrounding the back pasture.
- Remove invasive vegetation around the Souza foundation to expose historic structure.

Appendix H. Stewardship Recommendations Contained in Nasketucket Bay State Reservation: Ecological Inventory and Stewardship Recommendations (Epsilon Associates, Inc. 2000). (Continued)

Habitat Management and Monitoring. While existing habitats have been identified and their values described, nature is dynamic and habitats change, which may affect the habitat quality and/or diversity. Some changes will improve habitats while others will degrade it. DEM should consider some of the following strategies to sustain and enhance species quality and diversity at Nasketucket Bay State Reservation.

1. Management of the Drumlin Field. DEM should mow the drumlin field annually in late summer to keep back woody vegetation and preserve the grassland habitat, while protecting breeding conditions for grassland bird species, most specifically bobolink. In restoring the development road, the area of the road adjacent to the drumlin field should be restored as grassland so that the area of grassland habitat is expanded. DEM may also consider expanding some of the habitat to the south and west of the development road by clearing a small area of forest. Conversion of a small patch of this area to grassland may provide greater habitat benefits than are present in the area today. An ancillary benefit may be an expanded view of Buzzards Bay from the drumlin hill.
2. Salt Marsh Restoration. It is recommended that DEM act to remove the culvert and much of the adjacent fill to allow flood tides to access the upper marsh. Following the removal of fill, access across the marsh and over the ditch can be provided via a small wooden bridge.
3. Monitoring of Restoration Within Recently Degraded Areas. The length of the roadway should be inspected on a weekly basis to investigate potential unauthorized public use that may be adversely affecting the restoration areas. These inspections should also include monthly reporting of the vigor of new vegetative growth. Any opportunistic species found to be growing in the restoration, species such as poison ivy and invasive plant species, should be uprooted and discarded off property, or otherwise deterred.
4. Management of Fire Hazards. Due to its high fire potential and proximity to residential areas, focus attention to reduce fire hazards in the mixed oak area along the eastern property boundary through mechanical clearing of the understory. Consider beneficial fire management of the drumlin field to prevent successional woody growth and to encourage fire-induced germination of uncommon herbaceous species.
5. Invasive Species Management. Focus removal and control of invasive species along the western edge of the drumlin field through mechanical clearing. Prevent the spread of species in the drumlin field through seasonal mowing of the field and maintenance of the western field edge. Inspect and remove invasive species that have spread into forested areas to the south of the drumlin field and north of the back pasture. Vigilantly monitor restoration areas for establishment of invasive species and remove all specimens identified.
6. General Wildlife Habitat Management. Erect bird boxes in the drumlin field and an osprey platform in the salt marsh. Consult with MA Division of Fisheries and Wildlife and local bird clubs about these and other habitat enhancement opportunities.
7. Field Research. If budgets allow, implement a simple radio telemetry program to track movements of an individual turtle on the property. DEM staff, other state agencies, graduate students, or other experts in the field could implement this program.

Appendix H. Stewardship Recommendations Contained in Nasketucket Bay State Reservation: Ecological Inventory and Stewardship Recommendations (Epsilon Associates, Inc. 2000). (Continued)

Trail System. The proposed trail system will take advantage of several existing trails on the property. The development road and the old cart path to the east form the backbone of the proposed trail system. Names for each of the paths have been proposed in order to facilitate identification and discussion.

1. Bridle Path Trail. The portion of the cleared roadway swath intended for restoration must be isolated from public recreational use to allow natural revegetation to succeed. It is recommended that the public be directed to a small strip of land along the left side of the current roadway from the entrance parking lot. Some physical barriers must be erected to prevent the public from regularly walking across most of the cleared area and inhibiting forest growth.
2. Holly Trail. Other than removal of some vestiges of past development such as survey tape and stakes, the trail is suitable for immediate use.
3. Salt Marsh Trail. This trail runs about 0.2 miles and is well maintained and needs little maintenance other than the removal of some boards and debris. The trail will proceed over the salt marsh across a small wooden bridge to be built following the removal of the culvert and restoration of the eastern side of the marsh.
4. Swamp Trail. The path running from the parking lot to the old eastern cart path should be restored. Prior to full public access to this path, however, the degree of wetness of the path in the red maple swamp should be investigated during spring time conditions.
5. Shore Trail. The remains of a trail that runs the entire length of the shoreline. This trail should be cleared for better visibility and reused as the Shore Trail.
6. Maritime Trail. One new trail, the Maritime Trail, is proposed to provide a third point of access to the shoreline.
7. Parking and Signage. It is suggested that given the passive recreation nature of this reservation, the signage be provided in a compact area that is easily recognizable, yet is consistent with the surrounding landscape. Trail signage should be placed at the intersection between trails and colors for the signs used that make them recognizable while having them consistent with the surrounding landscape.

Interpretive Opportunities. The following ... serves to build upon the interpretive programming that has already been implemented at NBSR, and provides recommendations for several areas of interest, which may be elaborated upon as topics for future interpretive programming.

1. Restoration of the Souza Foundation. We recommend that DEM consider restoring the foundation and fireplaces for public viewing and provide an interpretive exhibit to describe past agricultural use of the property. We strongly recommend that DEM demolish the horse barn. Barbed wire should be removed to prevent injury should visitors attempt to explore the strip of forest along the northern property line. Remnants of electric fence should be removed for aesthetic reasons. Other remnants of past use of the property (e.g., boards, trash) are visible and should be removed if possible.
2. Forest Revegetation. It is recommended that an area be selected where the public can best observe the extent of the forest scar and provide an interpretive exhibit.
3. American Holly Grove. A plaque should be established in this area which talks about the ecological character of holly as a sand plain indicator and the historical importance of holly as a substitute for ivory ... and its use for cabinet work and turnery.
4. Vernal Pool. A plaque should be erected near the pool that describes the uniqueness of vernal pools and the species that breed there.
5. Coastal Environment/Salt Marsh Restoration. An interpretive exhibit should be established that discusses the characteristics of the coastal resources of the property.
6. Maritime Forest. With the likely development of a small spur trail down to the shore just to the west of the forest ... this would be a likely location of an interpretive exhibit discussing the formation of the maritime forest.

Appendix I. Management Strategies Included in the Previous Management Plan for Nasketucket Bay State Reservation (DEM 2000).

Recommended Short-term Strategies:

1. Filling public hazard areas. Purchase gravel and fill in the detention basin near the entrance, plus the 500-foot “quicksand” portion of the road corridor. *[2012 Status: Completed.]*
2. Replacing hay bale siltation barrier. Purchase and install hay bales and stakes along much of the cleared corridor, replacing the deteriorated existing line to prevent potential run-off prior to restoration, and to comply with the conservation commission’s enforcement order. *[2012 Status: Completed.]*
3. Addressing stump dump. Contract for the chipping of 3,500 cubic yard stump dump left by the previous owners in the field. *[2012 Status: Completed.]*
4. Removing small barn. Demolish and remove the 1960s-era small horse barn, which is in decrepit condition and is unsafe for the public. Ensure that the foundation, which appears connected with the 19th century farmhouse foundation, is not altered. *[2012 Status: Completed.]*
5. Design and permitting. Determine scope of permitting necessary with conservation commission. Contract for the engineering, landscape architecture, and permitting consultant services for base plans, design plans to support permit applications and construction bid documents, coordination of permit applications to the Mattapoissett Conservation Commission and Army Corps of Engineers, detailed cost estimates, and design plans for the entrance. *[2012 Status: Completed.]*
6. Restoring cleared road corridor and detention basins. Spread the stockpiles of loam back onto the cleared corridor, and remove any excess. Grade down the berms that were built up around the detention ponds, while retaining at least one as a fire pond and another for habitat purposes. Pull out the concrete headwall structures, and some of the riprap lining, as necessary. Once loam has been spread, DEM should consider hydroseeding the corridor to hold soil, and more intensive revegetation around the restored detention ponds. *[2012 Status: Completed.]*
7. Establishing main gravel cart path. Surface the main trail corridor with densely graded gravel, suitable for universal access, from the entrance to the intersection with the “Holly Trail” path. Also place gravel on the main spur to the shoreline. The cart path should be 10 feet in width in order to accommodate emergency vehicles, and the corridor should be kept clear 5 additional feet on either side. Symbolic fencing should be installed to keep visitors away from the rest of the corridor and to allow for natural revegetation. *[2012 Status: Completed.]*
8. Cultural management plan. Prepare a cultural resource management plan through the Office of Historic Resources for the property. *[2012 Status: No Action.]*
9. Restoring salt marsh. Work with EOE’s Wetlands Banking and Restoration Program to restore the approximately 5.5 acres of saltmarsh restricted by a culvert at the main beach access point. Replace the culvert with a larger one and/or remove sufficient fill. Also work with the Plymouth County Mosquito Control Project (PCMCP) to clear out the existing mosquito ditches, and conduct a mosquito population and water quality study to make recommendations for marsh restoration options and mosquito breeding control, e.g., widening pools in the ditches to support larvae-eating fish. Construct a boardwalk and observation platform over the ditch that will promote universal access. *[2012 Status: Partially completed.]*
10. Establish parking area trailhead. After the design process, install a gravel parking area near the current entrance of the town road for approximately 30 cars (with room for expansion to no more than 50). Bus parking should be accommodated as well. *[2012 Status: Completed.]*
11. Foundation clearing. Clear the invasive vines choking the old Souza foundation, perhaps with volunteer assistance, and perform periodic vegetation management in, on, and around the structure. Vegetation should be cut at grade (or eliminated with approved herbicides) and removed off-site to discourage the plants from colonizing the area again. Grubbing or otherwise removing root systems should not be undertaken at historic sites. Subsequently, DEM should promote appropriate interpretation of this structure. *[2012 Status: No Action.]*

Appendix I. Management Strategies Included in the Previous Management Plan for Nasketucket Bay State Reservation (DEM 2000). (Continued)

Recommended Longer-term Strategies:

1. Revegetation monitoring. Once the cleared corridor has been regarded, establish a structure for regular (e.g., weekly) monitoring for invasive species during the growing season, and removal of all such species by hand. [2012 Status: No Action.]
2. Signage. Establish road signs on Route 6 from both the east and west, especially junctions with Route 240 in Fairhaven and North Street in Mattapoisett. Establish directional signs within the park's trail system. Establish interpretive signage at the trailhead, and points of interest, e.g., the farmhouse foundation, vernal pool, exemplary holly grove, and maritime forest. [2012 Status: Completed.]
3. Field restoration and maintenance. Once the stockpiles of loam and other materials have been removed, the drumlin field should be mowed to keep back woody vegetation, or alternative treatments considered to reach the same goal. The barbed wire and remnants of electric and metal fencing should be removed from the hedgerow delineating the back pasture and the main field, but remnants of wooden fencing retained. The portion of the cleared corridor to the south of the field should be incorporated into the meadow, and DEM should consider clearing some of the adjacent woodland on the southern edge which shows a number of invasive species. Brush hogging the edges, especially on the northern end of the field, should help keep back invasives as well. The primary objective is to maintain scenic landscapes, and secondarily to provide some additional habitat. An additional potential secondary objective is establishing an agricultural land use. If the field is to be maintained in the long-term by mowing, it should be mown annually on a late-summer schedule to allow for potential grassland bird habitat. Agricultural options for maintaining the field should also be explored, such as the grazing of livestock. [2012 Status: Partially Completed.]
4. Trail system. The trail system will take advantage of existing trails on the property. The surface for the property's trails other than the main gravel cart-path should remain natural. The southern portions of the "Holly Trail" loop should be cleared and maintained as a wide cart-path, as opposed to a footpath, and the erosion at the short coastal bluff should be controlled. The inland "Shore Trail" that parallels the shoreline should be cleared and maintained as a simple foot-path, which will provide an alternative to walking the beach in case of inclement weather. Other informal trails connecting off-site to houses, etc., should be blocked off. Other trail segments should be considered, as well, such as re-establishing the "Swamp Trail" through the forested wetland, as well as a spur trail from the center of the beach. [2012 Status: Partially completed.]
5. Toilet facility. Install a Clivus composting unit at the trailhead for use by visitors. [2012 Status: No Action.]
6. Graffiti. Remove graffiti and monitor boulders at shoreline. [2012 Status: Completed.]
7. Bird boxes. Install bird boxes along the periphery of the drumlin field to provide nesting opportunities for bluebirds, swallows, wrens, etc. Consider installing an osprey platform at the shoreline. [2012 Status: No Action.]
8. Staffing. Park staff exclusive to NBSR and located on-site should be pursued for this currently unstaffed park. Such staffing is needed to provide increased levels of monitoring, maintenance, and interpretation. [2012 Status: Completed.]
9. Friends group. Encourage establishment of a local friends group to aid with appropriate stewardship tasks such as vegetation management, guided walks, fund raising, monitoring, trail maintenance, etc. [2012 Status: Unknown.]

Appendix J. Habitat Management Plan (HMP) for Cultural Grasslands: Nasketucket Bay State Reservation, Mattapoisett, Massachusetts.

Approved by MassWildlife; February 22, 2012.

1. PURPOSE

The majority of Nasketucket Bay State Reservation (97.2%) has been designated Priority Habitat under the Massachusetts Endangered Species Act (MESA; 321 CMR 10.00). This designation is due to the presence of a population of eastern box turtles, a Species of Special Concern. Under MESA, all state agencies must “review, evaluate and determine the impact on Endangered, Threatened and Special Concern species and their habitats of all works, projects or activities conducted by them; and use all practicable means and measures to avoid or minimize damage to such species or their habitats.”

The Massachusetts Department of Conservation and Recreation (DCR) currently mows the reservation’s cultural grasslands on an annual basis. This Habitat Management Plan (HMP) specifies revised protocols that allow for the cutting of cultural grasslands while avoiding or minimizing “damage to” eastern box turtles and their habitats. Secondly, these protocols will increase the protection of non-state-listed species and cultural resources that occur in these grasslands.

2. LAND USE HISTORY

For millennia Native Americans, and later European colonists, were drawn to the area’s coastal resources and protected waters. In the 19th and 20th centuries, the land was used for agricultural purposes. Stone walls and the foundation of a 19th century farmhouse attest to the property’s agricultural past.

In the late 1980s multiple development projects were proposed for what is now Nasketucket Bay State Reservation. A one-mile-long roadway, drainage systems, and detention basins were constructed in preparation for a residential community. Stumps and soils associated with land clearing were stockpiled in a field on site; the current location of the reservation’s main cultural grassland. In 1999 The Commonwealth of Massachusetts acquired 213 acres through a friendly taking. Initial management efforts included remediating development impacts and establishing infrastructure for passive recreation.

The reservation’s cultural grasslands are the product of historic agricultural activities, land clearing in the 1990s, and restoration activities conducted by the Department of Environmental Management following the state’s acquisition of the property.

3. EXISTING CONDITIONS

There are two cultural grasslands on the property: the Bridle Path Trail Corridor, and the Historic Souza Home Site Landscape.

Bridle Path Trail Corridor

This grassland consists of the shoulders of the reservation’s main trail. It is approximately 20 feet wide (i.e., a 10-foot-wide path with two 5-foot-wide shoulders) and serves multiple functions including recreation, access for park operations and emergency vehicles, and fire control. The Bridle Path Trail follows the centerline of the road bed constructed in the 1990s for the planned housing development (Figure J.1). It is approximately one-mile long, and ranges in width from 45 to 100 feet. Shrubs and saplings extend from the shoulders of the grassland to the adjacent tree-line.

Following acquisition by the state, compacted gravel was placed along the length of the road bed and culverts were installed at select locations to restore pre-construction hydrology. The road bed was then covered in topsoil that had been stored on site, and revegetated using a mixture of native and non-native grasses, forbs, and trees.

This corridor is currently mown every August to keep the road/trail open and to maintain herbaceous vegetation along the immediate road shoulder (approximately 5 feet). The areal extent of this grassland is estimated at 2.4 acres. The portion of the corridor between the road shoulder and tree line is being allowed to fill in with herbaceous and woody vegetation. White pine, autumn olive, and an unidentified willow are now common.

Historic Souza Home Site Landscape

This grassland totals 8.06 acres in area. It is comprised of three sections, the north (1.02 acres), east (3.76 acres), and west (3.28 acres). (See figure J.1)

North Section. This section is the location of the former Souza Home Site. Nearly half (0.48 acres, 47.1%) is overgrown with trees and shrubs.

This section was largely undisturbed by construction activities in the 1990s. A non-historic barn was demolished and removed from the site by the state shortly after the property was acquired. Plants associated with the home site (e.g., blackberries, apples, ornamental flowers) occur around the foundation. Invasive species, including Asiatic bittersweet, autumn olive, and multiflora rose are common; Japanese barberry is present in low numbers.

Evidence of past land use is readily observable, including:

- A wooden post and wire fence that separates this section from the rest of the grassland to the south
- A stone foundation, largely intact.
- The reservation's only certified vernal pool, which is a depression excavated or modified for agricultural purposes.
- Metal and wooden debris from the former barn.

East Section. The section is largely bordered by trails. (See figure J.1). Approximately 1.34 acres (35.6%) have been lost to shrub encroachment.

Prior to acquisition by the state, this section was used to stockpile topsoil and stumps cleared from the roadway and associated drainage basins. Following acquisition, the stumps were removed, the top soil spread, and the area planted with a mixture of native and non-native grasses and forbs. Common plants include little bluestem, goldenrods, and clovers; all of which likely originated from the restoration planting. White pine and eastern red cedar are spreading into this section of the field from its northeastern border. Red maple, Queen Anne's lace, milkweed, poison ivy, cherries, Allegheny raspberry, and Asiatic bittersweet are also present.

West Section. The section is similar to the East Section in land use history and vegetation. It is

bordered on the east by a hiking trail (i.e., Meadow Trail) and on the north by a fence line. Approximately 0.92 acres (28.0%) have been lost to shrub encroachment. In addition to those plant species present in the East Section, the West Section also has developing stands of quaking aspen and winged sumac. Also present are small but expanding patches of common reed and spotted knapweed.

All sections of this grassland are currently mown every August, in association with the mowing of the Bridle Path Trail. Encroachment by trees and shrubs since 2001 has resulted in successively less of this grassland being mown, which in turn promoted additional shrub encroachment.

4. GRASSLAND MANAGEMENT

Grassland management at Nasketucket Bay State Reservation will be conducted in a manner that protects eastern box turtles and their habitats while preventing the further incursion of woody vegetation.

Under this HMP the Bridle Path Trail and Souza Home Site grasslands will be managed similarly. Differences in management objectives and the sizes and shapes of these grasslands necessitate differences in management protocols.

Bridle Path Trail Corridor

The following protocol will be used to cut the cultural grassland along the Bridle Path Trail Corridor.

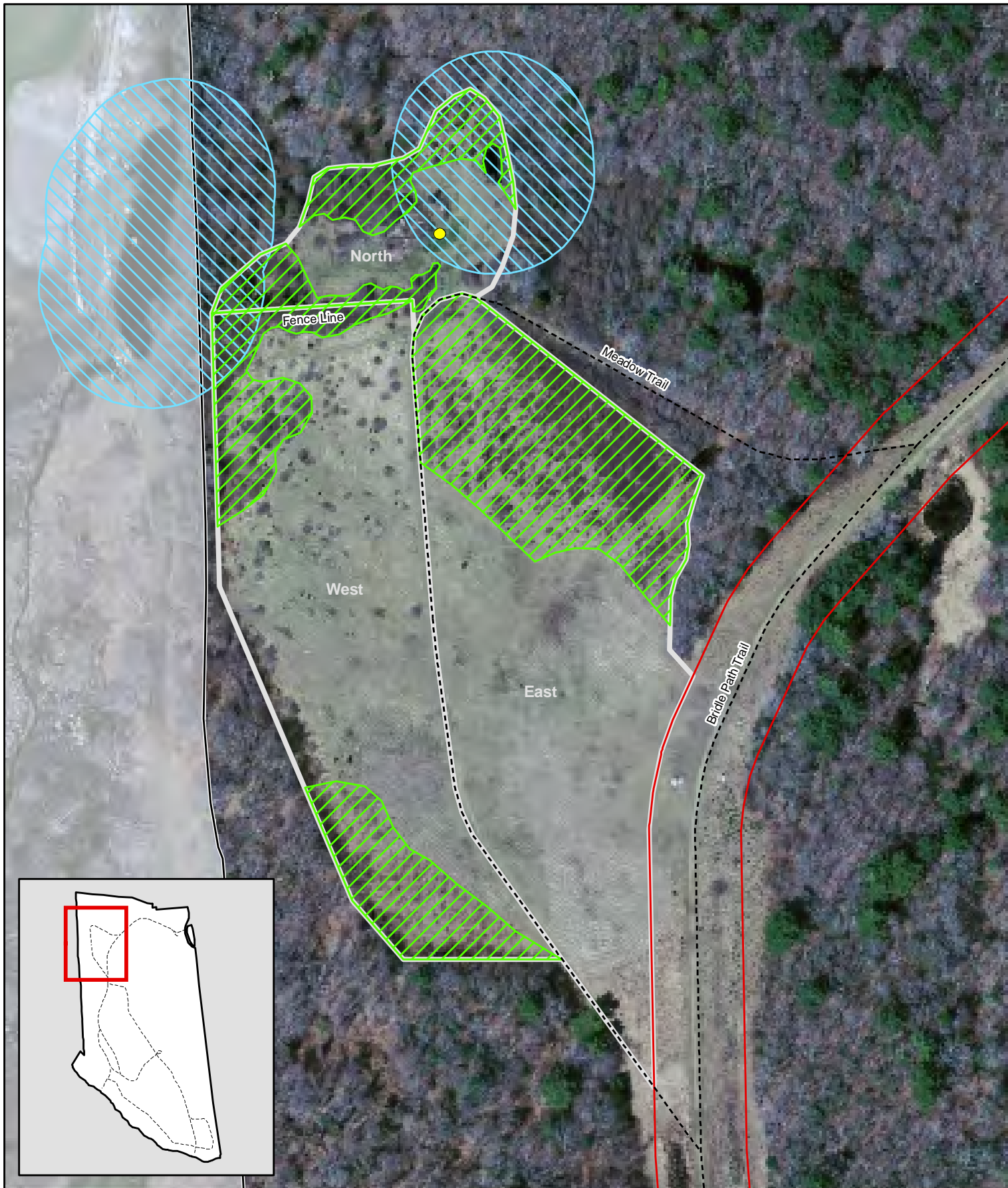
Objective. The purpose of mowing this grassland is maintaining a road corridor for vehicle access and fire control (i.e. fire break maintenance).

Timing. Mowing will be avoided between May 15th and September 15th (NHESP 2009).

Limited hand cutting of woody vegetation may be needed to maintain the herbaceous shoulder. Such cutting may occur at any time of year.

Mowing Rotation. The Bridle Path Trail will be mown annually. This is necessary to ensure emergency vehicle access and to maintain an effective fire break.

Percent Mowed. The entire road bed and both herbaceous road shoulders will be mown each year.



- Souza Home Site
- Trail
- Cultural Grassland
- 50' Trail Buffer
- 100' Vernal Pool Buffer
- Shrub Encroachment
- Nasketucket Bay State Reservation

Nasketucket Bay State Reservation

J.1. Habitat Management Plan

0 50 100 Feet

Geographic data supplied by the Office of Geographic Information (MassGIS) and DCR GIS.

DCR GIS May-12

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Mower Style. DCR will mow using a tractor with a rear-mounted mowing deck.

Mowing Height. The cutting deck will be set to a height of at least seven (7) inches above the ground.

Directionality. Mowing will follow the road bed. The narrow width and linear configuration of this grassland make a large circular pattern (e.g., NHESP 2009) impossible.

Mower Speed. Mowing will take place at slow speeds (e.g., less than 8 miles per hour) (NHESP 2009, Black et al. 2007).

Historic Souza Home Site Landscape

Ideally, management of this grassland involves removal of all encroaching trees and shrubs in order to restore the grassland to its original physical extent (i.e., 8.06 acres). However, limited staffing and funds make such a restoration unlikely for the foreseeable future. Because of this, management protocols are presented for two scenarios: maintenance, and restoration. The maintenance scenario assumes that no additional resources will be available to manage the Souza Home Site's cultural grassland. Under this scenario, only those portions of the grassland currently being mown will be mown in the future. The restoration scenario assumes that additional resources will be available to remove encroaching trees and shrubs and that, following restoration, the entire grassland will be mown. Both scenarios include vegetation management to preserve the historic integrity of the Souza Home Site.

Maintenance Protocol

Objective. The purpose of cutting this grassland is habitat maintenance for grassland plants and wildlife, and maintenance of the historic Souza Home Site landscape.

Timing. Mowing will be avoided between May 15th and September 15th (NHESP 2009).

Note: No mowing may occur in the Souza grassland between May 1st and September 15th.

See MassWildlife approval letter for details.

The hand cutting of vegetation may take place at any time of year. When possible, hand cutting will take place outside of the bird nesting season (approximately May through August). During the

bird nesting season, trees and shrubs containing nests will not be cut.

Mowing Rotation. Herbaceous portions of the Souza Home Site Landscape grassland will be mown annually. Such frequent mowing is required to reduce woody plant abundance and control the spread of invasive species.

Percent Mowed. At present, 5.32 acres (66.0%) are mowed annually. Under the Maintenance Protocol, the percent mowed will not exceed existing conditions. This level of mowing is considered necessary to stop the spread of woody vegetation. Under this scenario, uncut grassland habitat will be available among the field's other 2.74 acres.

Mower Style. DCR will perform mowing using a tractor with a rear-mounted mowing deck.

Mowing Height. The cutting deck will be set to a height of at least seven (7) inches above the ground.

Directionality. Mowing will begin in the center of the field, and use a back and forth approach. (NHESP 2009).

Mower Speed. Mowing will take place at slow speeds (e.g., less than 8 miles per hour) (NHESP 2009, Black et al. 2007).

Hand Cutting. Hand cutting of vegetation in and around the Souza foundation involves the use of hand tools (e.g., pruning shears, loppers, hand saws, weed wrench) or power tools (e.g., chain saws), as appropriate. The DCR's current policy limits the use of power tools to employees or contractors; volunteers and friends groups may not use power tools.

If needed, and as a last resort, herbicides may be used by a Licensed Pesticide Applicator to control invasive species that threaten the historic integrity of the foundation. In the event that a herbicide is used, it will be applied in a manner consistent with Massachusetts regulations and package labeling.

Hand cutting of vegetation will also be used to create a scenic vista along the stone wall that forms the western boundary of both the grassland and the reservation. This vista pruning is intended to reveal both the historic stone wall and the adjacent agricultural landscape, connecting visitors to the land's agricultural past.

Cut vegetation will be chipped and disposed of on site, or taken to a DEP-regulated composting site.

Restoration Protocol

Objective. The purpose of restoration is to create a contiguous 8.06 acres of herbaceous vegetation for grassland plants and wildlife, and the maintenance of the historic Souza Home Site Landscape. This is the physical extent of this grassland at the time the property was acquired by the Commonwealth.

Note: Because grassland restoration involves the cutting of vegetation within a vernal pool buffer, the proposed action will be submitted to the Mattapoiet Conservation Commission for review and approval prior to the clearing of trees and shrubs from the North Section of the grassland. If permission to manage those portions of the grassland within the vernal pool buffer cannot be obtained, only those portions of the North Section outside of the buffer will be mown and grassland habitat within the buffer will be lost to plant succession.

Timing. Mowing will be avoided between May 15th and September 15th (NHESP 2009).

Mowing Rotation. Following restoration, mowing will take place on a two-year rotation. The North and West sections of the grassland will be mown one year, and the East Section the following year.

Percent Mowed. The proposed post-restoration rotation will cut approximately 53% of the grassland in year one, and 47% in year two.

Mower Style. DCR will perform mowing using a tractor with a rear-mounted mowing deck.

Mowing Height. The cutting deck will be set to a height of at least seven (7) inches above the ground.

Directionality. Mowing will begin in the center of the field, using a back and forth approach.

Mower Speed. Mowing will take place at slow speeds (e.g., less than 8 miles per hour) (NHESP 2009, Black et al. 2007).

Hand Cutting. Hand cutting of vegetation will be used to: remove trees and shrubs from the grassland, manage vegetation in and around the Souza foundation, remove woody vegetation from along the fence line, and create a scenic vista along the

stone wall that forms the western boundary of both the grassland and the reservation.

Hand cutting involves the use of hand tools (e.g., pruning shears, loppers, hand saws, weed wrench) or power tools (e.g., chain saws), as appropriate. The DCR's current policy limits the use of power tools to employees or contractors; volunteers and friends groups may not use power tools. However, volunteers will be used to the greatest extent possible to restore the grassland.

The hand cutting of vegetation may take place at any time of year. When possible, hand cutting will take place outside of the bird nesting season (approximately May through August). During the bird nesting season, trees and shrubs containing nests will not be cut.

Cut vegetation will be chipped and disposed of on site, or taken to a DEP-regulated composting site.

Invasive plants will be primarily removed through mechanical means, such as hand pulling and cutting, as appropriate for each species. If a species cannot be controlled effectively through mechanical means, herbicides may be used. In the event that an herbicide is used, it will be applied by a Licensed Pesticide Applicator in a manner consistent with Massachusetts regulations and package labeling. The timing of herbicide applications will be determined by the biology of the plant being controlled, so as to maximize efficacy.

Plant material generated by the control of invasive species will be handled two ways. Those species that do not spread vegetatively from cuttings (e.g., multiflora rose, Japanese barberry) will be disposed of in the manner described above for non-invasive plants. Species with the potential to spread vegetatively from cuttings will be accumulated on site and disposed of in a burn conducted by DCR's Bureau of Forest Fire Control during winter months.

5. REFERENCES CITED

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Commonwealth of Massachusetts

Division of Fisheries & Wildlife

Wayne F. MacCallum, *Director*

February 22, 2012

Paul Cavanagh, Resource Management Planner
Bureau of Planning and Resource Protection
Department of Conservation and Recreation
Southeast Region Headquarters
P.O. Box 66
South Carver, 02366

RE: Project Location: Nasketucket Bay State Reservation, Mattapoisett
Project Description: Management of cultural grasslands
NHESP Tracking No.: 11-29241

Dear Mr. Cavanagh,

Thank you for submitting the Draft Habitat Management Plan for Nasketucket Bay State Reservation to the Natural Heritage and Endangered Species Program (NHESP) of the MA Division of Fisheries & Wildlife for review pursuant to the Massachusetts Endangered Species Act (MESA) (MGL c.131A) and its implementing regulations (321 CMR 10.00).

The NHESP hereby approves the submitted management plan, provided the following condition is met:

- No mowing shall occur **May 1 - September 15** of any year, at the Souza Site Grasslands.

The NHESP has the following recommendation:

- To encourage nesting bobolinks (not a State-listed species) DCR should consider adding an additional two weeks to the above mowing restriction timeline, thus starting on 15 April.

Therefore, the proposed activities are **exempt from MESA review** pursuant to 321 CMR 10.14 which states: "[t]he following Projects and Activities shall be exempt from the requirements of 321 CMR 10.18 through 10.23..."

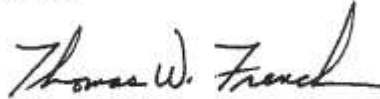
(15) The active management of State-listed Species habitat, including but not limited to mowing, cutting, burning, or pruning of vegetation, or removing exotic or invasive species, for the purpose of maintaining or enhancing the habitat for the benefit of rare species, provided that the management is carried out in accordance with a habitat management plan approved in writing by the Division"

Any changes to the proposed activities or any additional work beyond that described in the approved management plan may require a filing with the NHESP pursuant to MESA. If you have any questions about this letter, please contact Amy Coman-Hoenig, Endangered Species Review Assistant at 508-389-6364.

www.masswildlife.org

Division of Fisheries and Wildlife
Field Headquarters, One Rabbit Hill Road, Westborough, MA 01581 (508) 389-6300 Fax (508) 389-7890
An Agency of the Department of Fish and Game

Sincerely,

A handwritten signature in black ink that reads "Thomas W. French". The signature is written in a cursive style with a large, stylized 'T' and 'F'.

Thomas W. French, Ph.D.
Assistant Director

Appendix K. Management Issues and Goals Included in the Previous Management Plan for West Island State Reservation (DEM 1997).

Water Quality. The primary environmental issue on West Island is correcting the failing on-site septic systems which are polluting the island's ground water and adjoining coastal waters. The goal is to meet or exceed local, state, and federal wastewater disposal standards. Because only existing homes will be connected to the wastewater treatment system, any new construction must meet Title 5.

The DEM's responsibilities for achieving this goal were listed as follows:

1. Review wastewater monitoring reports provided by the town. *[2012 Status: No Action.]*
2. Periodically review town's compliance with TR-1 conditions. *[2012 Status: Ongoing.]*

Access. All citizens of the Commonwealth contributed to the purchase of the 338 acres under DEM's stewardship and they should have the ability to access this publicly-owned property on the island. The goal is to provide access to the DEM property consistent with low-intensity passive recreational use.

Present parking along the street is adequate however DEM will consider a parking lot near the Fir Street entrance to the park, in the future.

The DEM's responsibilities for achieving this goal were listed as follows:

1. Keep brush trimmed, grade if necessary and post signs along Fir Road (sic) near trail head to encourage parking on DEM side of road. *[2012 Status: Ongoing.]*
2. Oversee maintenance provided by volunteers on existing trails throughout the property. *[2012 Status: No Action.]*
3. Gradually improve abandoned trails. *[2012 Status: No Action.]*

Resource Protection. The varied beach, salt marsh and forested habitats and their respective wildlife ... were first protected by the purchase of the property for conservation. The goal is to protect resource areas: to monitor and protect wildlife and their habitat areas; and to regulate recreational uses in such a manner that the resource areas ... and wildlife habitats ... are maintained and protected.

The DEM's responsibilities for achieving this goal were listed as follows:

1. Work with the town, the Natural Heritage Program, the Massachusetts Audubon Society and other groups to protect rare or endangered habitats and species as appropriate. For example, DEM will continue to solicit help and cooperation from bird monitoring from staff at the Lloyd Center for the Environment. *[2012 Status: Ongoing.]*
2. In the event of rare species nesting, DEM will provide fencing to protect the nesting sites. *[2012 Status: Ongoing.]*
3. The DEM property has five small sections classified as "barrier beach." DEM will follow the guidelines in Appendix D (of the 1997 management plan). *[2012 Status: Ongoing.]*
4. Leave the forested area for wildlife habitat. Active forest management is not recommended due to low quality wood and the high wildlife habitat value. *[2012 Status: Ongoing.]*
5. Further inventory flora and fauna in conjunction with Natural Heritage Endangered Species Program and Lloyd Center. *[2012 Status: Ongoing.]*

Appendix K. Management Issues and Goals Included in the Previous Management Plan for West Island State Reservation (DEM 1997). (Continued)

Recreation and Environmental Education. Passive recreation is consistent with the property's intended uses and can be enhanced by environmental education. The goal is to provide a high quality, passive recreational experience, consistent with protecting the natural resources, while providing for environmental education, including a self-guided, interpretive trail system.

The DEM's responsibilities for achieving this goal were listed as follows:

1. Develop and request funding for a self-guided, interpretive trail ... incorporating views of some of the habitats within the property, which would be suitable for hiking or environmental education by individuals or school and other small groups. Signage and an informational kiosk, showing trails and explaining the ecology of the island and the partnership that resulted in the innovative wastewater disposal system will be developed in cooperation with the town. The West Island Property is not staffed, so all trails would be self-guided. Physical structures will be kept to a minimum, probably only the kiosk. Toilets and trash barrel will not be provided. *[2012 Status: Partially Completed.]*
2. Suggestions were made to place kiosk on the lawn of the Community Center Building to discourage vandalism. If association agrees to sign location, directions to the trail across the street will be included. *[2012 Status: No Action.]*
3. Brochures will not be provided initially but may be developed in the future. *[2012 Status: Partially Implemented.]*
4. Specific recreational uses: swimming - not regulated; boating – no ramps; hunting - allowed but target shooting is prohibited; fishing - allowed, off-road vehicle – not allowed; dogs – required to be on leash; camping and campfires - not permitted; and alcohol- not permitted . *[2012 Status: Ongoing.]*

Maintenance. Since vandalism has been a chronic problem on the island and there are (sic) no staff on site, the physical amenities will be kept to a minimum to make maintenance manageable and less costly. Staff from Fort Phoenix State Park (sic), located several miles away, do their best to maintain the trails and provide occasional surveillance.

Litter is problematic for both aesthetic and public safety reasons. Debris items on the shore come from both land-side or marine sources and can lead to wildlife entanglement or ingestion.

The goal is to provide adequate maintenance to keep the trails accessible, the property aesthetically pleasing, and to protect environmental resources and habitat, with existing limited staff and no new personnel.

The DEM's responsibilities for achieving this goal were listed as follows:

1. Maintain the property to the best of the ability of the existing staff, as has been done in the past. *[2012 Status: Ongoing.]*
2. Solicit volunteer groups to assist with trail maintenance. *[2012 Status: Unknown.]*
3. Explore the possibility of establishing a "Friends of West Island" group. *[2012 Status: Unknown.]*
4. Provide signage requiring users to take all trash out with them (Carry-in/Carry-out). *[2012 Status: No Action.]*
5. If time and budget allows, organize an annual park clean-up and coordinate with the "Coast Sweep" program at MCZM. *[2012 Status: No Action.]*
6. The beach area wrack line will not be cleaned or removed, as it provides a feeding area for plovers and terns. *[2012 Status: Ongoing.]*
7. Property supervisors will coordinate with response teams in the event of an oil spill which may or will affect the DEM property. *[2012 Status: Ongoing.]*
8. Train and deputize staff to allow them to issue citations for littering. *[2012 Status: No Action.]*

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