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Olmsted Center
for Landscape Preservation

Vegetation Management Recommendations for Fort Andrews

Peddocks Island
Hull, Massachusetts



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Boston Harbor Islands National & State Park

Peddocks Island

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Introduction

Recommendations

Vegetation Management Tasks

Prepared by:
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Olmsted Center for Landscape Preservation
Boston National Historical Park
Charlestown Navy Yard, Quarters C
Boston, MA 02129
www.nps.gov/oclp/

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Cover Photo: Aerial view of the East Head of Peddocks Island showing Fort Andrews buildings, Alex Maclean.

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Introduction

Located in Boston Harbor and in the Town of Hull within Norfolk County, Peddocks Island covers 210 acres and consists of five drumloid hills (Figure 1). Peddocks is one of over thirty islands within the Boston Harbor Islands National Recreation Area and is owned and managed by the Massachusetts Department of Conservation and Recreation (DCR). The eastern two drumlins, referred to as East Head contain the remains of Fort Andrews, one of several coastal fortifications on the Boston Harbor islands (Figure 2). Built in the early 1900s and expanded during World War II, the fort consists of several Colonial Revival style buildings, mortar batteries, and a chapel. Three batteries, Rice, McCook, and Bumpus, as well as a Battery Commander's Fire Control Station, stand near the top of the northern drumlin, where there are open views to Georges Island, Boston Light and the Outer Islands, and the tip of Hull.

The purpose of this Vegetation Management Recommendation document is to guide the rehabilitation of the historic landscape character of Fort Andrews, in order to accommodate safe, sustainable, and enjoyable use of the island. The document includes recommended maintenance practices, a series of vegetation maintenance tasks within specific fort areas, a calendar for maintenance practices, and related appendices.

PROJECT BACKGROUND

During its peak use in World War II as a defensive fortification and a prisoner-of-war camp, Fort Andrews included over fifty buildings and temporary barracks. After the war, many buildings were removed immediately while others slowly deteriorated due to lack of use and maintenance. In 2011, DCR and Boston Harbor Islands Alliance (BHIA) initiated a major rehabilitation of Fort Andrews. A demolition contractor removed about thirteen structurally unstable buildings, including the administration building, barracks buildings, officers quarters, and the fort hospital. Left standing are the guard house, two barracks buildings, the recreation hall, fire station, hospital steward's quarters, non-commissioned officers quarters, and large storehouse. Also retained are defensive structures, the fort road and path network, gun batteries, small-scale features, and remnants of building foundations. Following demolition, DCR revegetated disturbed areas with grass, native shrubs, and shade trees. DCR also constructed a yurt camping area in 2012 on the nearly level summit of the northern drumlin in the vicinity of Batteries Rice, McCook, and Bumpus, and the Fire Control Station. The campground was modeled after other popular DCR yurt sites located in Myles Standish State Forest in Carver, Shawme-Crowell State Forest in Sandwich, and Nickerson State Park in Brewster. While a major phase of the rehabilitation work is complete—building removal and site stabilization—continued work is needed

to rehabilitate, enhance, and maintain the cultural landscape.

RELATIONSHIP TO RESEARCH AND PLANNING DOCUMENTS

Several existing reports informed the management recommendations. A "Vascular Plant Survey" for the Boston Harbor Islands completed by Ted Elliman in 2004 provides a comprehensive list of existing plant species on the island. Recommendations for the re-vegetation of cleared areas utilized the vascular plant survey to identify species already present on the island. The "Peddocks Island Physical History, Chronology, and Statement of Significance" prepared in 2009 by Shaun Provencher, DCR Preservation Planner, provides a concise statement of significance for the island. Historic photographs and details on the evolution of the fort landscape informed recommendations relating to the addition and removal of vegetation. Specifications prepared by the Environmental Partners Group for BHIA provided baseline information for detailed landscape preservation recommendations. Additional sources are listed in the references section. The recommendations adhere to guidelines established by the National Park Service Management Policies (2006), NPS 28: Cultural Resource Management Guideline (1997), NPS 77: Natural Resources Management Guidelines (2004), and The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes (1996).

HISTORICAL OVERVIEW

Formed during the Wisconsin Glacial Episode, Peddocks Island is made up of five drumlins consisting of glacial till, each oriented on a northwest to southeast axis. Fort Andrews is predominantly sited within the long inner sides of the two easternmost drumlins, which are referred to as East Head. The outer side of East Head, also referred to as the northern scarp, is exposed to the erosive waves of Boston Harbor and Hull Gut. Native Americans seasonally occupied the island until the early 1600s when they were displaced by European settlers.

Leonard Peddock settled on the island in 1622 and thereafter, the island passed through a succession of farmers. In 1634 the General Court of the Massachusetts Bay Colony granted Peddocks Island to Charlestown, and then to Nantasket, now known as Hull. Farming activities were disrupted during the Revolutionary War when colonial troops occupied Peddocks Island and French allies constructed earthen fortifications on East Head. After the war, farming continued up until the 1890s.

In 1898 the United States government acquired a 23-acre parcel on East Head from Eliza Andrew, widow of Governor Andrew. Construction of coastal defenses commenced upon acquisition, and by the time of the Spanish-American War in 1898 to 1899, batteries Whitman, Rice, and Bumpus were underway. The following year the fort was officially dedicated as Fort Andrews. By 1912 the Army constructed most of the fort's buildings and gun batteries. During World War I, 400 men of the 55th Coast Artillery were stationed at Fort Andrews. After the war a caretaker tended the fort (Figures 3 and 4). During the interwar years, vegetation grew up on the hillsides and two plant nurseries were established (Figures 5

and 6). At the outset of World War II, the government constructed many additional buildings, though most were temporary. One notable building still standing is the 1941 chapel, which the Army built according to specifications used for hundreds of post chapels across the country. During the war, the 241st Coast Artillery occupied the island between 1944 and 1945, and over 1,000 Italian prisoners were held on the island.

After World War II, the government placed Peddocks Island in caretaker status and in 1959 the fort was officially decommissioned. By this time vegetation occupied the open hillsides of East Head and continued to grow unchecked. In 1970 the island became part of the Boston Harbor Islands State Park under the management of the Metropolitan District Commission. In 1996 the island became part of the national park area along with thirty three other Boston Harbor islands and peninsulas (Figures 7 and 8).

EXISTING CONDITIONS

Photographs taken in 2011 and 2013 illustrate the recent rehabilitation of the Fort Andrews area. The guardhouse stands by the pier and serves as the island's visitor center (Figures 9, 10, and 11). A new picnic area behind the guardhouse offers views to Hull Gut (Figures 12 and 13). New plantings provide seasonal interest to the entry area (Figure 14). Rehabilitation work is underway at the nearby chapel, a key feature on the island that is visible across Hingham Bay (Figures 15, 16, and 17). Two large barracks buildings, visible across the bay but structurally unstable, were taken down. Further inland, two barracks building have been retained (Figures 18, 19, and 20). An adjacent boathouse has been retained and will possibly be used as a food vending facility (see Figure 10).

Within the Fort Andrews area, vines and vegetation have been cut back around buildings and foundations to be retained. Open areas have been graded and seeded for seasonal mowing. For example, the foundation of the administration building has been retained and the surrounding area will be maintained as mown grass (Figures 21, 22, and 23). Woodchips were broadcast on steep slopes to reduce runoff (Figures 24 and 25). Where buildings have been removed, foundation remnants and associated concrete walkways will be retained to show the footprint of the former building. For buildings with basements, the basements have be filled, graded, and seeded (Figure 26). Several buildings were removed along Officers Row, including the former hospital. The area is now used as a group campsite (Figures 27, 28, and 29). Granite foundation blocks have been retained to be used for benches, steps, and retaining walls (see Figure 14).

On the north drumlin of East Head, trees were selectively cleared for a camping area in 2011 (Figure 30). The site is adjacent to Batteries Rice, McCook, and Bumpus, and a Fire Control Tower, which are visible historical features but not stabilized for access (Figures 30 through 35). The camping area is bounded by a historic fort road, which cuts along a steep slope (see Figures 33, 34, and 35). A privet hedge formerly grew along the top of the slope and the root structure remains. Six yurt sites and six campsites are located near the top of the drum-

lin (see Figures 32 and 34). Each yurt can accommodate six campers while each campsite can accommodated four campers, thus the capacity of the camping area is sixty people. (A group camping area is located on the other drumlin along the former Officers Row.) From the yurts, a vista exists at the edge of the eastern bluff of East Head (Figure 36). However, the edge of the bluff is unstable and slumping (Figure 37). A barrier discourages visitors from standing along the edge of the slope (Figure 38). Within the campground a Clivus Multrum composting toilet is located along the path, not far from the fire control station. A water spigot is located nearby (Figures 39 and 40).

HISTORICAL SIGNIFICANCE

The historical significance of Peddocks Island is documented in DCR's report, "Peddocks Island: Physical History, Chronology & Statement of Significance" (Provencher, 2009). The report states that Fort Andrews is significant under Criteria A and C for the years 1887 to 1959. Under Criterion A, Fort Andrews is significant at the state level for its role in coastal defense and military affairs in Massachusetts during the Endicott Era of harbor defense reform from the 1880s into the early 1900s. Under Criterion C, Fort Andrews is also significant at the state level as the sole intact Endicott Era cultural landscape remaining in the state, as well as for its collection of turn-of-the-century Colonial Revival architecture. The period of significance ends in 1959 with the closing of Fort Andrews (Provencher, 22). Provencher describe in 2009 the vegetation within Fort Andrews that dated to the historic period. While he observed that the forested land cover had significantly altered the setting of Peddocks Island, he described several Fort-era landscape plantings such as the maples between the officers quarters, wind breaks on the western bluff, and a privet hedge along the rear of batteries Rice, McCook, and Bumpus, which were still extant and contributed to the setting of the island (Provencher, 23). However, by 2012, many of the plantings in the fort area were compromised by bittersweet vines, and removed during the building demolition. The privet hedge was removed during the vegetation clearing process for the yurt campground. Some of the hedge has subsequently regenerated.

LANDSCAPE CHARACTER AREAS

For this report, the project team divided the Fort Andrews area into five character areas, based on landform, historical features, circulation, and current use. The five areas within Fort Andrews are:

- Arrival and Parade Ground Area
- Campground and Overlook Area
- Officers Row Area
- North Fort Area
- West Fort Area

Each of the areas is described below. Drawings 1 to 5 illustrate the areas and Tables 1 to 5 list vegetation-related tasks within each area.

ARRIVAL AND PARADE GROUND AREA

The Arrival and Parade Ground Area is predominantly open and is the most visible and most visited portion of Fort Andrews. Located between the north and south drumlins of East Head, the area is relatively flat and contains most of the administrative, operations, and civic buildings and structures associated with the fort, including the highly visible 1941 post chapel and brick guardhouse. The island's main pier is also situated in this area, and extends into Hingham Bay, not far from Hull Gut. The area historically contained numerous shade trees around the post buildings and was predominantly maintained as open lawn during active military use. A large flagpole stood by the shore, on axis with the administration building. Today the area is predominantly open with wooded areas on the surrounding slopes and a wet area at the base of the hillside between the administration building foundation and chapel. Park staff greet visitors and set up displays in the open space in front of the guard house. The guard house itself contains a small museum and interpretive display area, and meeting room, and restrooms. Popular picnic areas include the beach by the pier, a cookout area between the guardhouse and stable, overlooking Hull Gut, and in the apple orchard to the north of the chapel. The roads, paths, and steps in this area are in good to fair condition.

CAMPGROUND AND OVERLOOK AREA

The Campground and Overlook Area is located on the north drumlin of East Head with views north and east to Georges Island, Boston Light, Hull, and the Outer Harbor. The peak of the drumlin and high vantage point was a key part of the harbor defense system during the early twentieth century. Remaining structures include a fire control station and three gun batteries. Today the steep slopes of the drumlin are wooded, predominantly with Norway maple, except for the exposed northeast facing slope that is open and eroding due to its exposure to Hull Gut and Outer Harbor storm winds and waves. The top of the drumlin is partially open, with clusters of trees and shrubs and used as a yurt and tent camping area. Portions of a privet hedge along the top of the slope by the gun batteries has begun to regenerate after the extensive vegetation clearing work in 2011, which was necessary to remove bittersweet-laden trees and shrubs. A composting toilet is located along a path to the camping area and overlook. The overlook is a popular destination and the park recently cut a more direct path to the overlook to minimize pedestrian circulation through the campground area. Several sections of historic roadway have been stabilized with additional material and are in good condition. The buildings and fortifications in the area are in poor condition.

OFFICERS ROW AREA

The Officers Row Area is located on the south drumlin of East Head with views south toward Hingham Bay. The former row of buildings extends along a shelf or terrace, cut into the slope of the drumlin at the time of the construction of the fort in the early 1900s. Historically the terrace was lined with elegant Colonial Revival residences and a hospital. However, the buildings had been vacant for several decades and most were demolished in 2011. Today some of the Non-commissioned officers quarters remain and the vast open space is used as a group campground.

A composting toilet is located at the western end of the open space. The remaining buildings, roads, paths, and stairs historically associated with Officers Row remain intact, but in fair condition.

NORTH FORT AREA

Lying north of the Parade Ground and Arrival Area, the North Fort Area is predominantly wooded and encompasses the northern half of the valley between the north and south drumlins of East Head. Key features that remain from the fort include the large storehouse building by the north shore of the island, and the disappearing gun batteries, Battery Cushing and Battery Whitman, as well as the associated switchboard room, data booths, power plant, and plotting room. A network of roads leads through areas where temporary buildings were removed shortly after World War II. To the northeast of the storehouse, a spur road leads northeast and terminates at the edge of the eroding bluff. The terminus offers views to the Boston skyline, Georges Island, and the Outer Harbor. Today, the area is lightly used by park visitors that explore the fort area. The park has stockpiled raw materials from the building demolition project in the Battery Whitman area. The remaining building, roads, paths, and fortifications in this area are in fair to poor condition.

WEST FORT AREA

Located to the north of Officers Row and west of the North Fort Area, the West Fort Area covers the southern drumlin of East Head. A few features remain from the historic period including a dilapidated fire control station and several cottages on the western shore of East Head. The area is generally inaccessible and infrequently visited. DCR has considered locating a group campground at the summit of this drumlin, but views this as a long range plan as the project would require extensive clearing and a trail work. The area is predominantly covered with Norway maple and previously cleared areas are colonized with non-native shrubs such as multiflora rose, privet, and Oriental bittersweet. Two of the cottages are unoccupied and in poor condition. Two others are occupied and in good condition. The remnants of forth structures, roads, paths are mostly obscured by vegetation and in poor condition.

Recommendations

This chapter includes a series of recommendations to enhance the cultural and natural qualities of the vegetation in the Fort Andrews area. Tables 1 through 5 and Drawings 1 through 5 supplement the narrative tasks described below.

Goals for vegetation in the Fort Andrews area include establishing vegetation that reflects the historic landscape character, support native biodiversity, ensure that invasive species do not repopulate cleared areas, and stabilize recently cleared areas. Associated maintenance practices include encouraging healthy native plant populations, planting desired species, removing invasives, and applying herbicide to invasives and poison ivy.

I. VEGETATION AND VISTA MANAGEMENT THROUGHOUT FORT ANDREWS

After the closure of the fort in 1959, vegetation grew unchecked within the fort area. The Metropolitan District Commission acquired the island in 1970 but initially had limited staff and funds for its upkeep, hence most of the island remained wooded into the 1980s. With improved access and increased staffing, a portion of the former parade ground was restored to a grass lawn in the 1980s. Clearing continued in the 1990s and by the early 2000, park staff maintained the majority of the former parade ground as an open field and mowed a grassy path to the East Head overlook above Hull Gut.

The detailed vascular plant survey of flora on the Boston Harbor Islands completed by Ted Elliman in 2004 provides data on the Peddocks Island vegetation composition at that time, including the Fort Andrews area. When several buildings were demolished in 2011, contractors removed extensive vegetation from the building areas and the proposed camping area. Using the list of species present on the island from the Elliman report, historical documents that depict vegetation present during the historic period, and the existing conditions documentation, the following recommendations guide the future management of vegetation in the fort area.

A. VEGETATION MANAGEMENT PRACTICES

Vegetation management can be categorized according to maintenance requirements within the Fort Andrews landscape, as defined below and depicted

on Drawing 1. By carrying out these maintenance procedures, the fort vegetation will reflect the goals state above to preserve the fort's historic character and promote native biodiversity.

1) MANAGED TURF

Open areas of turf, or mown lawn, include the Arrival and Parade Ground Area, building surrounds, the center of the campground, the recently cleared Officers Row, and grass covered paths such as the route to the East Head overlook. Turf areas and paths are cut once every one or two weeks during the growing season, depending on the weather. Currently these areas consist of a mix of native and non-native grasses and forbs. Grass should be maintained at a height of 3 to 5 inches. For tick management, grasses should be kept at or below 3 inches, but this level of maintenance may be unsustainable for the entire Peddocks Island turf areas. Routine mowing in turf areas will restrict the growth of woody invasives in these areas.

2) MEADOW AREAS

Meadow areas are located on the periphery of the Arrival and Parade Ground Area, the edges of paths in the Campground and Overlook Area, and potentially for portions of the Officers Row. Meadow areas consist of a mix of herbaceous grasses and forbs that are mowed less frequently. These areas are located between managed turf and wooded edges, under orchard trees, and in open areas near overlooks. Meadow areas are mown seasonally, once or twice a year, following bird nesting season, and only as needed to prevent the growth of woody plants. Annual or biannual mowing will control most invasives, though some spot treatments or removals may be necessary to eliminate poison ivy, bittersweet, and knotweed.

3) WOODS EDGE

Woods edges are the transition areas between of lawn and woods, between road or path and woods, and between fortifications and woods. Woods edge conditions are present throughout the Fort Andrew landscape as they extend along many of the fort's roads and trails, and surround the clearings for buildings and camping areas. Edge areas are challenging to maintain and vulnerable to invasive, opportunistic plants such as poison ivy, bittersweet, and knotweed. Woods edge areas require selective removal of invasives and overgrown native vegetation, particularly when the vegetation grows into circulation corridors or obstructs and views and vistas. Management practices include manual physical removal of invasives with a weed wrench or cutting with loppers; mechanical removal with a brush hog, flail mower, or weedwacker; chemical control using herbicides; encouragement and planting of natives; and weeding and mulching desired plant species, with the intent of establishing native woody over-story and under-story

of native herbaceous plants, shrubs, and young trees. Areas with existing healthy populations of native flora are a priority for woods edge management to ensure that they remain healthy and multiply. Selective removal of non-native invasives may be monitored and/or prioritized in areas with significant resources, such as archeological sites. Appendix 1 provides additional information on herbicide treatments.

4) DENSE WOODS

Dense woods areas are located on the drumlin slopes at the periphery of the fort buildings. Dense woods contain trees with strong canopies that allow minimum penetration of sunlight to the ground-story. Unfortunately, many of these dense wooded areas are colonized by Norway maple, a non-native invasive species. Norway maples have colonized steep slopes and areas not frequented by visitors. Eliminating Norway maple is not feasible at this time. In areas where there is dense woods and no active use, no active maintenance will be carried out. In some locations, vegetation management may be required to protect cultural or natural resources. For example, gun batteries are described in greater detail below under #7.

5) HOT SPOTS

Hot spots represent areas where non-native invasive vegetation is present and should be contained. Current locations include a knotweed grove in the North Fort Area and a phragmites stand in the West Fort Area. Depending on staff and volunteer time and resources, hot spots may be monitored, mitigated, or eliminated. Associated maintenance practices include weeding, covering, removal, spraying to eliminate new invasive species on the island. For example, if Japanese knotweed were eradicated when it first arrived on the island, it would be much easier to eliminate, but it has self-seeded and is now widespread in the North Fort Area. The park has a watch “species list and contact info” for all islands that includes key pests and plants to watch for.

6) OVERLOOKS AND ERODED AREAS

The Fort Andrews area includes two overlooks, one by the campground and the other east of the storehouse. Both overlook areas are located above eroding bluffs as drumlins are made up of glacial till, which is susceptible to erosion by storm wind and wave action, and foot traffic. Vegetation management in these areas focuses on the stabilization of loose soil, root development, and minimizing human impacts.

7) GUN BATTERIES

The abandoned gun batteries in the North Fort Area—Cushing and Whitman—and the batteries in the Campground and Overlook Area—Rice, McCook, and

Bumpus—are now covered with a mix of trees, shrubs, and vines. Vegetation management in these areas focuses on eliminating trees that can damage historic engineered landforms and structures. Practices include eliminating trees greater than four inches in diameter, eliminating woody vegetation from within four feet of buildings and structures, and managing vegetation that restricts views from the gun batteries that were historically open. Following removal of woody vegetation, maintenance practices focus on establishing low vegetation to stabilize steep slopes without damaging the gun batteries.

Specific tasks associated with managing these seven areas follow. Certain areas also may be enhanced as wildlife habitat zones and/or to provide educational and recreational opportunities for visitors. At this time there are no species of special concern in the Fort Andrews area.

B. PRESERVE VIEWS THROUGH ONGOING VEGETATION MANAGEMENT

Closely associated with management of vegetation is the management of views. Goals associated with views include:

- Preserve key vantage points from the Fort Andrews area and from East Head associated with the yurt camping area overlook (Drawing 2). Key vantage points include views from the guardhouse and chapel area to Hingham Bay, the partial views from Officers Row, the view from the end of the road to the east of the Storehouse (Building 36), and the framed view from the East Head bluff to the Outer Harbor near the yurt campground area (Drawings 6 and 7).
- Trim or thin vegetation to maximize views to the harbor and key points such as Georges Island, Boston Light, Hull Gut, and Hingham Bay.
- For bluff views, install barriers to ensure visitor safety within viewing locations. Maintenance guidelines are further detailed in Section IV. Conservation Commission Submittal and Section VI. Calendar of Tasks.

C. REMOVE INVASIVE AND UNWANTED TREES, SHRUBS, VINES, AND HERBACEOUS PLANTS

1) TREES

Trees to be removed include those that are dead, dying, or are determined to be structurally unstable and within fifteen feet of roads, paths, or structures. Additional trees to be removed or thinned include trees obstructing views. During the historic period, the landscape was predominantly open with views to the surrounding harbor. Trees to be removed are marked in the field with an flagging tape marked with an "X." Upon cutting, each stump should be ground with a stump grinder to below the surface to prevent re-sprouting, or immediately painted with a systemic herbicide, such as Garlon® 4 Ultra to prevent re-sprouting.[1] Alternatively, the herbicide can be painted on the bark at the base

of the growing tree. This basal bark method is preferred for species that produce root sprouts after cutting, such as Tree-of-Heaven (*Ailanthus altissima*) When absorbed, the tree dies, and is then flush cut for removal.

2) SHRUBS

Shrubs to be removed include non-natives that form a brushy understory within fifteen feet of roads, paths, or structures. Additional shrubs to be removed are those that obscure notable vistas. Areas where additional shrub removal is needed are indicated on Drawing 1. Privet will be contained to historic hedge locations. Invasive shrubs to be removed throughout are Japanese barberry (*Berberis thunbergii*), Japanese and bush honeysuckles (*Lonicera* sp.), and multiflora rose (*Rosa multiflora*). Shrubs can be removed with a weed wrench, root talon, or cut with loppers. If cut, each stump should be immediately painted with a systemic herbicide, such as Garlon® 4 Ultra to prevent re-sprouting or cut further with a stump grinder so that no visible parts remaining above ground will sprout (called the cut and paint method). Like trees, the herbicide can be painted on the basal bark on growing shrub, though this method is not used as much for shrubs. When absorbed, the shrub dies, and is then flush cut for removal. Japanese knotweed is described as an herbaceous weed below.

3) POISON IVY AND BITTERSWEET VINES

Where noted on Drawing 1, in areas to be regularly mowed, poison ivy and bittersweet vines should be removed. In areas where removal is not feasible or not recommended, or regular mowing will not contain resprouts (on live trees and on building facades, and in border and forest understory areas), the vine should be removed or cut at the base and the cut root end painted with an herbicide containing Triclopyr or Glyphosate as the active ingredient. Patches with multiple small stems should be sprayed with a foliar application of an approved herbicide.

4) INVASIVE HERBACEOUS PLANTS

Two highly invasive herbaceous weeds are prevalent throughout Fort Andrews, Japanese knotweed and garlic mustard. For knotweed, foliar herbicide is recommended. Garlic mustard can be eradicated through repeat manual removal for two to three years in early Spring.

Future invasives eradication should be carried out with herbicides and cutting based on the schedule in Section VI. Calendar of Tasks.

Once invasive cover is removed, the area should be planted with natives and/or mulched so that another wave of invasives does not colonize the area. Bare ground is especially inviting to garlic mustard.

D. RETAIN TREES, SHRUBS, AND UNDERSTORY

1) TREES

During the establishment of the yurt campground in 2011 through 2013, several trees were retained in the camping area to provide shade for the yurts and campsites. Trees retained include:

- Strong shade trees with canopy including Norway maples (*Acer platanoides*) and some pines (*Pinus sylvestris, P. resinosa,* and P. nigra)
- Young trees with potential to grow and provide shade in the future
- Native tree species including ash (*Fraxinus americana*), elm (*Ulmus americana*), red cedar (*Juniperus virginiana*), black cherry (*Prunus serotina*), aspen, (*Populus sp*), and birch (*Betula sp*).

2) SHRUBS

Criteria for retaining shrubs include:

- Historic shrubs in historic planting location (privet hedge (*Ligustrum* sp.) along top of slope)
- Native shrub species such as northern arrowwood viburnum (*Viburnum recognitum*), wild red raspberry (*Rubus idaeus*), and blackberry (*Rubus pensylvanicus*).
- Potential to provide screening between individual yurt sites and campsites.

E. ADD TREES AND SHRUBS FOR SHADE, PRIVACY AND SCREENING AROUND CAMPSITES AND PRIVIES

Using Elliman's 2004 vascular plant survey as a guide, the following species are recommended for screening in the camping area. Trees and shrubs selected are 1) currently growing on the island or other Harbor Islands; 2) tolerant of the mixed sun and shade growing conditions; 3) establish quickly; 4) add seasonal interest or offer recreational fruit or berry picking; and 5) are native species or non-invasive non-native species that were present during the historic period. Some trees and shrubs were added during the installation of the yurts and campsites. Additional vegetation may be added in the future, though not so much as to obscure views toward the water.

1) EVERGREEN TREES

American holly (*Ilex opaca*)

Scotch pine *(Pinus sylvestris)*

Austrian pine *(Pinus nigra)*

Red pine *(Pinus resinosa)*

White Pine *(Pinus strobus)*

Red cedar *(Juniperus virginiana)*

2) DECIDUOUS TREES

Red maple (*Acer rubrum*)

Silver maple (*Acer saccharinum*)

Horsechestnut (*Aesculus hippocastanum*)

Downy shadbush (*Amelianchier arborea*)

Quaking aspen *(Populus tremuloides)*

Gray birch *(Betula populifolia)*

Hackberry (*Celtis occidentalis*)

American chestnut (*Castanea dentata*)

Green ash (*Fraxinus pensylvanica*)

Cottonwood (*Populus deltoides*)

Big-tooth aspen (*Populus grandidentata*)

Quaking aspen (*Populus tremuloides*)

American elm (*Ulmus americana*) disease resistant cultivars

3) ORCHARD TREES

Pear (*Pyrus communis*)

Apple *(Malus sylvestris)* low maintenance varieties such as 'Roxbury Russet'

Crabapple (*Malus coronaria, M. fusca, and M. ioensis*)

4) SHRUBS

Thicket shadbush (*Amelanchier canadensis*)

Running shadbush (*Amelanchier stolonifera*)

Chokeberry (*Aronia arbutifolia*)

Bayberry (*Myrica pensylvanica*)

Beach plum *(Prunus maritima)*

Sumac (*Rhus sp.*)

Wild red raspberry (*Rubus idaeus*)

Northern dewberry *(Rubus flagellaris)*

Pennsylvania blackberry (*Rubus pensylvanicus*) -- if necessary to control foot traffic on slopes

Bebb's willow (*Salix bebbiana*)

Common Elderberry (*Sambucus canadensis*)

Maple-leaf viburnum (*Viburnum acerifolium*)

Nannyberry viburnum (*Viburnum lentago*)

Northern Arrowwood viburnum (*Viburnum recognitum*)

Highbush cranberry viburnum (*Viburnum trilobum*)

Highbush blueberry (*Vaccinium corymbosum*)

5) HERBACEOUS

Autumn Bentgrass *(Agrostis perennans)*

Common Milkweed *(Asclepias syriaca)*

Bushy aster (*Aster dumosus*)

Heath aster (*Aster ericoides*)

New York aster (*Aster novi-belgii*)

Lady fern (*Aythrium filix-femina*)

Marsh straw hedge (*Carex hormathodes*)

Broom sedge (*Carex scoparia*)

Swan's sedge (Carex swanii)

Poverty oatgrass (*Danthonia spicata*)

Hay-scented fern (*Dennstaedtia punctilobula*)

Intermediate woodfern (*Dryopteris intermedia*)

Field horsetail (*Equisetum arvense*)

Daisy fleabane (*Erigeron annuus*)

Rough fleabane (*Erigeron strigosus*)

Grass-leaved goldenrod (*Euthamia graminifolia*)

Red fescue (*Festuca rubra* ssp. *Pruinosa*)

Beach pea (*Lathyrus japonicas*)

Common woodrush (*Luzula multiflora*)

Old field toadflax (*Linarea canadense*)

Canada mayflower (*Mianthemum canadense*)

Common evening primrose (*Oneothera biennis*)

Sensitive fern (*Onoclea sensibilis*)

Panicum (*Panicum virgatum*)

Common cinquefoil (*Potentilla simplex*)

Sweet everlasting (*Pseudonaphalium obtusifolium*)

Little bluestem (*Schizachryium scoparium*)

Canada goldenrod *(Solidago canadensis)*

Rough-stemmed goldenrod *(Solidago rugosa)*

Seaside goldenrod *(Solidago sempervirens)*

Blue vervain *(Verbena hastate)*

F. NEED FOR CHIPPER FOR VEGETATION MAINTENANCE AND USE OF WOODCHIPS

The clearing of overgrown, dead, and dying trees resulted in many cubic yards of

woodchips. Generally these have been broadcast on steep slopes to reduce the likelihood of erosion and deter the growth of opportunistic invasive species. While woodchips are prone to washing in heavy rains, the angle of repose on the slopes is generally low enough to retain the wood chips. As the woodchips may contain poison ivy vines, which retain oils, woodchips should not be used in the campsite areas. Potential uses of woodchips include:

- Place mulch ring around the base of newly planted trees (at the level of the tree base, not mounded up against the trunk).
- Continue to cover steep slopes along fort roadways to discourage regeneration of invasive vegetation.
- Compost wood chips in piles for future soil amendment

G. VIEWS WITHIN CAMPGROUND AREA AND PRIVY LOCATIONS

The campground area includes six 20-foot diameter yurts, six campsites, and one outhouse (Drawing 2). The park installed a Clivus Multrum M54 ADA unit at the south side of the camping area, which is a stand-alone, self-contained, wheel-chair accessible composting toilet (Figures 39 and 40). A second privy is needed. A water line extends from the Fort Andrews area up the west facing slope of the drumlin and is diagramed in a plan by Environmental Partners Group (6/7/2010). Contractors installed the water line in May 2011. Two water taps were subsequently installed within the camping area, one at the western side and one near the composting toilet.

1) YURT SITES

Yurt sites are situated 70 feet away from adjacent tent sites and at least 70 feet away from the privy. The yurts are arranged in a circle, with the doors facing toward the central lawn area and the windows oriented predominantly in an easterly direction, toward a filtered view of the Outer Harbor. Each yurt is 20 feet in diameter and built upon a platform as specified by Environmental Partners Group (Detail C-7, sheet 3 of 3). Yurt #6 is accessible and includes an entrance and egress ramp. The specifications for the ramps are similar to those used at DCR's Willard Brook State Forest in Ashby and Shawme-Crowell State Forest in Sandwich (Detail C-7, sheet 3 of 3).

Each yurt can accommodate 6 people, and includes a 6 or 8-foot long picnic table, a cooking grill, and a post with a yurt site number (see Figures 31 and 32). Open fires are not allowed at the yurt sites. Granite blocks, recycled from the fort area may be used to retain the slope as needed to ensure that the picnic table and grill are set on level ground.

Screening vegetation has been installed around each yurt, using species listed in the previous section. A schematic layout is shown in Drawing 3, however the exact placement and choice of species is varied according to existing vegetation

and availability of native nursery plants.

2) TENT SITES

The layout of each campsite and surrounding vegetation treatment is detailed on Drawing 4. The Park may add campsites to the north or south of the current proposed camping area, but will first monitor the success and capacity of the current proposal.

For tent sites, each site offers a picnic table, cooking grill, and enough space for a 4-person tent and a two-person tent. The capacity of each tent site is four people. Open fires will not be allowed at the campsites. Each campsite also includes a post with a campsite number. A well-drained base material is essential for the tent pitching area for both the durability of the site and the comfort of campers in wet weather. A mix that has successfully been used at Acadia National Park campgrounds is detailed in Appendix 3. At least one third, or 300 square feet of each campsite should be covered with the well-drained material. Thus each campsite will require five to six cubic yards of material, spread and compacted to a depth of 4 to 6 inches (thus a total of 30 to 40 cubic yards of material). Loam should be scraped from the tent site location prior to spreading the well-drained gravel mix. The park added a well-drained base material to each campsite in the winter of 2012–13.

Like the yurt sites, screening vegetation has been or should be installed around each tent site using species listed in the previous section. A schematic layout is shown in Drawing 4, however the exact placement and choice of species can be varied according to existing vegetation and availability of native plants. For most of the tent sites, the palette of shrubs is limited by the heavy shade cast by the stand of Norway maples, and the limited moisture due to competition with the shallow rooted maples. Notably shade tolerate shrubs include Maple-leaf and arrowwood viburnums.

3) LOCATION OF COMPOSTING TOILETS

Two primitive privies are needed in the camping area, one of which can also be used by non-campers who are exploring the island and overlook. Each privy will be 70 or more feet from the nearest campsite. The type of privy to be used is accessible composting toilet, which are in place on other islands in the park (Drawing 1). The specifications for siting the privies include:

- Centrally located to yurts and campsites.
- One of the toilets located where it is accessible to other visitors going to the overlook without going into the camping area.
- Level site with adequate base preparation to prevent heaving
- Level entry to facilitate construction of ramp or installation of compacted

surface at entry as needed.

- Not in primary viewsheds, including the view from the yurts to the east overlook and the view from the yurts to the historic gun batteries.
- Not near or over the water or electrical lines.

The above parameters for siting the privies greatly reduce their convenient placement for campers. Based on an on-site evaluation, the project team recommends that the second privy be placed adjacent to the existing campground privy. Alternative locations have limitations. For example, placement to the east or north of the yurt would compromise views, and placement west of the yurts would be down a slope, and potentially too close to archeological sites and the water and electric lines.

H. GRANITE BLOCK PLACEMENT TO APPRECIATE VIEWS AND RETAIN PLANTING BEDS

As part of the demolition of several fort buildings, granite blocks of varying sizes will be salvaged (see Figure 14). Blocks to be salvaged should be of uniform width and height, but can vary in length and mortar should be removed. Six foot lengths are ideal for benches. If blocks are too irregular, their use should be minimal. The blocks should be pinned and firmly affixed to posts or legs to prevent slipping. If no granite blocks are suitable for benches, manufactured benches, similar to those used on other islands, may be used instead. Recommended locations for the granite blocks include:

- Use for seating in the camping and overlook areas that are compatible with vegetation management practices.
- As edging for planting beds around the visitor center (currently installed).
- As low seating on the beach above the high tide line
- As benches for a gathering circle in the center of the campground area, arranged in a configuration that will not impede turf maintenance in the area

I. WAYSIDE PLACEMENT TO ALIGN WITH VIEWS AND VISITOR CIRCULATION

To enhance visitor education and interpretation, waysides are placed throughout the Fort Andrews area, that highlight key events and individuals during the historic period and display historical photographs. Recommendations for waysides include:

- Place waysides in locations that are compatible with vegetation management practices
- Place waysides strategically to direct visitor circulation
- Maintain vegetation as needed to ensure that views in waysides are evident in the surrounding landscape

II. LANDSCAPE SURROUNDING THE GUARDHOUSE

Located by the pier, the former Fort Andrews guardhouse now serves as the Peddocks Island visitor center. Historic photographs show the vegetation in the vicinity of the building during the historic period (1887–1959). A photograph from 1909 (see Provencher, Figure 20, page 48) shows newly planted trees along the main fort road and in the lawn area near the dock. The trees exhibit the branching characteristics of young elms. Figure 4 dates to 1927 and shows three shade trees to the north rear of the guardhouse. Vines grew on the east face of the building, most likely Boston ivy. Shrubs grew along the east side of the shed to the north of the guardhouse. Trees also lined the main road into the fort. A hedge lined the beach area on either side of the original fort flagpole, which was on axis with the Administration building at the far end of the Parade Ground. The hedge likely consist of privet, which was used for hedges elsewhere in the fort.

Figures 5 and 6 dates to about 1940 and shows the same three trees to the north rear of the guardhouse and along the main road through the fort. However, the three trees to the north of the guardhouse are smaller, indicating that the original trees were replaced. The original trees may have been elms and succumbed to Dutch Elm Disease. A soil sample should be taken before planting in this area to determine if saltwater intrusion may be a problem for larger trees. If soil samples yield good soil without high levels of salt, poplars or aspens (*Populus sp.*) or birches (*Betula sp.*) could be planted.

By 1940, the hedge along the shoreline between the dock and flagpole (and extending further southwest) was gone. The shoreline location was likely too harsh for the hedge. Recently the park has added shrubs around the guard house. The planting beds are edged with granite blocks, salvaged from fort buildings.

Another shade tree grew in the front bed of the guardhouse during the historic period and was present in the 1980s. This tree produced shade for a seating area in front of the building (see Figures 7 and 8).

Presently two American ash (*Fraxinus americana*) trees are growing to the southwest of the guardhouse and dock. The trees likely post-date the historic period because they are small in 1986 photographs (see Figures 7 and 8). The ash trees are in fair condition. Most ash in the area have died due to ash decline. Indeed, many American ash in the yurt camping area were half dead and removed in April 2011. When the ash trees by the dock die, they should be replaced with other tree species such as cottonwood (*Populus deltoides*) or a disease-resistant cultivar of American elm. The trees provide welcome shade in the arrival area and frame the view to the chapel.

Along the main road past the barracks, elm persisted until recently. During the rehabilitation, snags and stumps of dead elms were removed. Some Norway

maples persist. New trees should be planted along the main road to produce a broad canopy for shade. Trees should be spaced approximately thirty feet apart or in the specific locations evident in historic photographs (See Figures 3 through 6). Recommended species follow, all of which are or where present on the Boston Harbor Islands (Drawing 5).

Historic photographs suggest that the main road from the pier to the storehouse was lined with American elms. Later photographs indicate that many were replaced with Norway maples (*Acer platanoides*). Norway maple, considered an invasive non-native species, subsequently colonized across much of East Head. Further planting of Norway maple is not recommended. Native species that can be used as shade trees along the main road include: Cottonwood (*Populus deltoides*); Disease-resistant American elm (*Ulmus americana* 'Jefferson,' 'Valley Forge,' 'Princeton' or other cultivar); Red maple (*Acer rubrum*); and American sycamore (*Platanus americana*).

III. EAST HEAD BLUFF AND OUTER HARBOR OVERLOOK

A 100-foot zone extending inland from the upper edge of the East Head bluff is demarcated on a yurt camping area schematic design (Drawing 2). Work in this zone requires the approval of the Hull Conservation Commission. The goal for the physical appearance of this area is to provide filtered views from the yurt camping area and a panoramic view from the overlook above the northeast-facing bluff toward Hull Gut and the Outer Harbor, while preserving the integrity of the bluff. Within this zone, existing healthy trees will be preserved. Non-native invasive and noxious vines and shrubs will be removed such as bittersweet and multiflora rose.

A. MANAGE VEGETATION BETWEEN CAMPING AREA AND BLUFF

A filtered view is present from the yurt camping area east toward Hull Gut. Additional clearing will remove dead trees, vines, brush, and invasive and noxious plants, thereby improving the filtered view, but retaining the healthy tree canopy. Desired management and appearance in this area consists of four types of vegetation management:

1) MOWN PATH

An 8 to 10-foot wide path will be mowed regularly during the growing season to provide visitor access to the East Heat overlook with views toward Hull Gut, Boston Light and the Outer Islands, and Georges Island. The path will terminate at a viewing platform, which will be twenty feet back from the edge of the bluff. A split-rail fence, signs, and the platform railing will discourage visitors from walking

closer to the edge of the bluff. The path will be seeded with a grass mix (for seed mix, See Appendix 1). The path to the overlook has been mown for many years so no additional grass seeding is necessary.

2) MEADOW EDGES

On either side of the path, all healthy trees and native shrubs will be retained. Where invasive shrubs and vines are removed, a meadow mix of native grasses and forbs will be sown, which will require annual mowing. The width of the meadow edge will vary (10 to 50 feet) depending on the extant stands of trees. Meadow areas will cover the edges up to the woodland edge, where mowing is difficult. The meadow mix will also be applied to steep slopes in the battery area. The roots of the grasses and forbs will stabilize the soil, while annual mowing (or string trimming on battery slopes) will ensure that non-native shrubs and vines to not overtake the area (For meadow species, see Section I above under "Herbaceous," and Appendix 1).

3) MANAGED WOODLAND EDGE

The edge of the wooded areas, between stands of trees, will be managed with targeted herbicide treatments to eliminate the dominance of non-native invasive and noxious vines and shrubs such as bittersweet, poison ivy, multiflora rose and Japanese knotweed. Native shrubs will be encouraged. The targeted treatment of invasives will extend 20 feet into the woods—beyond which the dense shade restricts the growth of shrubs.

4) WOODED AREAS

Wooded areas that cast a heavy shade have fewer invasive and noxious vines and shrubs. Minimal treatment is recommended in these areas other than to preserve the tree canopy and root structure. Invasive species that can be pulled with a weed wrench include Japanese barberry (*Berberis thunbergii*) and multiflora rose (*Rosa multiflora*)

B. VIEWING AREA BARRIER, BENCHES, SIGNS, AND VEGETATION ALONG BLUFF

To discourage visitors from walking too close to the edge of the bluff, a barrier and seating and viewing area is needed. The area may contain benches or a platform with a railing. Feature should be installed at least twenty feet from the edge of the bluff. Visitors would approach the overlook along a mown path.

1) BARRIER

To discourage visitors from walking to the bluff edge, install a barrier, consisting of a posts and rails, that extends three feet above the ground and 100 feet in length

(see Drawings 6 and 7). For example, Cape Cod National Seashore uses viewing platforms, benches, fences, and signs along fragile bluffs and dune areas (Figures 27 to 32).

2)BENCHES

Install at least two benches in the viewing area that are made of recycled materials, such as the granite blocks from the demolished fort buildings.

3) SIGNS

Install at least three signs that warn visitors of the danger of approaching the bluff as well as the negative impact on the slope (collapsing and slumping). Recommended locations for signs include one at each end of the barrier railing and one on a low post between the viewing area and the edge of the bluff.

4) VEGETATION

Between the viewing area and the bluff, native vegetation should be encouraged to a height of three feet. If the existing poison ivy is retained, additional warning signs should be added indicating its presence on the bluff. The area should be monitored for social paths to the bluff edge, damage to the bluff by foot traffic, and the overall stability of the bluff. If social paths occur, they should be obstructed immediately with brush. Additional signs should be added to stop foot traffic. If social paths do occur, station a ranger at the overlook during periods of anticipated high visitation to patrol use of the area.

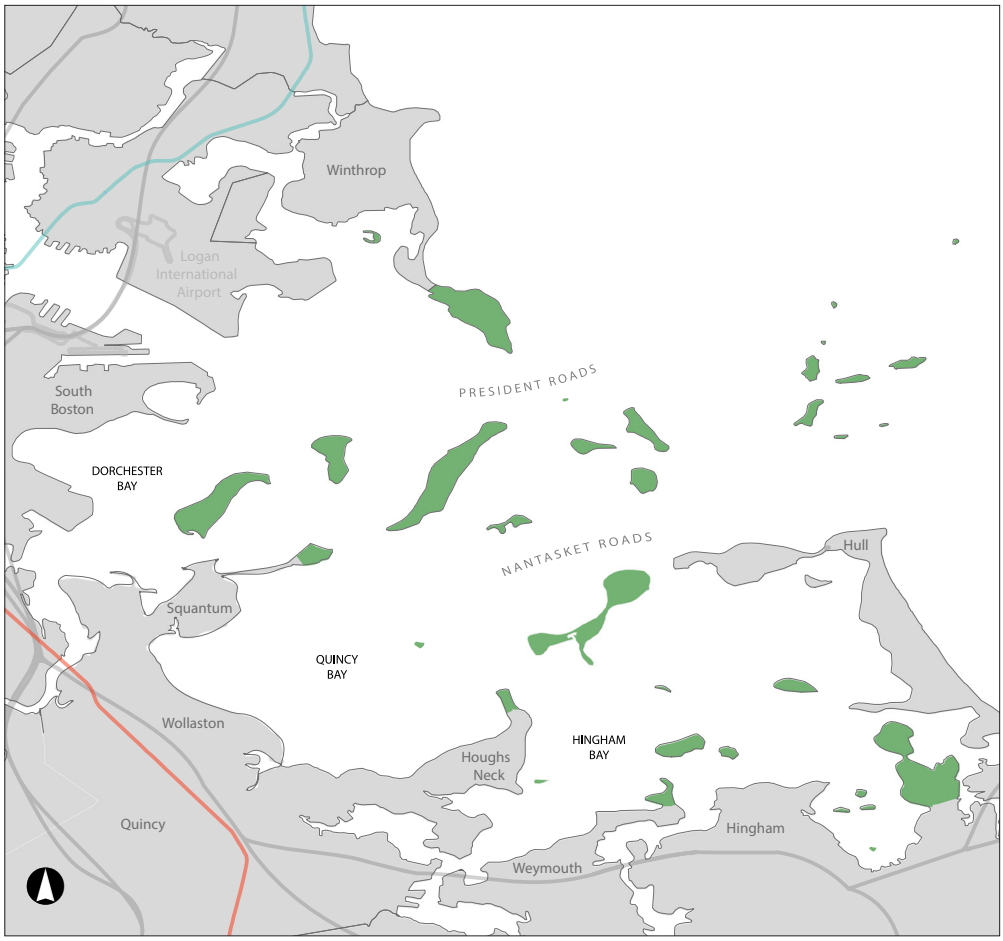


Figure 1. Peddocks Island is one of 34 islands within the Boston Harbor Islands National Park Area, and located between Quincy Bay, Hingham Bay, and the Outer Harbor. (BOHA.)

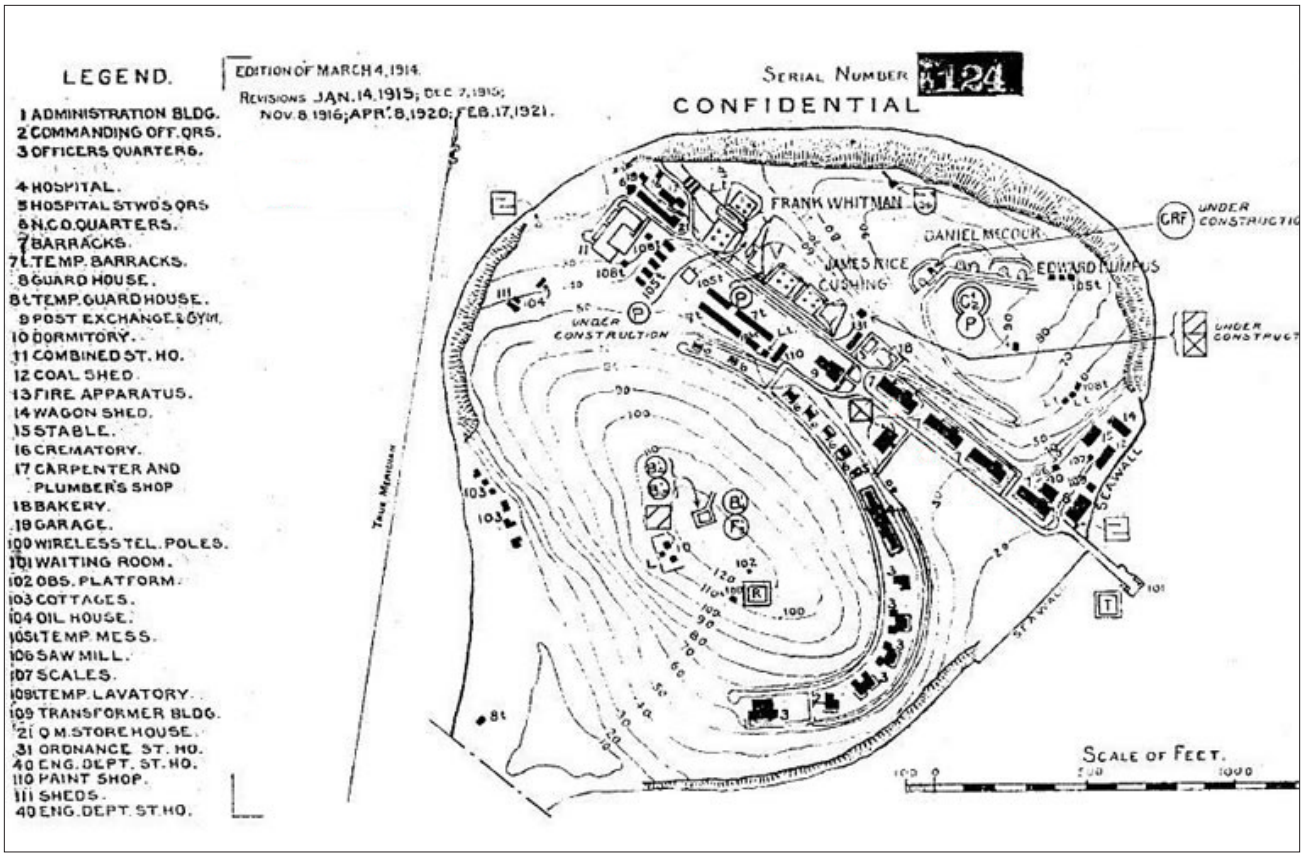


Figure 2. Map of the historic Fort Andrews on the East Head of Peddocks Island. Many of the historic buildings were recently removed due to deterioration and unsafe conditions. (DCR files.)



Figure 3. View looking north in 1925 of Fort Andrews on East Head. Batteries Rice, McCook, and Bumpus are at the far upper right of the image. (Coast Defense Study Group Press.)



Figure 4. View looking west in 1927 of Fort Andrews on East Head. Batteries Rice, McCook, and Bumpus are at the right of the image. The hill is open with scattered evergreens. The privet hedge is visible along the slope by the batteries (Coast Defense Study Group Press.)



Figure 5. View looking southeast in c. 1940 of Fort Andrews on East Head, prior to the construction of the Chapel. Batteries Rice, McCook, and Bumpus are at the left of the image. Note the numerous evergreens scattered on the slopes near the batteries as well as the young tree nursery. (Coast Defense Study Group Press.)

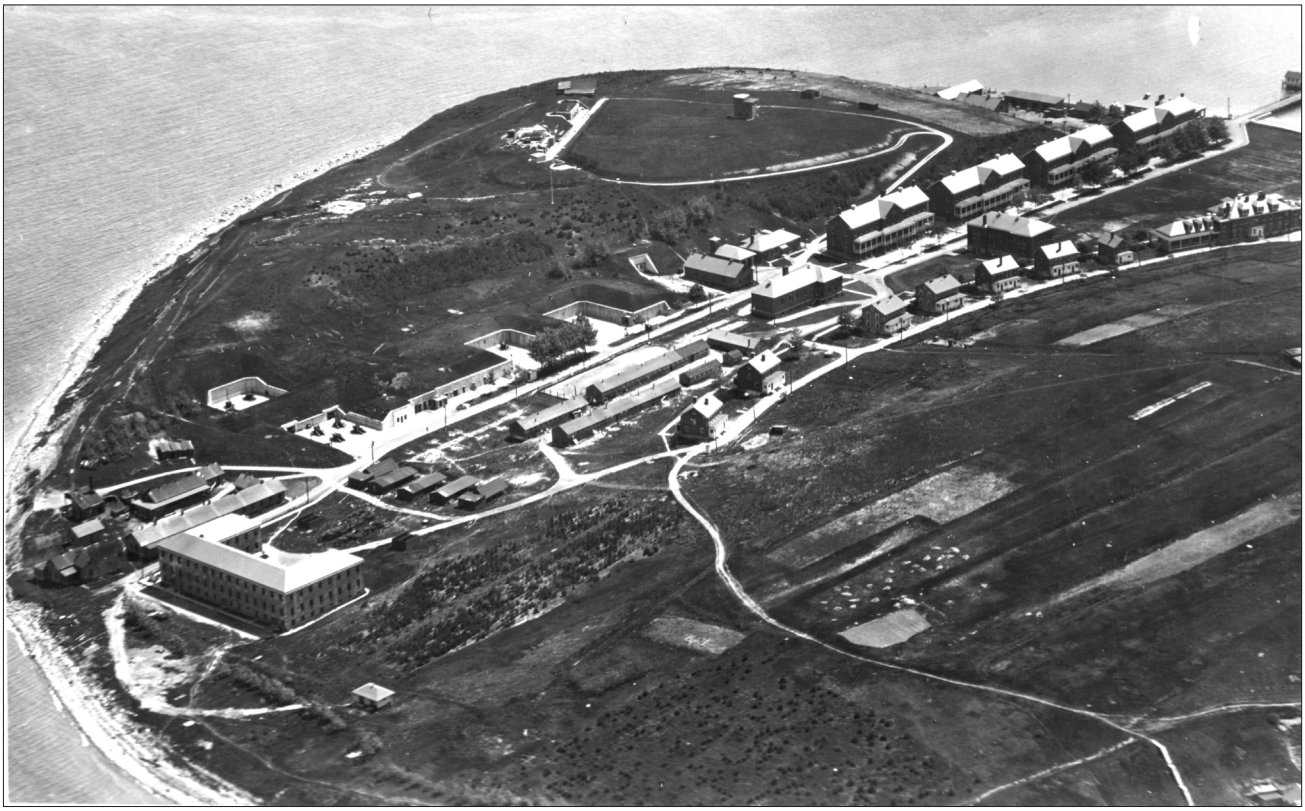


Figure 6. View looking northeast in c. 1940 of Fort Andrews on East Head. Batteries Rice, McCook, and Bumpus are at the upper center of the image. (Coast Defense Study Group Press.)



Figure 7. Low altitude aerial photograph of Peddocks Island in 1986 looking north. A tree grows to the left of the front steps of the guardhouse. The ash trees are visible in the lawn and several shade trees grow to the north of the guardhouse. (Alex MacLean photographer, 136119.tif, City of Boston collection, MIT Libraries Dome, accessed June 2011.)



Figure 8. Low altitude aerial photograph of Peddocks Island in 1986 looking northwest. A tree grows to the left of the front steps of the guardhouse. The ash trees are visible in the lawn and several shade trees grow to the north of the guardhouse. (Alex MacLean photographer, 136114.tif, City of Boston collection, MIT Libraries Dome, accessed June 2011.)



Figure 9. View of guardhouse by the pier at right. Demolition is underway for the barracks (#29) at left. (Olmsted Center, April 2011.)



Figure 10. Rubble to be removed from the island piled on the foundation of barracks (#29). The guard house at right with the boathouse to the northwest (behind). (Olmsted Center, May 2011.)



Figure 11. View of the guardhouse visitor center at right, new flagpole on axis with the pier, new benches, signs, and planting bed in front of the guardhouse (Olmsted Center, August 2013.)



Figure 12. New picnic area with views to Hull Gut behind the guardhouse. Recently installed grill, picnic table by a cottonwood tree, gravel path, and newly planted grass (OCLP, August 2013.)



Figure 13. Path extending from the rear of the guardhouse visitor center to the picnic area (OCLP, August 2013.)



Figure 14. Close up of planting bed in front of the guardhouse. Salvaged granite foundation blocks line the edge of the bed (BOHA, June 2013.)



Figure 15. View of the chapel constructed during World War II to the west of the pier. (Olmsted Center, April 2011.)



Figure 16. View of the chapel prior to repainting. (Olmsted Center, July 2013.)



Figure 17. Chapel rehabilitation in progress. The building received a new roof and paint. (Olmsted Center, August 2013.)



Figure 18. View of barracks to be retained. (OCLP, April 2011.)



Figure 19. Barracks building retained (BOHA 2013.)



Figure 20. View south of fort road with barracks at left. One Norway maple remains along the fort road). (OCLP, June 2013.)



Figure 21. View of the area east of the administration building at Fort Andrews that will be graded and seeded for future mowing. (Olmsted Center, April 2011.)



Figure 22. View looking west of the administration building foundation with steps up to Officers Row. . (OCLP, August 2013.)



Figure 23. View of the administration building foundation with parade ground and former site of barracks building (#29). (OCLP, August 2013.)



Figure 24. View of the area east of the administration building at Fort Andrews that will be graded and seeded for future mowing. (Olmsted Center, April 2011.)



Figure 25. View looking east of slope covered with wood chips to reduce runoff and prevent sprouting of vegetation. (Olmsted Center, April 2011.)



Figure 26. View looking southeast of former building site on Officer's Row. The site will be graded, raked, and grass seeded. (Olmsted Center, April 2011.)



Figure 27. View north of former hospital site along Officers Row (July 2013).



Figure 28. View south of former hospital site along Officers Row, now serving as a group campground (July 2013).



Figure 29. View south from former hospital site along Officers Row (July 2013).



Figure 30. View of the fire control tower adjacent to the proposed camping area. (Olmsted Center, April 2011.)



Figure 31. Recently installed grill, picnic table, and screen planting of native trees and shrubs for yurt site near fire control tower (Olmsted Center, July 2013.)



Figure 32. View south from gun batteries of yurts and fire control tower (Olmsted Center, August 2013.)



Figure 33. View west of historic fort road between camping area at left and batteries at right with slopes on either side. (Olmsted Center, April 2011.)



Figure 34. View west of historic fort road between camping area at left and batteries at right with slopes on either side. (Olmsted Center, June 2013.)



Figure 35. Battery Bumpus, a gun battery to the north of the yurt campground (Olmsted Center, August 2013.)



Figure 36. View from the edge of the bluff at East Head, before railing installed. (Olmsted Center, April 2011.)



Figure 37. View east of unstable edge of the bluff at East Head. (Olmsted Center, April 2011.)



Figure 38. View east of railing installed thirty feet from the bluff. (Olmsted Center, August 2013.)

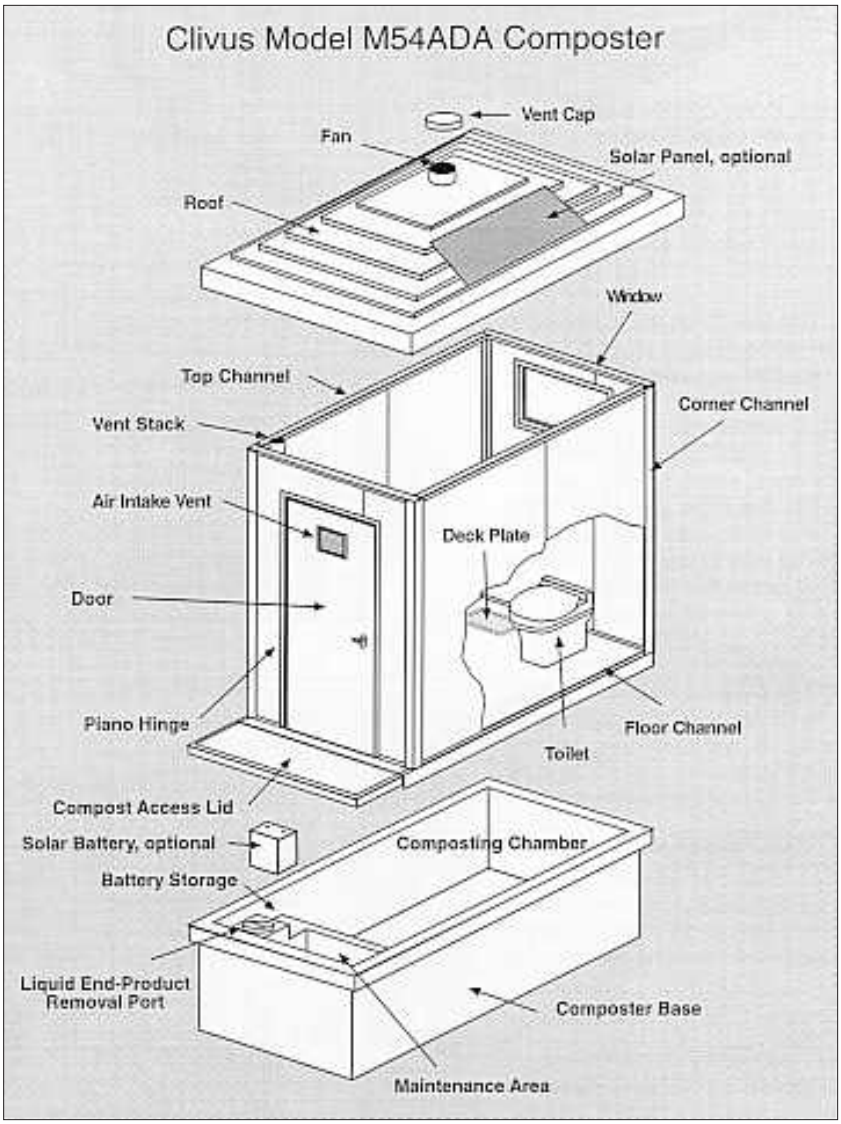


Figure 39. Diagram of Clivus Multrum composting toilet building. This type of privy is currently in use on other islands in the park (Clivus Multrum M54 ADA Trailhead.)



Figure 40. Clivus Multrum composting toilet installed in the yurt campground (2013).

Vegetation Management
Recommendations

Boston Harbor Islands National & State Park

Fort Andrews

Peddocks Island
Hull, Massachusetts

Vegetation Management

National Park Service
Olmsted Center for Landscape Preservation
www.nps.gov/oclp

SOURCES

1. Orthographic photo, ____
2. Designing the Parks Final Design Proposals, 2013
3. Field observation and photos, 2013
4. Aerial photo, 1944

DRAWN BY

Alexandra von Bieberstein, AutoCAD 2013 & Illustrator CS5
Updated by: Melissa Eloshway, 2016

LEGEND

- NPS Boundary
- 100' Buffer Line
- Building
- Managed Turf (Level 1)
- Meadow Area (Level 2)
- Managed (Level 3)
- Canopy Vegetation (Level 4)
- Paved Surface
- Wood Decking
- Water

NOTES

1. Projection: UTM Zone 19N, NAD 83, International Feet
2. All features shown in approximate scale and location

0' 50' 100' 200'

Drawing 1

Vegetation Management Recommendations

Boston Harbor Islands National & State Park

Fort Andrews

Peddocks Island
Hull, Massachusetts

Arrival Area: Vegetation Management

National Park Service
Olmsted Center for Landscape Preservation
www.nps.gov/oclp

SOURCES

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- Managed (Level 3)
- Canopy Vegetation (Level 4)
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- Wood Decking
- Water

NOTES

1. Projection: UTM Zone 19N, NAD 83, International Feet
2. All features shown in approximate scale and location

0' 25' 50' 100'

Drawing 2

Gun Battery McCook

Battery Loop Road Edge
Mow as needed 2' each side of trail

Gun Battery Bumpus

Gun Battery Rice

Battery Loop Treadway:
Mow as needed
6' width

Overlook

View to Harbor

Retain pine trees
Maintain views by removing selected trees, limbs, and shrubs

Preserve native elderberry, viburnum, birch and other native species in islands

Wet Meadow:
Remove invasives, encourage sensitive fern, vervain, and other wetland species; trim shrubs to maintain views

Yurt

Yurt area plantings:
Install and maintain native ferns, sedges, grasses and wildflowers

CAMPGROUND

Maintain lawn height 3-5", mow as needed

Yurt Area Meadow:
Maintain vegetation height less than 24"

Path from Fire Control Tower to Overlook

Path treadway:
Mow as needed, 6' width, control or eliminate poison ivy

Path/Woods Edge:
Mow as needed 2' width each side of train, maintain vegetation height less than 24"

Woodland Edge and Understory:
Remove invasives, encourage existing viburnum, elderberry, ferns, and other native plants

Trail from junction south of Campground to Overlook

Overlook Trail Treadway:
Mow as needed, 6' width

Overlook Trail / Woods Edge:
Mow as needed 2' width each side of trail

Fire Station

Bakery

Barracks

Tent pad

Privy

Install additonal privy

Vegetation Management Recommendations

Boston Harbor Islands National Park Area

Fort Andrews

Peddocks Island
Hull, Massachusetts

Campground Area
Vegetation Management

National Park Service
Olmsted Center for Landscape Preservation
www.nps.gov/oclp

SOURCES

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2. Designing the Parks Final Design Proposals, 2013
3. Field observation and photos, 2013
4. Aerial photo, 1944

DRAWN BY

Alexandra von Bieberstein, AutoCAD 2013 & Illustrator CS5
updated by: Melissa Eloshway, 2016

LEGEND

- NPS Boundary
- 100' Buffer Line
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- Managed Turf (Level 1)
- Meadow Area (Level 2)
- Managed (Level 3)
- Canopy Vegetation (Level 4)
- Paved Surface
- Wood Decking
- Water

NOTES

1. Projection: UTM Zone 19N, NAD 83, International Feet
2. All features shown in approximate scale and location

0' 15' 30' 60'

Drawing 3

Base end station and Depression Postion Finder

Collapsed fire control structure within 15' pit

Existing drainage ditch-consider run-off from yurts

Historic steps in need of repair

East Access Road Eliminate poison ivy

Steep slopes and abundance of poison ivy.

Privy

Shrub edge of mown grasses Eliminate poison ivy Remove privet, multiflora, honeysuckle

Slope to East access read

Maintain vegetation height 3-5"

SOUTH DRUMLIN

Slope to picnic area: Remove invasives, encourage native ferns, Canada mayflower, viburnum

Install additional privy

Maintain vegetation height of taller grasses at lawn edges less than 24"

Move privy into slope

Clear vegetation re-opening roadway to pedestrian use

Remove invasive privet, honeysuckle, multiflora, mulch around native ferns and groundcovers

Slope to campground

Optimal views of Hull and Peddocks Beach/Dock

Repair stairs

Install additional privy

CAMPING AREA

OFFICERS ROW

Picnic Area

Remove encroaching vegetation near steps

Maintain filtered views

Remnant walkway

Remove designated trees and limbs to maintain filtered views

Plant shrubs no higher than 4' tall

Thicket: Remove privet, multiflora honeysuckle. Encourage aspen, viburnum, elderberry, sensitive fern

Rehabilitated Steps-not easily accessible for campers with supplies

Maintain understory vegetation height less than 48"

Install handrail

Eliminate poison ivy

Clear encroaching vegetation around steps

Maintain understory height less than 48"

Retain existing apple trees and plant additional trees to enhance the orchard area.

Vegetation Management Recommendations

Boston Harbor Islands National & State Park

Fort Andrews

Peddocks Island
Hull, Massachusetts

Officers Row
Vegetation Management

National Park Service

Olmsted Center for Landscape Preservation

www.nps.gov/oclp

SOURCES

1. Orthographic photo, ____
2. Designing the Parks Final Design Proposals, 2013
3. Field observation and photos, 2013
4. Aerial photo, 1944

DRAWN BY

Alexandra von Bieberstein, AutoCAD 2013 & Illustrator CS5
Updated by: Melissa Eloshway, 2016

LEGEND

- NPS Boundary
- 100' Buffer Line
- Proposed Fence
- Building
- Managed Turf (Level 1)
- Meadow Area (Level 2)
- Managed (Level 3)
- Canopy Vegetation (Level 4)
- Paved Surface
- Wood Decking
- Water

NOTES

1. Projection: UTM Zone 19N, NAD 83, International Feet
2. All features shown in approximate scale and location

0' 25' 50' 100'

Drawing 4

Vegetation Management Recommendations

Boston Harbor Islands National & State Park

Fort Andrews
Peddocks Island
Hull, Massachusetts

Yurt Placement

National Park Service

Olmsted Center for Landscape Preservation

www.nps.gov/oclp

SOURCES

1. Orthographic photo, ____
2. Designing the Parks Final Design Proposals, 2013
3. Field observation and photos, 2013
4. Aerial photo, 1944

DRAWN BY

Alexandra von Bieberstein, AutoCAD 2013 & Illustrator CS5

Updated by: Ericka Duym, 2015, Melissa Eloshway, 2016

LEGEND

- NPS Boundary
- 100' Buffer Line
- Building
- Managed Turf (Level 1)
- Meadow Area (Level 2)
- Managed (Level 3)
- Canopy Vegetation (Level 4)
- Paved Surface
- Wood Decking
- Water

NOTES

1. Projection: UTM Zone 19N, NAD 83, International Feet
2. All features shown in approximate scale and location

0' 50' 100' 200'

Drawing 5

Vegetation Management Tasks

Peddocks Island offers an excellent outdoor classroom for resource stewardship. This section presents a series of vegetation management tasks that integrate the objectives and tasks from the recommendations with ongoing landscape, grounds, and resource stewardship work of DCR and NPS managers and volunteers. Long term maintenance of the project area that utilizes volunteer crews provides an opportunity to both get needed work done and build a cadre of committed site stewards.

Potential safety issues while carrying out resource stewardship projects include risks associated with boat transportation and docking, exposure to the natural elements, and working on an island. Island projects require additional preparedness to ensure appropriate footwear and protective clothing, adequate food and water, and means of communicating. Personal protective equipment should include gloves, safety glasses, extra drinking water, and first aid supplies. Potential injuries associated with resource stewardship may include slips, trips, falls, cuts, injury by tools, and exposure to poison ivy, ticks, insect bites, and heat exhaustion or sunburn. In general, a risk management assessment is needed before carrying out vegetation management tasks.

The following pages contain five tables detailing vegetation management areas, goals, methods, tools, plant material, and who will be conducting each management task. The tables list vegetation management projects to be accomplished in five areas respectively:

- Arrival and Parade Ground Area
- Campground and Overlook Area
- Officers Row
- North Fort Area
- West Fort Area

TABLE 1: VEGETATION MANAGEMENT FORT ANDREWS ARRIVAL AND PARADE-GROUND AREA

Areas	Goals/hazards	Methods	Who	Tools	Plant Material
Arrival and Visitor Center					
Lawn and parade grounds	Maintain vegetation height 3-5”	Mow as needed	Operations	Grass mower	Encourage current mix of native and non-native grasses
Edges of lawn area	Maintain vegetation height less than 24”	Mow as needed	Operations	Sickle, rotary, or flail mower	Encourage native warm season perennial grasses, asters, goldenrod
Recently graded – future lawn	Seed with cool season non-native grass mix	Mechanical seeding, hand seeding	Operations/ Contractor	Mechanical seeding equipment	Spread seed mix for frequently mowed lawn areas
Recently graded – future transition areas	Seed/plant warm season native grasses, cool season sedges and perennials	Mechanical seeding, hand seeding, plant plugs	Operations/ Contractor	Mechanical seeding equipment	Encourage little bluestem, red fescue, broom sedge, soft rush, path rush, asters, goldenrod, milkweed
Visitor center beds	Maintain attractive weed-free plantings	Weed, mulch, plant annuals and perennials for color	Operations/ Volunteers	Trowels, hand rakes	Maintain native shrubs, non-native annuals (Lantana, marigolds, currently)
Shade trees	Rehabilitate ash trees in front of VC	Remove dead limbs, mulch, chip debris, water	Operations/ Arborist	Chain saw, loppers, chipper seaweed, wood chips, hose	Rehabilitate ash trees, replace with red maple, American elm cultivars, aspen, cottonwood
	Source appropriate shade trees for difficult site (sandy, windy, salt)	Investigate cause of current problems, identify stressors; purchase material	Operations/ Arborist		Source red maple, American elm cultivars, big-toothed aspen, cottonwood or other appropriate species
	Plant shade trees behind VC; replacement trees in front of VC	Prep soil in advance, dig holes, plant trees, water, mulch	Operations/ Horticulturist/ Volunteers	Bobcat, shovels, mulch, hose for water	Plant red maple, American elm cultivars, big-toothed aspen, cottonwood, sassafras
Beach to Lawn Transition					
Beach to lawn transition	Eliminate poison ivy (on lawn near chairs)	Treat with herbicide	Herbicide license	Herbicide, backpack sprayer, protective gear	Eliminate poison ivy
	Encourage patches of natives	Identify, delineate, transplant, mulch natives	Botanist with/3-5 trained volunteers	Shovels, buckets, wheeled carts, wood chips	Encourage dunegrass, seaside goldenrod, beach pea
	Monitor and maintain patches of natives	Check bi-monthly, weed, mulch, remove invasives	Botanist/ Volunteers	Weed wrench, loppers, pruners, mulch	Remove mugwort, multiflora, oriental bittersweet, others
Parade Ground					
Historic parade ground	Maintain vegetation height 3-5”	Mow as needed	Operations	Grass mower, weed-wacker	Encourage current mix native and non-native grasses

Shade tree allee	Plant shade trees along path to barracks	Plant, mulch, water	Operations/ Volunteers	Bobcat, shovels, mulch, trailer pumper, or tree bags for water	Plant red maple, American elm cultivars, American chestnut cultivars, others
Orchard	Rehabilitate historic orchard	Prune for health, safety, chip debris, mulch with seaweed and wood chips	Operations/ Arborist/ Volunteers	Chain saw, loppers, chipper, wheeled carts, shovels, pitchforks	Identify existing trees
	Plant low-maintenance cultivars and companion plants	Source, order and plant trees, shrubs, forbs; mulch, protect from wildlife and mowing damage	Operations/ Horticulturist	Bobcat, shovels, mulch, truck, trailer pumper unit or tree bags for water, trunk protective materials	Plant Roxbury russet, Baldwin, Tolman Sweet, Endicott Pear, Sour Cherry, American Plum, native crabapples, shadbush, highbush blueberry
	Maintain new plantings, pollinators, companion plantings	Monitor for wildlife/wind damage, replace mulch, water	Operations	Trunk protection, stakes, tree bags, truck/pumper unit, mulch, shovels	Maintain Roxbury russet, Baldwin, Tolman Sweet, Endicott pear, sour cherry, American plum, native crabapples, shadbush, highbush blueberry
Grassy edge of parade ground	Maintain vegetation height less than 24”	Mow as needed	Operations	Sickle, rotary, or flail mower	Encourage current lawn species
Woodland Edges and Understory Northeast and Southwest of Parade Gorund					
Woodland edge and understory	Eliminate poison ivy (near toilets and stable)	Cut-stump, treat with herbicide, foliar spray, mechanical removal	Herbicide license	Loppers, pruners, herbicide, protective gear, trash bags	Eliminate poison ivy
*Woodland edge and understory Option 1****	Locate, protect, label native understory shrubs and forbs	Walk through annually	Botanist/Trained volunteers	Field guides, pruners, flagging, sharpies, saws	Identify existing viburnum, elderberry, ferns, and other natives
	Create invasive-free edge within forest understory	Hand or mechanically remove invasives, treat stumps, chip debris, mulch around native plants	Operations/ Biologist/ Herbicide license/ Trained Chipper Operator	Brush hog, weed wrench, pruners, saws, loppers, herbicide, chipper	Remove privet, multi-flora, honeysuckle, bittersweet; Encourage native species
*Woodland edge and understory Option 2****	Maintain brush-free edge within forest understory	Mechanically remove non-native shrubs, leave natives if possible, chip debris, mulch	Operations	Brush hog, chipper, loppers, pruners, herbicide	Remove privet, multi-flora, honeysuckle, bittersweet
Thicket and Seep along Southwest Side of Parade Ground					

Thicket	Remove invasives	Weed, cut, treat with herbicide (cut stump), chip debris, mulch natives	Biologist/ Herbicide license/ Trained chipper operator /Trained volunteers	Weed wrench, pruners, loppers, herbicide, chipper	Remove privet, multiflora rose, Norway maple, crabapple**
	Encourage natives	Prune lower branches at edge of thicket to accommodate mowing, chip debris, mulch natives	Biologist/Chipper training/ Trained volunteers	Loppers, pruners, chipper, shovels, forks, rake, wheeled cart	Encourage viburnum, elderberry. Maintain some crabapple **
	Create pathway through thicket	Trim branches, chip debris, mow, mulch, possible boardwalk, seating	Biologist/ Trained chipper operator/ Trained volunteers	Loppers, pruners, wood chips, shovels, rakes, wheeled cart, chipper	Remove crabapple**, multiflora, privet, possibly trim some native trees and shrubs
	Monitor and maintain thicket path and invasives	Check monthly, re-cut or re-treat invasives, check for vegetation encroaching on path, wildlife observations	Biologist/ Herbicide license	Loppers, pruners, herbicide, wheeled cart, woodchips, binoculars	Encourage viburnum, elderberry, blackberry, raspberry. Remove invasives and woody natives that encroach on path
	Interpret thicket	Label plants, provide informational material on plants and wildlife	Interpretive staff	Wooden stakes, low cost durable means of signage	Label viburnum, elderberry, aspen, gray birch, sensitive fern and other natives

* Beach-lawn transition in the arrival area is currently dominated by mugwort, poison ivy and erosional cliff-lets. Locally sourced native dunegrass would help stabilize the eroding shoreline behind the visitor center. Dunegrass is easy to install, low maintenance, biologically accurate, present elsewhere on the island (small quantities may be transplanted).

**The thicket area contains what appears to be spreading clumps of crabapple, of an unknown variety. Crapapples are useful as pollinators and sources of rootstock for new apple grafts, but can also be overly aggressive in a native area.

*** If time and staff resources allow, treatment of edge areas would reduce non-natives and enhance the fort setting as it appeared at the end of the historic period.

TABLE 2: VEGETATION MANAGEMENT FORT ANDREWS CAMPGROUND AREA

Areas	Goals/ hazards	Methods	Who	Tools	Plant Material
Gun Battery Area					
McCook, Bumpus, Rice	Remove damaging vegetation. Possibly dangerous area to work	Cut, lop, weedwack, and pull weeds, apply herbicide, chip debris	Operations/ Herbicide license	Chain saw, loppers, backpack sprayer, herbicide, chipper	Remove privet, Oriental bittersweet, multiflora rose, Norway maple
Gun Battery loop road treadway	Maintain vegetation height 3-5”*	Mow as needed, 6’width	Operations	Grass mower	Encourage existing red fescue, path rush, sedges
Gun Battery loop road edge	Maintain vegetation height less than 24”	Mow as needed 2’width each side of trail	Operations	Sickle, rotary, or flail mower	Encourage existing red fescue, path rush, sedges, ferns, other native species
Trail from Junction South of Campground to Overlook					
Overlook	Maintain views of Hull and Islands	Remove selected trees, limbs and shrubs	Operations/ Arborist	Chain and hand saws, loppers	Retain pine trees, trim or remove shrubs
Overlook trail	Re-establish historic path to overlook, visible in 1920s aerial photograph	Hand or mechanical removal, treat stumps, chip debris	Operations/ Arborist/ Biologist/ Herbicide license/Trained chipper operator/ Volunteers	Chain and hand saws, weed wrench, pruners, herbicide, backpack sprayer	Remove privet, Oriental bittersweet, honeysuckle, selected native trees/shrubs
Overlook trail treadway	Maintain vegetation height 3-5”	Mow as needed, 6’width	Operations	Grass mower	Encourage existing red fescue, path rush, sedges
Overlook trail/ woods edge	Maintain vegetation height less than 24”	Mow as needed 2’ width each side of trail	Operations	Sickle, rotary, or flail mower	Encourage existing red fescue, path rush, sedges, ferns, other shade tolerant species
Path from Fire Control Tower to Overlook					
Path treadway	Maintain vegetation height 3-5”	Mow as needed 6’ width	Operations	Grass mower	Encourage existing red fescue, path rush, sedges
Path/woods edge	Maintain vegetation height less than 24”	Mow as needed 2’ width each side of trail	Operations	Sickle, rotary, or flail mower	Encourage ferns, native warm season grasses, asters, goldenrod
Path treadway/ woods edge	Control/ eliminate poison ivy	Mow, treat with herbicide (foliar spray, cut stump)	Herbicide license	Sickle, rotary, or flail mower, backpack sprayer	Remove poison ivy

Woodland edge and understory	Locate and protect native understory shrubs and forbs	Walk through bi-monthly	Botanist w/3-5 trained volunteers	Field guides, pruners, saw, flagging, sharpies	Encourage existing viburnum, elderberry, ferns, other natives as found
	Create invasive-free islands within forest understory	Hand remove or cut/stump invasives, chip debris, mulch around native plants	Biologist w/ trained volunteer groups	Weed wrench, pruners, saws, loppers, herbicide, chipper	Remove privet, multiflora rose, Oriental bittersweet, Japanese barberry
	Maintain filtered views by cutting brush in understory	Mechanical removal of invasive shrub layer, chip debris	Operations	Brush-cutter, chain saw, loppers, chipper	Remove privet, multiflora rose, Oriental bittersweet, honeysuckle
	Improve safety and appearance of understory area	Remove dead and damaged tree limbs, high canopy bittersweet, chip debris	Operations/ Arborist	Cherry picker, climbing gear, chain saw, chipper	Remove Norway maple branches, Oriental bittersweet
Yurt Area					
Lawn at center of yurt area	Maintain vegetation height 3-5”	Mow as needed	Operations	Grass mower, weed-wacker	Encourage current lawn mix
Yurt area plantings	Install low maintenance native herbaceous plantings **	Plant, transplant, weed, mulch	Horticulturist w/ volunteers	Shovels, trowels, buckets	Plant ferns, sedges, native grasses, asters, goldenrods, field horsetail
	Maintain herbaceous plantings until stable	Weed, mulch, replace plants as needed, remove invasives	Horticulturist w/ volunteers	Hand tools, wood chips, wheeled cart, shovels, buckets	Maintain ferns, sedges, native grasses, asters, goldenrods, field horsetail
	Monitor and maintain health of shrub plantings	Check for health, prune, weed, add mulch as needed	Operations/ Horticulturist w/ volunteers	Pruners, loppers, wood chips, wheeled cart	Maintain bayberry, viburnum, chokeberry
Wet Meadow Area between Yurts and Overlook					
Wet Meadow area	Remove invasives	Weed, cut, treat with herbicide (cut stump)	Biologist/ Herbicide license	Weed wrench, pruners, loppers, herbicide equipment	Remove mugwort, privet, multiflora rose
	Establish stable herbaceous planting	Divide, transplant, mulch, sow appropriate seed	Horticulturist w/3-5 trained volunteers	Shovels, trowels, buckets	Encourage sensitive fern, vervain, grass-leaf goldenrod, NY Aster, other wetland species
Wet Meadow area viewshed	Monitor and maintain plantings, trim shrubs to preserve overlook views	Weed, mulch, remove invasives; trim and prune Native shrubs	Horticulturist w/3-5 trained volunteers	Weed wrench, loppers, pruners, wood chips, wheeled cart, shovels	Trim and maintain viburnum, elderberry, non-native shrubs and forbs

* Mowing height and ticks: Most sources recommend enlarging lawns and mowing grass to 3 inches or less to discourage ticks. On a sunny lawn, short grasses dry out and become relatively inhospitable to ticks. During the growing season, keeping the turf below 3 inches may require mowing every 3-5 days. A manicured 3 foot barrier and a 9 foot tick migration zone on the lawn side of the barrier are also recommended. Shaded forest trails are problematic. Exclusion/removal of hosts (a.k.a. deer) is recommended by many sources. This might be a practical option on Peddocks if ticks become a problem.
http://www.smdc.army.mil, http://www.ct.gov, http://www.health.ny.gov

** Some work may need to be done when yurts are unoccupied

TABLE 3: VEGETATION MANAGEMENT FORT ANDREWS OFFICERS ROW AREA

Areas	Goals/ hazards	Methods	Who	Tools	Plant Material
Group Camp Area					
Camping area	Maintain vegetation height 3-5”	Mow as needed	Operations	Grass mower	Maintain current mix of native and non-native grasses
*Taller grasses at edge of lawns**	Maintain vegetation height less than 24”	Mow as needed*	Operations	Sickle, rotary, or flail mower	Encourage native warm season perennial grasses, asters, goldenrod
Shrub edge of mown grasses	Maintain native shrub edge and understory	Identify, remove and treat non-native woody shrubs and vines, chip debris, mulch	Operations/ Biologist/ Herbicide license/Trained chipper operator/ Volunteers	Brush hog, chipper, loppers, pruners, herbicide	Remove honeysuckle, privet, multiflora, bittersweet
Access roads and edges; remnant walkways	Eliminate poison ivy	Mow, foliar spray, cut stump	Herbicide license	Grass mower, backpack sprayer, herbicide loppers, protective equipment	Elmininate poison ivy
Filtered Views					
Slope to parade ground	Maintain filtered views	Remove designated trees, limbs, chip debris, mulch native vegetation	Arborist/Arborist trainees	Chain saws, hand saws, loppers, chipper	Remove Norway maple, privet
	Maintain understory vegetation height less than 48”	Remove shrubs with weed wrench, cut and treat stumps to prevent regrowth, chip debris	Biologist/ Herbicide license/ Trained chipper operator	Saws, loppers, weed wrench, herbicide, chipper	Remove privet, multiflora rose, Oriental bittersweet
	Encourage native plant cover	Identify and flag native trees and shrubs, mulch natives with chipped debris	Botanist/ w 3-5 volunteers	Field guides, flagging, sharpies	Encourage viburnum, elderberry, possibly alder
Steps to parade ground	Monitor and reduce vegetation around steps as needed	Clear encroaching vegetation	Operations	Loppers, pruners,	Trim Blackberry, raspberry. Remove Oriental bittersweet, privet
Slopes to campground, picnic area, and East access road from South Drumlin					
*Slopes to campground, picnic area and East access road-**	Remove invasives	Weed, cut, treat with herbicide, (cut stump), chip debris, mulch around natives	Operations/ Biologist/ Herbicide license/ Trained chipper operator	Weed wrench, pruners, loppers, herbicide equipment, chipper	Remove privet, multiflora rose, young Norway maple
	Enhance native vegetation	Identify, label and flag natives	Botanist w/1-2 trained volunteers	Field guide, flagging, sharpies	Ferns, Canada mayflower, white pine, viburnum

East Road to Tombolo					
Path to tombolo	Establish new route west of McDevitt cottage to avoid eroding bluff	Identify optimal route	Operations, Contractors		To be determined
	Clear vegetation	Mechanical removal of trees and shrubs, chip debris	Operations/ Arborist/ Contractors	Appropriate mechanical equipment	To be determined
	Salvage desirable plant material	Identify and relocate any desired plant material	Botanist/ Volunteers	Shovels, buckets, wheeled carts	To be determined

*Annual mowing will not kill shrubby invasives but may help keep them short.

** This is a large area and may not warrant intensive management, it does have a nice amount of native ferns and understory in spots.

TABLE 4: VEGETATION MANAGEMENT FORT ANDREWS NORTH FORT AREA

Areas	Objectives	Methods	Who	Tools	Plant Material
Batteries, Bunkers					
Battery Cushing, Battery Whitman	Prevent damage to structure from vegetation	Remove damaging/ encroaching vegetation, treat stumps with herbicide, chip debris	Operations	Chain saw, hand saw, loppers, pruners, herbicide	Remove privet, Oriental bittersweet, Norway maple, multiflora rose
Battery Whitman	Rehabilitate Mortar Pit B	Clean, remove invasives, stabilize and hardscape mortar pit, chip debris	Operations/ Biologist/ Volunteers	Truck, shovels, brooms, mortar	Remove mugwort, privet, honeysuckle Install granite blocks/picnic table
Quartermaster Building					
Lawn	Maintain vegetation height 3-5”	Mow as needed	Operations	Grass mower	Encourage current lawn mix
Northwest Viewshed East of Storehouse					
Trail to NW viewshed	Eliminate poison ivy along trail	Foliar spray, cut stump	Biologist/ Herbicide license	Backpack sprayer, herbicide	Eliminate poison ivy
NW viewshed	Encourage native plant cover	Identify and flag native trees and shrubs	Botanist with 1-3 trained volunteers	Field guides, flagging, sharpies	Encourage viburnum, elderberry, gray birch, other
	Remove invasive shrubs and vines	Weed wrench, cut, treat stumps, chip debris	Biologist/ Herbicide license/Trained chipper operator/ Volunteers	Loppers, pruners, backpack sprayer, herbicide, chipper	Remove bittersweet, privet, honeysuckle
	Create destination at end of trail	Install seating, poss. picnic tables, interp. signage about Boston skyline, historic ship types etc.	Operations, Interpretive staff	Granite blocks, signs	
Woodlands along Road to Quartermaster Building					
Knotweed area (to be removed)	Develop management plan for this area	Survey area for native plants, obstacles to mowing, safety concerns	Operations/ Biologist	Site visit	Identify native and invasive plant material
	Identify any natural resources	Flag and protect native and historic trees, thickets, habitat areas	Botanist	Flagging, permanent markers, field guides	To be determined

Knotweed area	Remove obstacles to mowing, chip debris	Remove invasive shrubs, chop and pile obstacles to mowing, address safety issues (dangerous limbs overhead, trash, etc), chip debris	Operations/ Arborist/ Trained chipper operator/ Volunteers	Chain saw, brush hog, loppers, chipper	Remove honeysuckle, multiflora rose, stumps, debris etc.
	Remove knotweed	Mow	Operations	Sickle, rotary or flail mower	Remove knotweed
	Encourage aggressive natives	Delineate, mulch, transplant natives if appropriate	Botanist/3-5 trained volunteers	Shovels, buckets, wood chips	To be determined
	Remove knotweed re-sprouts	Mow, or fence and graze livestock	Operations/ Contractor	Sickle, rotary or flail mower, goats, sheep	Remove knotweed
Transition to slopes	Identify and remove invasive vegetation	Remove shrubs with weed wrench or cut and treat stumps to prevent regrowth, chip debris	Biologist/ Herbicide license/ Trained chipper operator/ Trained volunteers	Saws, loppers, weed wrench, herbicide chipper	Remove privet, multilflora, bittersweet, honeysuckle
Upper Forest* , Northwest ridge of North Drumlin on East Head					
Pine forest	Identify and protect desired vegetation	Identify, mark, and protect native and desirable non-native plants	Botanist	Field guides, pruners, sharpies	Encourage Austrian pine, Scotch pine, red pine, paper or gray birch, ferns
	Remove invasive shrubs and vines	Weed wrench, cut, treat stumps with herbicide, chip debris, mulch natives	Biologist/ Herbicide license/ Trained chipper operator	Saws, loppers, weed wrench, herbicide chipper	Remove privet, honeysuckle, multiflora, bittersweet
Trail to West Fort area between Storage Building and South Drumlin on East Head					
Trail to West Fort area	Keep vegetation height less than 24" along trail edges	Mow as needed	Operations	Sickle, rotary or flail mower	Limit height of existing vegetation

*Depression Position Finder Bunker is located in Upper Forest NW of Battery McCook. Entrance is an open shaft, the viewing area of the bunker is a potential access point as well. The searchlight pit has a cover of unknown strength, it is about 30' from the DPF bunker. Both are protected by extensive thorny growth, however they are currently accessible to the intrepid explorer. It would be nice to rehabilitate the former pine/birch forest in this part of the island, but vegetation work in this area might create easier access to these hazards.

TABLE 5: VEGETATION MANAGEMENT FORT ANDREWS WEST FORT AREA

Areas	Objectives	Methods	Who	Tools	Plant Material
Cottages on Southwest Side of South Drumlin on East Head					
Cottage lawns and transition areas	Maintain vegetation height 3-5" if appropriate	Mow as needed	Operations	Grass mower	Existing grasses
	Maintain lawn edge height less than 24"	Mow as needed	Operations	Sickle, rotary, or flail mower	Existing grasses, multiflora, honeysuckle, privet
	Identify any existing natural resources	Identify native plants/wildlife use	Botanist/ Biologist	Field guides, binoculars	To be determined
	Maintain selected habitats wildlife if appropriate	Weedwacking, cutting brush, treating with herbicide, chip debris if appropriate	Operations/ Biologist/ Herbicide license/ Trained chipper operator	Loppers, pruners, herbicide, chipper if needed	Remove Norway maple, multiflora, bittersweet, privet
Historic plantings	Inventory cultural vegetation	Identify and inventory historic plantings associated with cottages	Botanist	GPS, camera, field guides	Inventory apple trees, historic ornamentals
	Stabilize or preserve selected cottage plantings	Weed, mulch, propagate desired plant material	Botanist, Horticulturist	Apply appropriate horticultural techniques	Preserve any desired historic ornamentals
	Maintain historic orchard	Remove invasive overgrowth, prune apple trees, mow around trees, encourage desirable companion plants	Arborist, Biologist, Trained chipper operator, Volunteer groups	Loppers, pruners, brush cutter, chipper if needed	Preserve apple and other fruit trees and native flora that encourages pollinators
Fire Control Tower Ruins on South Drumlin on East Head					
*Drainage ditch**	Identify natural and cultural resources	Map and check for natural and historic resources	Biologist/ Botanist	GPS, camera, field guides	Identify ferns, mosses, native forbs
Historic steps, fence lines	Identify natural and cultural resources	Map and check for natural and historic resources	Biologist	GPS, camera, field guides	To be determined
Norway Maple Forest on South Drumlin on East Head					
Slopes to campground and East access road	Identify and encourage native plants	Clear encroaching invasives, treat with herbicide, chip debris, mulch natives	Biologist/ Botanist/ Herbicide license/ Trained chipper operator / Volunteer groups	Loppers, weed wrench, chipper	Encourage ferns, Canada mayflower

Historic Pine Nursery on West Side of South Drumlin on East Head					
Road to pine forest	Create access for chipper	Clear road, chip brush	Operations/ Arborist/ Biologist/ Volunteers	Loppers, chain saw, chipper	Remove privet, multiflora, bittersweet, selected natives
Pine forest	Assess condition of historic plantings	Site visit in winter	Arborist	Apply appropriate techniques	Assess condition of Austrian pine, Scotch pine, red pine
Pine forest	Preserve/ stabilize/ regenerate plant material if appropriate	Apply applicable horticultural techniques	Horticulturist/ Arborist	Chain saws, herbicides, pesticides, mulch etc.	Preserve Austrian pine, Scotch pine, red pine
	Identify and remove invasive understory to allow regeneration	Remove mechanically or by hand; cut/ treat stumps to prevent regrowth, chip debris or limb and leave flat	Biologist/ Herbicide license/ Trained chipper operator	Brush hog or saws, loppers, weed wrench, herbicide, chipper	Remove Norway maple, honeysuckle, privet, multiflora rose, Oriental bittersweet
	Encourage appropriate historic or native understory	Identify and flag and mulch desirable trees and shrubs	Botanist	Field guides, flagging, sharpies, shovels, mulch	Encourage ferns, mosses, sedges. other
Young Forest Management Area					
Young forest (Northwest slope of South Drumlin)	Locate and assess condition of young forest remnants	Site visit in winter	State upland game biologist/ Biologist		Identify gray birch, viburnum, quaking aspen
	Assess wildlife use of young forest	Bi-monthly site visits	Biologist/ NPS birding volunteers	Field guides, binoculars	Assess wildlife use of gray birch, viburnum, aspen
	Remove invasive trees, vines, and tall shrubs	Remove trees and shrubs, chip debris or limb and leave	Arborist/ Biologist/ Herbicide license/ Trained chipper operator/Trained volunteers	Brush hog or chain saw, hand saws, loppers, weed wrench, herbicide, chipper	Remove Norway maple, privet, Oriental bittersweet, multiflora, privet
	Clear native vegetation in accordance with state guidelines, encourage early successional species	Cut back native trees over 4" DBH and allow to re-sprout, chip debris if appropriate, leave fallen logs/ thickets when appropriate	Biologist/ Arborist/ Herbicide license/ Trained chipper operator /Trained volunteers	Brush hog, sickle, rotary or flail mower, chain saw, loppers, chipper	Remove black cherry, other mature natives if appropriate
	Monitor results and log habitat sections on rotational basis	Assess wildlife use, cut trees and shrubs; manage debris in accordance with State guidelines	Biologist/ Arborist/ Herbicide license/ Trained chipper operator /Trained volunteers	Hand saws, chain saw, brush hog if appropriate	Remove native and invasive trees and shrubs as needed to maintain shrubland and young forest
Phragmites 'Seep' West of McDevitt Cottage at Base of South Drumlin on East Head					
Trail to 'seep' (for staff use only)	Create access to 'seep' to identify resources	Cut inconspicuous path, eliminate poison ivy	Biologist/ Herbicide license	Loppers, pruners, backpack sprayer, herbicide	Remove phragmites, poison ivy

Phragmites stand (to be removed)	Identify plant material in this area, remove invasives and encourage natives if appropriate	Manual or mechanical removal of phragmites, woody and viny plants, chip debris, mulch natives	Biologist/ Botanist/ Herbicide license/ Trained chipper operator /Trained volunteers	Pruners, loppers, herbicide, chipper	Remove phragmites and other invasives as needed to encourage any native plants in this area

* Ditches and seeps can be good places for native ferns/shrubs to take hold

Condition Assessment and Maintenance Schedule

A condition assessment and maintenance schedule is an important component of a vegetation management plan. Periodic inspections of the Fort Andrews area are necessary to identify damage, deterioration, or potential threats to vegetation and other features, as well as safety issues. Inspections should be conducted routinely to record the status of vegetation, identify work needed to improve condition, and establish maintenance priorities. This chapter details condition assessments for vegetation and outlines a yearly schedule for vegetation management on Peddocks Island. The schedule is provided as a table to which additional tasks can be added or amended (Table 6).

Cultural landscape assessments are used to:

- Establish a baseline of information on the condition of the landscape
- Document change in condition over time
- Identify causes of damage and potential threats to landscape resources
- Determine preservation maintenance actions needed for correcting deficiencies in condition
- Assist with setting preservation maintenance and resource management priorities
- Identify the level of effort and resources required (staffing, expertise, funding, etc.) to address deficiencies and improve condition
- Evaluate the effectiveness of implemented treatments
- For Peddocks Island vegetation, four types of inspections are recommended: cyclic comprehensive assessments, annual inspections, daily checks, and event/impact assessments.

Cyclic Comprehensive Assessments

Cyclic comprehensive assessments should be conducted once every three to five years to document, at a high level of detail, the condition of individual trees and shrubs and the overall historic character of the landscape. A multi-disciplinary team including gardeners, horticulturists, landscape architects, architect, engineer, and cultural resource staff should participate in the process. The information collected should be used for identifying long-term preservation maintenance goals and as a baseline to monitor change in condition over time.

ANNUAL INSPECTIONS

Annual inspections should focus on routine evaluation of landscape condition. Using information from cyclic comprehensive assessments for comparison, annual inspections assist with tracking the improvement or deterioration of resources. Based on information collected through an annual inspection, yearly maintenance schedules can be effectively prioritized.

DAILY CHECKS

Daily checks are used to note previously undocumented deficiencies in landscape condition that pose threats to visitor safety and/or park resources. These assessments are accomplished as "windshield" surveys and should not involve highly detailed examinations of landscape features. If a daily check identifies problems that require further study, the need for a more detailed inspection should be noted rather than conducting such examination at that time.

EVENT/IMPACT ASSESSMENTS

Event/impact assessments are conducted before and/or after a planned or unplanned event such as a hurricane, ice storm, wind storm, extended drought, vandalism, pest infestation, VIP visit, or special event. Specific features to be inspected, skills of the assessment team and types of impacts to evaluate will depend on the actual event. For planned or anticipated events, an inspection before and after the impacts occur is recommended to assist with mitigating resource damage.

CONDUCTING INSPECTIONS

Condition assessments at Peddocks Island should include four steps: 1) Planning; 2) Field Inspections; 3) Documenting Information; and 4) Prioritizing Preservation Maintenance Work.

PLANNING

Prior to conducting field assessments, an inspection checklist should be prepared to identify the features to examine, deficiencies to analyze, and degree of acceptable resource deterioration. For Peddocks Island, inspection criteria are listed below for vegetation, views, and adjacent structures.

FIELD INSPECTIONS

Field inspections should focus on documenting current condition of individual features and the integrity of historic landscape character. Specifically, condition assessments at Fort Andrews should:

- Monitor change in plant health, growth, size, structural stability
- Evaluate deficiencies of built features in the landscape such as concrete heaving, settling, and erosion
- Identify potential threats to resources including pests, diseases, weather, fire, and invasive plants
- Recognize changes to the intended historic character of the landscape, including overgrowth/undergrowth of plants, blocked views/vistas, and altered pruning styles
- Determine the severity of deficiencies and impacts, i.e, safety hazard, resource loss;
- Specify corrective actions needed to improve resource condition.

A primary goal of field inspections is to identify deficiencies and associated actions necessary to improve resource condition. It is important to recognize that while individual features may be in good physical condition, historic character of the landscape may be compromised. For example, a specimen tree may be in good health; however, limbs from the tree that are blocking a historic view are adversely affecting the integrity of the cultural landscape. As such, it is important to assess individual features and overall historic character to determine cultural landscape condition deficiencies.

Landscape inspections at Fort Andrews should note the type of impacts and the severity of impacts to resources. Types of impacts include: deferred/poor maintenance, erosion, fire, storm damage, pests/diseases, vandalism, and soil compaction. Noting the severity of an impact helps to determine the magnitude of a particular problem: low severity will not cause further damage to a resource, moderate severity may result in further damage to a resource if no corrective action is taken, and high severity will cause certain damage to a resource or pose a serious safety risk if no corrective action is taken.

Field inspections offer the opportunity to update landscape records such as site plans and photographs. It is recommended that site plans are annotated with information regarding resource condition and if features have been added, removed, or modified as compared to the previous inspection. Photographs of landscape features should be taken to support written documentation of current condition.

Some deficiencies will be obvious, such as a fallen tree, dead shrub, or cracked pavement, while others, such as a nutrient deficiency or root disease, are more

subtle and will require further examination. Condition information collected in the field should be classified into four categories: good, fair, poor, and critical:

Good condition indicates that a resource shows no clear evidence of negative disturbance or deterioration. The resource is well preserved and no immediate corrective action is required to maintain its current condition.

Fair condition indicates the resource shows evidence of minor disturbances. Some degree of corrective action is needed to prevent further deterioration. Without corrective action, the resource will degrade to poor condition.

Poor condition indicates the resource shows evidence of major negative disturbances. Corrective action is necessary to halt deterioration, improve condition, and prevent further decline or failure of the resource.

Critical condition indicates that there is severe and advanced resource deterioration and loss will occur without intervention. Immediate corrective and/or stabilization action is required.

Information collected in the field should have sufficient detail to facilitate the prioritization of work, preparation of cost estimates, and assist with identifying necessary labor, equipment and materials to correct deficiencies. Field notes should include:

- Deficiencies and associated severity
- Location of deficiencies with reference to a specific landscape area/zone (e.g., Hilltop Gardens Landscape Character Area/Lower Garden)
- Cause(s) of deficiencies (e.g., normal wear, vandalism, etc.)
- Need for specialist(s) or further examination
- Corrective actions needed to address deficiencies
- Sufficient detail for preparing cost estimates (e.g., specific work to be performed, equipment and material requirements)
- Safety hazards or other serious problems should be emphasized as “Critical”, requiring immediate attention.
- In cases where a landscape feature is causing damage to an adjacent resource (e.g. a tree limb causing roof damage), the information should be shared immediately with other maintenance and resource managers at the site

DOCUMENTING INFORMATION

Information collected during a field inspection needs to be organized in a paper file system or computerized format so that it can effectively be used for work planning and resource management.

PRIORITIZING PRESERVATION MAINTENANCE WORK

When prioritizing landscape preservation maintenance at Fort Andrews, factors to consider include:

Safety. The safety of visitors, volunteers, and staff is imperative. Resource conditions that pose threats to health and safety should be addressed as immediately after being observed in the field.

Critical Systems. Landscape features that will damage adjacent resources if they fail are considered critical systems. For example, a retaining wall of a fortification is critical system because if it collapses, damage will occur to adjacent resources. Due to the potential for damaging multiple resources, critical system deficiencies should be corrected as soon as possible.

Significant Features. As identified in DCR resource management documents, features associated with historic Fort Andrews should be preserved to the extent that they do not pose safety threats.

Character. Retaining the overall character of the landscape is critical to meeting preservation goals, strengthening educational value and enhancing visitor experience at the site.

Function. Features in the landscape at Fort Andrews should function if they are used to meet contemporary management goals. For example, stairways improve visitor circulation throughout the Fort Andrews area.

Aesthetic. Deficiencies that are clearly visible to the visiting public can detract from their experience at the site. While not critically important for resource protection and preservation, maintenance activities which improve aesthetics, i.e., Oriental bittersweet vines growing into trees.

Prior to performing preservation maintenance actions, the feasibility of implementation should be reviewed. This evaluation will determine the best maintenance options for meeting operational, preservation and management goals at the site. Feasibility considerations should include:

Affordability. Is the recommended action affordable, if not, how can it be modified or adapted to work within the available budget?

Sustainability. How long will the corrective action last? Is there a way that the recommended procedure can be changed to have a longer lasting effect?

Accessibility. Will implementation of the recommended action limit visitor access to an area of the landscape? Will it require access by large equipment? How can the recommendation be modified to provide more access to the area?

Impact to adjacent resources. Are there adjacent resources such as a building or artwork that may be adversely impacted by implementing the recommended action? If so, can the recommendation be modified to be more sensitive to adjacent resources?

Availability of supplies, expertise, or equipment. Are all of the necessary resources needed to do the work readily available? If not, can the work be modified and accomplished with available resources?

MAINTENANCE CALENDAR

Table 6 presents a maintenance calendar for recurring actions necessary to care for the vegetation at Fort Andrews. The calendar is organized by task, then by month. Maintenance tasks are identified as "High Priority" (bold X); and "As Needed" (small x). It is recommended that "High priority" actions be done as scheduled to retain important features and perpetuate the historic landscape character at Fort Andrews. As staff time and funding allow, action items identified "As Needed" should be done to enhance preservation maintenance operations. Routine inspections will inform tasks to be listed in the calendar. As such, calendar schedules will have to be periodically adjusted to accommodate for additional maintenance activities. Records of maintenance performed, adjustments to schedules, etc., should be kept and used, as applicable, to update the calendars.

VEGETATION - SHADE AND ORCHARD TREES

- Dead/missing plant
- Plant health/vigor problems
- Flowers/fruit problems (insect, disease, or pest damage)
- Foliage problems (insect damage/disease, chlorotic, wilting, etc.)
- Plant growth excessive/irregular
- Improperly pruned (inappropriate size/shape)
- Improperly planted
- Heavy accumulation of debris/organic matter on leaf surfaces
- Failing graft union
- Soil build-up around root flair
- Trunk/branch/root problems (splits, cracks, decay)
- Abnormal branch structure
- Improper canopy height
- Insect/disease/pest problems
- Weed/exotic species problems
- Potential safety hazard

- Damaged/improperly installed/removed components (tree staking, guy wires, cable and bracing)
- Further inspection/testing required

SHRUBS

- Dead/missing plant
- Plant health/vigor problems
- Flowers problems (insect, disease, or pest damage)
- Foliage problems (insect damage/disease, chlorotic, wilting, etc.)
- Plant growth excessive/irregular
- Improperly pruned (inappropriate size/shape)
- Improperly planted
- Heavy accumulation of debris/organic matter on leaf surfaces
- Soil build-up around root flair
- Trunk/branch/root problems (splits, cracks, decay)
- Abnormal branch structure
- Missing components (plants within a hedge)
- Incorrect spacing between plants
- Weed/exotic species problems
- Further inspection/testing required

PERENNIAL BEDDING PLANTS AROUND GUARD HOUSE

- Dead/missing plant
- Plant health/vigor problems
- Plant growth excessive/irregular
- Improperly pruned (inappropriate size/shape)
- Improperly planted
- Incorrect spacing between plants
- Insect/disease/pest problems
- Weed/exotic species problems
- Further inspection/testing required

VISTAS/VIEWS

- Trees/limbs blocking view
- Excessive vegetation growth/height
- Missing/altered focal point
- Missing/altered vantage point
- Improper canopy height

- Missing components (plants to frame view)

METAL RAILINGS

- Damaged/missing/uplifted/settled
- Loose/unstable
- Rusted/corroded

FORTIFICATIONS AND ASSOCIATED STRUCTURES

- Damaged/missing/uplifted/settled
- Loose/unstable
- Cracking
- Eroded or sandy mortar joints
- Mortar cracking

TABLE 6: SCHEDULE OF TASKS AND PRIORITIES: FORT ANDREWS VEGETATION MANAGEMENT

X best time of year
x acceptable time of year

Task	Priority	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mowing													
Mow turf areas	High					**X**	**X**	**X**	**X**	**X**			
Mow transition areas	High					x	**X**	**X**		x			
Mow meadow areas following bird nesting season									x	x	x		
Hazardous Tree Management													
Cut dangerous limbs in high canopy, cut and chip debris	High	x	x	x	x	x	x	x	x	x	x	x	x
Invasive and Noxious Weed Removal													
Remove de-stabilizing vegetation from historic structures	High	x	x	x	x	x	x	x	x	x	x	x	x
Treat poison ivy - cut stump, basal bark, foliar spray (Glyphosate, Trichlopyr, etc)	High			x	x	**X**	**X**	**X**	**X**	**X**	**X**	x	x
Remove poison ivy – hand removal		**X**	**X**	**X**									**X**
Treat woody invasives , basal bark method, (Trichlopyr or similar)					**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Remove woody invasives, cut stump method, (Trichlopyr, Glyphosate, etc.), chip debris				x	x	**X**	**X**	**X**	**X**	**X**	**X**	x	x
Remove woody invasives, hand tool method, (weed wrenches, loppers, pruners);treat stumps and chip debris if appropriate		x	x	x	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**

Remove woody invasives, power tool method, (brush hog, chain saw, brush saw, etc.); treat stumps and chip debris if appropriate		x	x	x	x	x	x	x	x	x	x	x	x
Remove herbaceous invasives (garlic mustard, mugwort, etc.)					**X**	**X**	**X**	x	x	x	x	x	
Viewshed Management													
Remove native and non-native trees or limbs from trees	High	x	x	x	x	x	x	x	x	x	x	x	x
Remove or cut back shrubs to improve open and filtered views	High	x	x	x	x	x	x	x	x	x	x	x	x
Vegetation Enhancements													
Apply grass seed to cleared areas that need stabilization, particularly paths and slopes					x	x					x		
Apply meadow seed mix					x	x					x		
Remove native and non-native trees and shrubs to enhance wildlife habitat for key species		**X**	**X**	x	x	x	x	x	x	x	x	**X**	**X**
Transplant or plant native trees, shrubs, and herbaceous plants					x	x	x			x			
Monitor and maintain native plantings				x	x	**X**	**X**	**X**	**X**	**X**	**X**	x	
Follow-up and Planning													
Conduct site inspection, develop treatment plan for next season						x	x			x	x		

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Appendices

APPENDIX 1: HERBICIDE APPLICATIONS

In April 2011, the majority of dead and dying trees were removed from the Fort Andrews area. A second phase of clearing in June 2011 focused on understory vegetation between the camping area and East Head bluff for a view corridor and selective removal of trees in the Fort Andrews area. A targeted herbicide application eliminated poison ivy from the campground area and along paths. Additional herbicide applications may be necessary to control regrowth of poison ivy and invasive exotic plants such as Oriental bittersweet to achieve the desired appearance based on the five types of vegetation management shown in Drawing 1.

Two types of herbicides are needed to control non-native invasive vegetation, one for woody material and one for herbaceous material. First, a topical systemic with the active ingredient "triclopyr" or "glyphosate" is needed to prevent the regrowth of cut woody vegetation. Glyphosate is the active ingredient in the herbicide, Round Up and Prosecutor. Triclopyr is the active ingredient in the herbicides, Garlon and Release. These herbicides are painted on the cut base of woody plants using a cut and dab method. The herbicide is applied with a roller or brush. A color dye is typically added to show treated areas. Another method used on Peddocks is the basal bark method, which is used before the tree or shrub is cut down. The triclopyr-based herbicide is painted on the bark of the trees and shrubs. After the tree or shrub dies, it is cut down. This method reduces the likelihood of resprouting, for vigorous species such as Ailanthus.

A foliar systemic is needed to control woody vegetation that will not be cut. Triclopyr kills broadleaf shrubs while leaving grasses unaffected. In addition to Garlon and Release, Brush-B-Gone is another broadleaf woody herbicide that is effective for foliar applications.

More information on triclopyr can be found at http://npic.orst.edu/factsheets/triclotech.pdf

A foliar systemic also is needed to control herbaceous invasive vegetation that will not be cut. Herbaceous plants should be treated with a foliar systemic with the active ingredient "glyphosate." As noted above, glyphosate is the active ingredient

in the herbicides, Roundup and Prosecutor. Glyphosate kills both broadleafs and grasses. Glyphosate inhibits an enzyme involved in plant growth, thus is only effective on actively growing plants. Glyphosate is effective in preventing regrowth of plants if painted on the freshly cut bases of trees, shrubs and herbaceous invasives.

More information on glyphosate can be found at http://npic.orst.edu/factsheets/glyphotech.pdf

For foliar applications, a nonionic spray adjuvant may be added to increase the effectiveness of the herbicide. The adjuvant reduces surface tension on waxy leaf surfaces to increase uptake of herbicide. The adjuvant has the active ingredients D-limonene, related isomers, and emulsifiers. Cide-Kick II is an example of a product that is a wetting agent, sticker, penetrator, and activator.

More information on adjuvants can be found at http://www.ars.usda.gov/Services/docs.htm?docid=19299

Any herbicide use should be planned and implemented by a Massachusetts licensed pesticide applicator, following all directions on product labels, as part of an integrated pest management approach. The NPS/NER Integrated Pest Management Coordinator should be consulted prior to applying herbicides. Park and regional NPS staff are available to assist with this.

APPENDIX 2: HYDROSEEDING

PART 1 - GENERAL

1.1 SCOPE

A. The work to be performed under this contract shall consist of providing all materials, labor, equipment, tools, and services necessary to complete hydroseeding in accordance with the specifications and drawings herein, but is not limited to, the following:

1. Fine grading

2. Hydroseeding

3. Maintenance

4. Guarantee

B. The contractor shall not subcontract any work required by this contract without the express written approval of the Contracting Officer (CO). If the CO approves the Contractor to subcontract any part of the work required under this contract, a copy of any such subcontract shall be provided to the CO.

1.2 EXAMINATION OF SITE AND DOCUMENTS

A. The following items of related work are specified and included in other Sections of the Specifications:

02100 Site Preparation

02230 Clearing and Stump Grinding

B. Examine Drawing, "Scope of Work Map, [Peddocks Island]" for designated areas to be hydroseeded, labeled [areas #1, #2, and #3] and all other Sections of the Specifications for requirements therein affecting the work of this trade.

C. All areas to be hydroseeded shall be inspected by the Contractor before starting work and any defects such as incorrect grading, etc., shall be reported to the Contracting Officer prior to beginning this work. The commencement of work by the Contractor shall indicate his/her acceptance of the areas to be seeded, and he/she shall assume full responsibility for the work of this Section.

1.3 DEFINITIONS

A. The following standards and definitions shall apply to the work of this Section.

1. AOAC: Association of Official Agricultural Chemists

2. USDA: United States Department of Agriculture, latest requirements for "USDA Textural Classification."

1.4 WORK AREA

The contractor shall confine his/her work, the storage of materials and equipment, the parking of vehicles, and all other operations in connection with this contract to the areas approved by the CO.

1.5 HEAVY EQUIPMENT:

Contractor shall not permit heavy equipment or vehicles or the stock piling of heavy materials in the desired root protection area. The root protection area is defined as an area equal to a radius of 1.5 feet for each inch of diameter at breast height (dbh) (ie: a 10 inch dbh tree will require protection 15 feet from the main trunk in all directions). Limited activity of this sort may take place with the expressed permission of the CO in areas determined to be safe from excessive damage, however, under no conditions shall this activity take place within the root protection area without mitigation to protect the tree trunk and roots. If construction activities are to take place within the desired root protection area, prior to any construction, tree trunks must be protected with chain link fence and the entire root protection area covered with double layered plywood, AlturnaMats® or similar, or a geotextile fabric and mulched with a minimum of 4-5 inches of wood chips. Pruning, fertilization, aeration, and irrigation may also be required if directed by the CO. Any damage resulting from such practices shall be made good to the satisfaction of and without additional expense to the Government.

1.6 RESPONSIBILITY REGARDING EXISTING PLANT MATERIAL AND OTHER LANDSCAPE FEATURES:

The Contractor shall preserve and protect all existing vegetation such as trees, shrubs, and grass on or adjacent to the site. Trees and shrubs that may be subject to construction activities within the root protection area shall be boxed and protected with vinyl, plastic mesh, or wood fencing material as directed by the CO. The Contractor shall be responsible for all unauthorized cutting or damage to trees and shrubs, including damage resulting from careless operation of equipment, stockpiling of materials, or tracking of grass and other surfaced areas by equipment. Such damaged areas or materials shall be restored, repaired, or replaced by the Contractor, as directed by the CO, at no expense to the Government and within 5 days prior to Initial Acceptance.

1.7 PATCHING OF PUBLIC SIDEWALKS, CURBS, GUTTERS, AND STREETS:

The Contractor shall patch, repair, or replace portions of sidewalks, curbs, gutters, streets, manholes, and the like that are damaged in connection with work under this contract or as a result of operations thereunder. Materials and methods shall conform to the current standards for the area damaged, match existing on-site materials, and shall meet the approval of all cognizant officials and the CO. All damaged areas shall make smooth,

satisfactory, and imperceptible transitions to existing adjacent work, and shall be performed without additional expense to the Government.

1.8 WARNING SIGNS:

The Contractor shall provide, erect, and maintain all necessary barricades to ensure protection of the work area, and safety of the public in accordance with "Work Zone Traffic Control, Standards and Guidelines", U.S. Department of Transportation, Federal Highway Administration. All open excavations shall be barricaded overnight shall be clearly visible.

1.9 AIR AND WATER POLLUTION CONTROL:

The Contractor shall take all necessary measures to prevent soil erosion, air and water pollution by any material and/or equipment used during construction. The Contractor shall keep the site clean and free of trash and debris including, but not limited to, loose construction and materials such as; sand, cement, lime, wood pieces, building paper, etc. The Contractor shall place all trash and debris in approved containers. These containers shall be removed from the site daily to a location where it will not be possible for water to reach them, or for it to be dispersed in any way. No burning of trash or debris will be permitted on site. When excavation, obliterations, and demolitions are made, resultant loose earth and debris shall be immediately disposed of, off the site, unless otherwise specified.

1.10 CLEANUP AND RESTORATION:

The Contractor will be required to furnish all labor, materials, and equipment for daily cleanup and restoration of all disturbed areas or features which have been damaged during the course of work. If so directed, the Contractor shall be prepared to sweep and wash paved surfaces daily or as needed. The Contractor shall also be responsible for replacing all damaged turf areas to the satisfaction of the CO.

1.11 LAYOUT OF WORK:

Final grades and all planting locations shall be subject to adjustment and approval on-site with the concurrence of the CO or designated representative.

1.12 SCHEDULING AND COORDINATION

A. The contractor shall notify the Contracting Officer (CO) 48 hours prior to beginning any work on a delivery order. Work shall be performed between the hours of 7 a.m. and 5 p.m. Monday through Friday, legal holidays excluded, unless authorized in writing by the CO.

B. Work shall be scheduled and arranged so as not to interfere with normal activities of the park. Advanced notice will be given to the contractor if a conflict is expected. Any plant debris, personnel, or equipment that would interfere with an activity or event shall be removed prior to the activity.

C. Once work begins the contractor is expected to be on the job site each day in which weather conditions are favorable as determined by the COR or designated park representative.

D. All work within a designated area as specified on the delivery order shall be completed, inspected, and accepted in accordance with the procedures stated herein before beginning work in another area.

E. If, at any time, the CO determines that the work is unsatisfactory or being conducted in an unsafe manner, the contractor will be notified and shall immediately cease all work activities.

F. The time stated for completion shall include final cleanup of the premises.

G. All approvals will be in writing.

PART 2 - PRODUCTS

2.1 IMPORTED TOPSOIL

A. Any depressions greater than three (3) inches depth created during the tree clearing work should be brought to level grade with added topsoil. Topsoil shall be natural, surface soil, free of any man-made materials, in a friable condition and contain less than 3 percent subsoil. It shall match the existing parent soil in composition and texture. When tested, the topsoil shall have a pH range of 6.0 to 7.0. The topsoil shall be free of hardpan material, stones and clods larger than 1/2 inch in diameter, sticks, tree or shrub roots, debris, toxic substances (i.e. residual herbicides) and other material detrimental to plant growth. The area and the topsoil shall be free of plant or plant parts of undesirable plants such as, but not limited to, bermudagrass, nut sedge, mugwort, johnson grass, quack grass, Canada thistle or noxious weeds as set forth in the Federal Seed Act.

B. Contractor shall notify CO of location of all sources of the topsoil and furnish the CO a certified report from the agricultural experiment station or approved agricultural laboratory of an analysis performed not more than 60 days prior to the date of submission. The CO shall inspect a sample of the topsoil.

C. Agricultural limestone at not more than 5 pounds per cubic yard of topsoil may be used to adjust an acidic condition if necessary following soil tests and with approval of the CO. The limestone, if needed, shall be thoroughly mixed by volume.

D. Amended topsoil is not acceptable. Topsoil which has been synthesized by blending materials which individually do not meet the requirements of this specification will not be accepted even

though the resulting blend meets the organic matter, mechanical analysis, pH and soluble salts requirements.

E. The CO must inspect and sample all topsoil at the source and at the time of delivery. These inspections will be made without cost to the Contractor.

F. Topsoil must not be delivered or handled in a frozen or muddy condition.

G. Shipment and delivery - All soil must be approved by the CO before delivery to site. Any material not meeting requirements of this specification will be rejected on or after delivery.

2.2 SOIL ADDITIVES

A. Agricultural limestone or other additives shall be used to counteract soil deficiencies as recommended by the soil test analysis and as directed by the CO. Nitrogen fertilizers shall not be used unless soil nutritional conditions are extremely poor, as may be the case on sand dunes or gravel pits.

B. Acidic soils greater than 5.5 pH shall be adjusted with ground limestone meeting the following specifications: Limestone shall be calcic or dolomitic agricultural ground limestone containing at least 85% of total calcium and magnesium carbonates with 40% passing a No. 100 sieve and 95% passing a No. 8 sieve.

2.3 SEED MIXTURES FOR HYDRODSEEDING

A. Seed mixtures shall be fresh, clean, new crop seed. Grass shall be of the previous year's crop and in no case shall weed seed content exceed 1% by weight. The seed shall be furnished and delivered in the proportion specified below in new, clean, sealed and properly labeled containers. All seed shall comply with State and Federal seed laws. Submit manufacturer's Certificates of Compliance. Seed which has become wet, moldy, or otherwise damaged will not be acceptable.

B. Seed shall be labeled in accordance with USDA Rules and Regulations under the Federal Seed Act and applicable state seed laws. Seed shall be from the same or previous year's crop; each variety of seed shall have the following:

Percentage of germination	≥ 90%
Percentage of purity	≥ 85%
Percentage of weed seed	≤ 0.02%
Percentage of inert material	< 2%

Within thirty (30) days of award of the contract, the Contractor shall provide the CO with written certification from the supplier of the seed to ensure that the required plant species are available.

Seed Mix for Frequently Mowed Lawn Areas

Acceptable and unacceptable Mixes for Frequently Mowed Lawn Areas are listed below:

Athletic Field Seed Mix, such as ERNMX-106 by Ernst Conservation Seeds
Perennial Ryegrass, 'Saint' (turf type) (Lolium perenne, 'Saint') 30%
Tall Fescue, 'Cochise III' (turf type) (Festuca arundinacea, 'Cochise III') 30%
Kentucky Bluegrass, 'Argyle' (Poa pratensis, 'Argyle') 15%
Kentucky Bluegrass, 'SR2100' (Poa pratensis, 'SR2100') 15%
Annual Ryegrass (Lolium multiflorum (L. perenne var. italicum)) 10%

No Mow Fescue Lawn Mix by Prairie Grass Company **(not recommended)**
Hard Fescue (Festuca brevipila) %
Sheep Fescue (Festuca ovina) --same as Festuca filiforma, invasive and banned in MA Chewings Fescue (Festuca rubra subs. fallax)
Red Fescue (Festuca rubra)
Creeping Red Fescue (Festuca rubra var. rubra) --native

Seed Mix for Seasonally Mowed Meadow Areas

The seed mix should yield an open meadow plant community which is low maintenance, requiring no more than one to two mowings per year once the vegetation is established. The plant community should also be relatively resistant to invasion by non-native plant species so that there is not a constant need for spraying, pulling, or hand-weeding. Three mixes are listed below:

Custom mix (preferred)

The following grass species are found in coastal areas and can be purchased commercially, which makes them desirable candidates for the seed mix, depending on the site conditions. However, the mix includes non-natives, so other native grasses can be considered and some are listed after this section.

Custom Mix (preferred)

Tall Fescue (Festuca arundinacea) --not native, Eurasian
Annual Ryegrass (Lolium perenne) --not native, Eurasian
Common Milkweed (Asclepias syriaca)
Autumn Bentgrass (Agrostis perennans)
Rough-stemmed goldenrod (Solidago rugosa)
Canada goldenrod (Solidago canadensis)

Partially Shaded Area Roadside Mix ERNMX-140 by Ernst Conservation Seeds Co.

(not all of these species are native this far north)

19% Riverbank Wild Rye, PA Ecotype (Elymus riparius, PA Ecotype)
19% Bottlebrush Grass, PA Ecotype (Elymus hystrix (Hystrix patula), PA Ecotype)

16% Little Bluestem, FIG PA Ecotype (Schizachyrium scoparium, FIG PA Ecotype)
5% Tall White Beard Tongue, PA Ecotype (Penstemon digitalis, PA Ecotype)
5% Deer Tongue, 'Tioga' (Panicum clandestinum (Dichanthelium c.), 'Tioga')
5% Black Eyed Susan, CP NC Ecotype (Rudbeckia hirta, CP NC Ecotype)
5% Golden Alexanders (Zizia aurea)
5% Partridge Pea, PA Ecotype (Chamaecrista fasciculata (Cassia f.), PA Ecotype)
3% Marsh (Dense) Blazing Star (Spiked Gayfeather) (Liatris spicata)
2% Thimbleweed, PA Ecotype (Anemone virginiana, PA Ecotype)
2% Common Milkweed, PA Ecotype (Asclepias syriaca, PA Ecotype)
2% Blue Wood (Heart Leaved) Aster, PA Ecotype (Aster cordifolius (Symphyotrichum cordifolium), PA Ecotype)
2% Autumn Bentgrass, APB (Agrostis perennans, APB)
2% Purple Bergamot, PA Ecotype (Monarda media, PA Ecotype)
2% Zigzag Aster, PA Ecotype (Aster prenanthoides (Symphyotrichum p.), PA Ecotype)
2% Appalachian Beard Tongue, PA Ecotype (Penstemon laevigatus, PA Ecotype)
1% Bigleaf Aster, PA Ecotype (Aster macrophyllus (Eurybia macrophylla), PA Ecotype)
1% Ox Eye Sunflower, PA Ecotype (Heliopsis helianthoides, PA Ecotype)
1% White (Silver Rod) Goldenrod, PA Ecotype (Solidago bicolor, PA Ecotype)
1% White Wood Aster, PA Ecotype (Aster divaricatus (Eurybia divaricata), PA Ecotype)

Native Upland Wildlife Forage & Cover Meadow Mix (for sunny areas)
ERNMX-123, Ernst Conservation Seeds Co.

(native to Pennsylvania, but closer than previous mix)

20% Virginia Wild Rye, PA Ecotype (Elymus virginicus, PA Ecotype)
20% Little Bluestem, 'Camper' (Schizachyrium scoparium, 'Camper')
12% Indiangrass, 'Prairie View', IN Ecotype (Sorghastrum nutans, 'Prairie View', IN Ecotype)
10% Switchgrass, 'Shelter' (Panicum virgatum, 'Shelter')
10% Big Bluestem, 'Niagara' (Andropogon gerardii, 'Niagara')
10% Eastern Gamagrass (Tripsacum dactyloides)
5% Coastal Panic Grass, 'Atlantic', VA Ecotype (Panicum amarum, 'Atlantic', VA Ecotype)
5% Partridge Pea, PA Ecotype (Chamaecrista fasciculata (Cassia f.), PA Ecotype)
3% Black Eyed Susan, CP NC Ecotype (Rudbeckia hirta, CP NC Ecotype)
3% Fowl Bluegrass (Poa palustris)
1% Plains Coreopsis (Coreopsis tinctoria)
1% Common Milkweed, PA Ecotype (Asclepias syriaca, PA Ecotype)

Prior to the start of work, the Contractor shall furnish the CO with a certified statement as to the number of pounds of materials to be used per 1000 square feet at least thirty- (30) days prior to starting work.

2.4 HYDROMULCH

A. Hydromulch shall be 100% Virgin Wood Fiber Mulch with tackifier shall be for use in hydraulically planting grass seed, either alone or in combination with fertilizers and other approved additives, and shall consist of specially prepared wood fibers as manufactured from whole wood chips by Weyerhaeuser under the brand name of Silva-Fiber or approved equal. It shall contain a specified range of fiber lengths, with a minimum of 30% of the fibers averaging 0.15 inches or longer. All matter shall be non-toxic to plant or animal life.

1. The Virgin Wood Fiber Mulch shall contain no growth or germination-inhibiting factors, and be colored green with a non-toxic dye to facilitate visual metering during application. It shall disperse rapidly in water to form a homogenous slurry, and remain in such a state when agitated in the hydraulic mulching unit with any other specified and approved materials.
2. The Virgin Wood Fiber Mulch and any specified additives, when applied, shall form an absorptive mat, but not a growth inhibiting membrane, to allow moisture, natural or mechanical, to percolate into the underlying soil.
3. Fiber for mulch shall not be produced from recycled material such as sawdust, paper, cardboard or residue from pulp, paper, or insulation factories.

B. Hydromulch Virgin Wood Fiber With Tackifier shall be applied at a rate of 1,200-1,500 pounds per acre on 2.5:1 slopes or flatter, or at 1,500-2,000 pounds per acre on slopes steeper than 2.5:1.

2.5 SUBMITTALS

A. Source for seed mixtures - Within 7 days of receiving a delivery order

B. Topsoil - 2 pounds submitted 14 days after award. A soil analysis certificate conducted not less than 60 days before submittal shall accompany the sample.

2.6 WATER

A. If a water supply is not available or not functioning on site the Contractor will be held responsible to furnish adequate supplies of water to meet the watering requirements specified, herein, at his own cost.

B. Any work injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor's responsibility to correct. Water shall be free from impurities injurious to vegetation.

C. Any water trucks or mechanical pumping devices shall be appropriately sized to not damage existing structures, historic earthworks, pathways, or other site improvements. Contractor likewise shall not cause damage to any lawns or planting during the watering operation. Any damage to the site or adjacent sites caused by the Contractor shall be repaired in kind at his cost.

PART 3 - EXECUTION

3.1 FINE GRADING

A. The Contractor shall prepare all areas to be hydroseeded with a York® rake or equivalent landscape rake and light tractor to remove from the surface all stones greater than two (2") inches and all debris including branches and piles of woodchips or rubbish. Such material shall be removed from the site and legally disposed of.

B. All depressions caused by tree clearing work greater in depth than three (3) inches below existing grade shall be filled with approved imported topsoil. The surface shall be regraded until presenting a smooth and even finish corresponding to level, adjacent grades.

C. No subsoil or imported topsoil shall be handled in any way if it is in a wet or frozen condition.

D. After approved imported topsoil has been spread, it shall be carefully prepared by scarifying and hand raking. Any large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter, and stones over one inch in diameter shall be removed from the topsoil. Approved imported topsoil shall also be free of smaller stones in excessive quantities as determined by the CO.

E. Contractor shall obtain CO's approval of fine grading and bed preparation before doing any hydroseeding.

3.2 INCORPORATION OF ADDITIVES

A. For areas to be hydroseeded, the soil additives shall be included in the hydroseeding mix. The mix composition shall be submitted for written approval of the CO.

3.3 HYDROSEEDING

A. Limit of hydroseeding shall be as indicated as areas #1, #2, and #3 on the Drawing "Scope of Work Map, [Peddocks Island]." These areas shall be hydroseeded only after written approval of bed preparation by the CO. If areas are disturbed by the Contractor during his construction operations these areas shall be rehydroseeded by the Contractor at no increased cost, and shall be subject to the same quality control and guarantees as regular hydroseeding specified herein.

B. Hydroseeding shall be done only during the period from April 1 to May 15 or August 20 to September 30. The actual planting of seed shall be done, however, only during periods within this season, which are normal for such work as determined by weather conditions and by accepted practice in this locality. At his option, and on his responsibility, the Contractor may plant seed under unseasonable conditions at no increased cost.

C. Hydroseed only when the bed is in a friable condition, not muddy or hard. Any area inadequately covered shall be retreated until a satisfactory stand of grass is established. This shall include mowing, refertilizing, reseeding and remulching as required.

D. Wood cellulose fiber mulch shall be added to the hydroseeding slurry at the rate of 1,200 to 1,500 pounds per acre for 2.5:1 slopes or flatter slopes and 1,500 to 2,000 pounds per acre for slopes steeper than 2.5:1.

E. Mobile sprayers shall be filled with water, virgin wood fiber mulch, and tackifier, in quantities so they may be sprayed in the specified proportions per unit of area to be seeded. The slurry shall be thoroughly mixed by means of positive agitation in the tank. The sprayer shall be equipped with a seeding nozzle of a proper design to insure even distribution of the hydromulch with tackifier over the area to be mulched and shall be operated by a person thoroughly familiar with this type of spraying operation.

F. When applying hydromulch the equipment to be utilized shall be approved by the CO before arriving on the site.

3.4 MAINTENANCE

A. Maintenance shall begin immediately after any area is hydroseeded

and shall continue for one (1) year following the completion of all seeding work, and until final acceptance of the project.

B. Contractor shall mow entire hydroseeded grass areas and other areas identified on the Drawings for one (1) year after hydroseeding as detailed below under Section 3.4, H.

C. Maintenance shall include reseeding or rehydroseeding, mowing, watering, weeding, and fertilizing. Maintenance shall also include chemical treatments as required for fungus, weed, and/or pest control. Submit all proposed chemical treatments for approval of the CO prior to application.

D. During the maintenance period, any decline in the condition of seeded or hydroseeded areas shall require the Contractor to take immediate action to identify potential problems and to undertake corrective measures.

E. Watering of Hydroseeded Areas:

1. First Week: The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable lawn. In the absence of an adequate rainfall, watering shall be performed daily or as often as necessary during the first week and in sufficient quantities to maintain moist soil to a depth of at least two inches.

2. Second and Subsequent Weeks: The Contractor shall water the lawn as required to maintain adequate moisture, in the upper two inches of soil, necessary for the promotion of deep root growth.

3. Watering shall be done in a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply one complete coverage to the hydroseeded areas in an eight (8) hour period.

H. Rehydroseeding:

1. After the grass in hydroseeded areas has appeared, all areas and parts of areas which, in the opinion of the CO, fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas shall be rehydroseeded repeatedly until all areas are covered with a satisfactory growth of grass.

2. Rehydroseeding together with necessary grading, fertilizing,

liming and trimming shall be done at the expense of the Contractor who shall spread the seed by a method approved by the CO and during an approved season.

3.5 INITIAL ACCEPTANCE

Initial acceptance will be given by the CO after an inspection and verification of the work performed as defined in the contract specifications. Acceptance can be on partially completed work if approved by the CO.

3.6 GUARANTEE

The guarantee period shall begin after Initial Acceptance. During the guarantee period the contractor shall properly care for all hydroseeded grass areas as specified herein until final acceptance. The contractor is responsible for periodically inspecting the materials during the guarantee period and shall notify the Government in writing of any suspected problems.

3.7 FINAL ACCEPTANCE

Final Acceptance will be given at the end of the one (1) year maintenance period. At the time of final acceptance, hydroseeded grass areas shall be considered unacceptable if they fail to show a uniform stand of grass. The Contractor shall be responsible for a one time replacement only.

3.8 MEASUREMENT AND PAYMENT:

A. The Contractor shall include with all invoices for payment an acceptance report signed by the CO or designated park representative. Failure of the contractor to obtain signed acceptance report(s) will release the Government from any obligation to pay for services claimed but not documented by a signed acceptance report.

B. The amount to be paid will be based on the actual bid items completed and accepted. Quantities so measured will be paid for at the specified item bid price.

APPENDIX 3: CRUSHED STONE AGGREGATE FOR CAMPSITES AND WALKWAYS

The following specifications are adapted from the Acadia National Park carriage roads, hiking trails, and tent site specs for a well-drained durable surface.

GENERAL:

1. Provide crushed aggregate surface course material ("half inch minus"), crushed stone aggregate ("inch minus"), and blown ledge in accordance with specifications below. Materials shall be delivered to Peddocks Island, Hull, MA. Notice to proceed will be issued upon receipt of certified test results and certificate of compliance.

2. Delivery location: Camping Area, Fort Andrews, Peddocks Island

3. Deliveries. Deliver all material within 60 days of approval of test results.

TESTING AND QUALITY CONTROL:

4. Within 10 days of award, Contractor shall submit test results from a certified testing laboratory and a Certificate of Compliance. Failure to submit test results meeting specifications and Certificate of Compliance within 30 days will result in termination of contract and award will be made to next lowest bidder.

5. In addition to initial testing, Contractor shall perform additional gradation tests and furnish results as materials are processed and/or delivered. Frequency of additional testing shall be 1 test per 500 cubic yards. If source of materials should change after completion of original test, a complete set of tests, as required above, shall be performed again.

6. Government reserves the right to conduct quality control inspection and testing to determine the reliability of the test results and Certificate of Compliance. Materials delivered that do not comply with the specifications and/or certifications shall be removed from the site at no cost to the Government.

CRUSHED AGGREGATE SURFACE COURSE MATERIAL (HALF INCH MINUS)

7. Aggregate shall consist of hard, durable particles or fragments of crushed stone or gravel conforming to the following requirements and gradations:

   Los Angles abrasion, ASTM C 131 and C 535 ..... 50% max.*
   Fractured faces (one face) ..... 95% min.*
   Fracture faces (two faces) ..... 75% min.*
   Soundness loss, 5 cycles, ASTM C 88 (magnesium) ..... 18% max.*
   Flat/Elongated (length to width >5 ASTM D4791 ..... 15% max.*

   * Based on the portion retained on the 3/8" sieve

8. Materials shall be free from organic material and lumps or balls of clay.

9. Material passing the No. 4 sieve shall consist of natural or crushed sand and fine mineral particles. The material including any blended filler, shall have a plasticity index of not more than 6 and a liquid limit of not more

than 25 when tested in accordance with ASTM D4318.

10. Aggregate shall contain a minimum of 5% clay particles by no more than 50% of that portion of material passing the No. 200 sieve size shall be clay. Inorganic clay to be used as binder shall conform to the following:

    Passing No. 200 ..... 75%
    Liquid Limit ..... 30 min.
    Plastic Index ..... 8 min.

11. The fraction of material passing the No. 200 sieve size shall be determined by washing as indicated in ASTM D1140, "Amount of Material in Soils Finer Than the No. 200 Sieve." The fractured faces for the coarse aggregate portion (retained on the No. 4 Sieve) shall have an area of each face equal to at least 75% of the smallest midsectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces. Fractured faces shall be obtained by mechanical crushing.

12. Gradation shall be obtained by crushing, screening, and blending processes as may be necessary. Material shall meet following screen analysis requirements by weight.

Sieve Designation	Percent Passing
1/2"	100%
3/8"	90-100%
No. 4	60-81%
No. 8	44-60%
No. 40	20-33%
No. 200	10-16%

CRUSHED STONE AGGREGATE (INCH MINUS)

13. Material shall be composed of clean, hard, durable fragments or particles of crushed stone or natural gravel. Material shall be free from organic matter and lumps or balls of clay.

14. Material shall have 50% minimum fractured faces per FLH T 507.

15. Obtain the aggregate gradation by crushing, screening, and blending processes as necessary. Fine aggregate, material passing the no. 4 sieve, shall consist of natural or crushed sand and fine mineral particles.

16. Material shall meet following screen analysis requirements by weight.

Sieve Designation	Percent Passing
1 inch	100%
3/4 inch	97 - 100%
3/8 inch	67 - 79%
No. 4	47 - 59%
No. 40	12 - 21%
No. 200	6 - 10%

BLOWN LEDGE

17. Material shall be composed of clean, hard, durable fragments of crushed

or blasted stone. Material shall be free from organic matter and lumps or balls of clay.

18. 100% of the material shall have at least two fractured faces.

19. Gradation shall be obtained by crushing, screening, and blending processes as may be necessary. Material shall meet following screen analysis requirements by weight.

Sieve Designation	Percent Passing
6”	100%
2”	5%

20. Government reserves the right to approve blown ledge based on visual inspection.

MEASUREMENT AND PAYMENT:

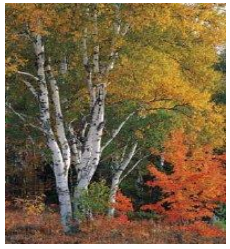
21. Payment shall be made at the unit price per ton based on certified weight tickets.

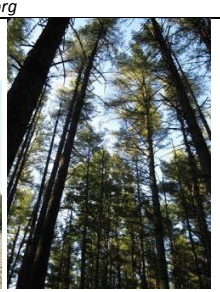
22. Award shall be made for at least the minimum quantity listed for each item and may be made for additional quantities up to the maximum listed for each item.

PEDDOCKS ISLAND

Plant Material

Common Name	Picture	Scientific Name, Elliman notes	Family	Habitat, Soils	More Information
Native trees and shrubs currently on Peddocks					
Red Maple *Shade Tree*	  *gobotany.newenglandwild.org*	*Acer rubrum* Thickets Seedlings/saplings might be sourced on-island **Allee** **VC Area Shade** **Young Forest**	Aceraceae	Flooded swamps, secondary succession, uplands Soil: Tolerates variety.	• Found: 9 Boston Harbor Islands. • Height/Spread: 40-60'/about 40' at full maturity • Habit: Oval, rounded, upright or erect • Growth rate: Medium to fast • Full sun, partial shade. • Prefers wet soil conditions, slight drought tolerance. • Wildlife: Samaras eaten by rodents. • Outstanding beauty in fall and early spring
Silver Maple *Shade Tree*	 	*Acer saccharinum* Listed as in "field" **Allee** **Damp tranisition Areas**	Aceraceae	Floodplains,edges of bogs and streams Soil: Wide range of soil types, prefers moist, acidic sites	• Found: 3 Boston Harbor Islands. • Height/Spread: 50-80'/ 35-50' at full maturity • Habit: Vase shape • Growth rate: Fast, storms may damage • Prefers sun • Moderate drought tolerance • Wildlife: Early spring seeds provide food for squirrels
Downy shadbush *Shade Tree, Fruit*	  *gobotany.newenglandwild.org*	*Amelanchier arborea* Listed in Elliman with note that needs verification **Transition Areas** **Orchard Companion Plant**	*Rosaceae*	Woodland borders, stream banks, fence rows in open country; also hillsides and mountain slope.	• Found: 1 Boston Harbor Island. • Height/Spread: 15-25 / variable spread • Habit: Multi- stemmed shrub or small tree • Full sun to part shade • Tolerates wet to dry • Wildlife: Attracts birds • Diseases and Insects: Rust, scale, aphids, mildews

Red Chokeberry *Fruiting Shrub*	 gobotany.newenglandwild.org	*Aronia arbutifolia* Thickets Poss. source on-island **Campground** **Transition Areas** **Orchard Companion Plant**	*Rosacaeae*	Forest edges and understory	• Height: Sp. Height to 20'; cultivar to 10'/ 3-5' • Habit: Wet to dry thickets • Sun/Part shade • Flower April-July, white bloom, red fruit Aug-Nov, brilliant red leaves in fall
Paper birch *Shade Tree, Ornamental*		*Betula papyrifera** Not on Elliman list for Peddocks; but possibly remnants N. Fort area **Historic Pine Forest Campground** **VC Shade** **Viewsheds**	*Betulacaeae*	Soil: Acidic, loamy, moist, sandy, well drained, clay soils.	• Found: 2 Boston Harbor Islands. • Height/Spread 50-70' / 35' • Habit: Oval shape, multistemmed • Growth rate: medium to fast • Full sun, partial shade. • Normal moisture, some drought tolerance. • Wildlife: Redpolls, siskins, and chickadees eat seeds. Used by cavity-nesting birds. Yellow-bellied sapsucker creates sapwells used by hummingbirds and squirrels.
Gray birch *Shade tree, Ornamental*	 	*Betula populifolia* Thickets Poss. source on island **Transition areas** **VC area** **Young Forest**	*Betulacaeae*	Soils: Does well in poor soils; will grow on sandy, rocky, gravelly sites and also heavier soils.	• Found: 13 Boston Harbor Islands. • Height/Spread 20-40'/ 10-20'. • Habit: Narrow, irregularly open, usually multi-stemmed, may form thickets, short-lived (15 to 25 yrs). • Growth rate: Medium to fast, averaging 2' per year • Full sun, intolerant of competition • Tolerates wet and dry • Diseases and insects: More resistant to bronze birch borer, more pest free on islands
Hackberry *Shade tree*	  *http://www.ndsu.edu* *http://davisla.wordpress.com*	*Celtis occidentalis* Woodlands Poss. source on-island **Difficult soils** **Transition areas** **VC Shade**	Ulmaceae	Soil**:** Wide range, tolerates salt and compaction, flooding, drought	• Found: 10 Boston Harbor Islands. • Height/Spread: 40- 60' / 40-60' • Habit: Rounded, vase shape similar to Am. elm • Growth rate: medium to fast • Full sun • Some susceptibility to storm damage • Wildlife: Outstanding wildlife value. Berries attract birds, host plant for many butterfly species.
White ash *Shade Tree*	  *http://www.pfaf.org* *gobotany.newenglandwild.org*	*Fraxinus americana* Thickets, woodlands Could be sourced on island? **Allee** **Inland wooded areas**	*Oleaceae*	Found with white pine, black cherry, red oak, red maples on well drained slopes Soil: wide range soils, prefers deep, moist, intolerant of compaction	• Found: 2 Boston Harbor Islands. • Height/Spread 50- 80'/40-50' • Growth rate: Medium • Full sun • Prefers moist soil • Wildlife: Seeds eaten by migrating birds. • Some sources mention lack of tolerance to spray. Current trees near VC not doing well

Green ash *Shade Tree*	 *davesgarden.com*	*Fraxinus pensylvanica* Thickets on Prince's head, needs verification	*Oleaceae*	Bottomlands Soil: wide range, tolerates flooding, some sources say salt tolerant, others say no	• Found: 7 Boston Harbor Islands • Height/Spread: 50-60' /25' • Habit: Oval, upright or erect. • Growth rate: Fast • Full sun • Prefers wet soil conditions, drought tolerant. • Wildlife: Birds, host plant for butterflies • Susceptible to emerald ash borer
Eastern Red Cedar *Evergreen*	 	*Juniperus virginiana* Thickets, old fields Could be sourced on island. **Transition Areas** **Screening for utility areas**	*Cupressaceae*	Soil**:** wide range	• Found: 17 Boston Harbor Islands • Height/Spread 40-50'/8- 20' • Growth rate: medium • Habit: oval, pyramidal shape • Full sun • Moisture: Withstands flooding, good drought tolerance • Wildlife Value: Seeds eaten by cedar waxwings. Prime wintering bird habitat when planted in clumps • Prune for formal look
Bayberry	 *gobotany.newenglandwild.org*	*Myrica pensylvanica* Thickets **Beach strand** **VC plantings** **Screening structures**	*Myricaceae*	Soil: Does well in sandy,clay, and areas subject to flooding	• Currently planted in campground and around visitor center • Prefers full sun • Berries a food source for migrating Tree Swallows • Berries used in candle-making by colonists
White Pine *Evergreen*	  *gobotany.newenglandwild.orgextremeforestmakeover.com*	Pinus strobus Thickets Could be sourced on-island	*Pinaceae*	Soil: Well-drained, moist, acidic, dry, wet soils.	• Found: 4 Boston Harbor Islands • Height/Spread 50-80'/20-40' • Habit: oval, pyramidal • Growth rate: Fast • Full sun, partial shade. • Best in moist soil, tolerates dry, rocky ridges to bogs • Wildlife Value: Seeds favored by birds, Provides nesting sites for woodpeckers, chickadees, nuthatches
Big-tooth aspen *Shade tree, Ornamental*	  *gobotany.newenglandwild.org*	*Populus grandidentata* Old fields, thickets Poss. source on-island **Damp Thicket** **Transition Areas** **VC area shade**	*Salicaceae*	Soil**:** Prefers moist, fertile soils, will grow on dry, sandy or gravelly.	• Found: 13 Boston Harbor Islands. • Height/Spread: 50- 70'/ 20-40'. • Habit: Pyramid shape in youth, developing, open, irregular crown at maturity. • Growth rate: Fast (65' in 20 years) • Susceptible to storm damage • Wildlife value: High, forms beautiful groves

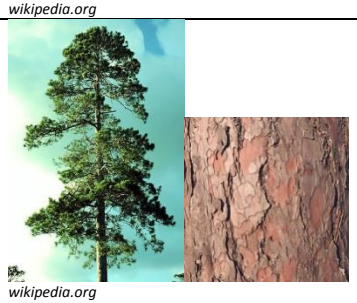
Quaking aspen *Ornamental Tree, Shade Tree*	 *http://deq.mt.gov*	*Populus tremuloides* Thickets Poss. source on-island **Damp thicket** **Young forest** **VC area shade**	*Salicaceae*	Soil: Acidic, loamy, moist, sandy, well drained, clay	• Found on 16 Boston Harbor Islands • Height/Spread: 40-50 /20-30' • Habit: Oval • Growth rate: Fast • Full sun • Wildlife value:. Prime habitat for young forest species such as woodcock, willow flycatcher, American redstart • Susceptible to storm damage rejuvenates quickly
Beach Plum	  gobotany.newenglandwild.org	*Prunus maritima* Thickets Tombolo **Beach strand**	*Rosaceae*	•**Soil:** Does well in sandy soil	• Plums edible • Tolerates salt and overwash • Prefers full sun
Pin Cherry (Fire cherry)	  gobotany.newenglandwild.org	*Prunus pensylvanica* Thickets -note that it needs verification Could be sourced on-island **Transition areas** **Young forest**	*Rosaceae*	Soil**:** tolerates wide range from sandy to rocky	• Prefers full sun • Aggressive, competes with invasives
Wild Black Cherry *Fruit tree* *Shade tree*	  *http://www.carolinanature.com*	*Prunus serotina* Thickets Poss. source on island **Knotweed area** **Transition areas**	*Rosaceae*	Soil: Best in moist, fertile loams	• Found: 20 Boston Harbor Islands. • Height/Spread: 50- 60'/ • Habit: Forest-grown: long clear trunks, little taper, oval crown; open-grownz; short trunks, many branches, irregular, spreading crown. • Full sun to part shade • Susceptible to diseases and insects in cultivation. Aggressive, can compete with invasives
Choke cherry *Fruit tree*	 *tamu.edu*	*Prunus virginiana* Not on Elliman spreadsheet for Peddocks but mentioned in his notes for that island. **Transition areas** **Campground**	*Rosaceae*	Soil: Dry, shallow, rocky. Drought tolerant	• Found: 5 Boston Harbor Islands. • Height/Spread: 20-30'/ 18-25' • Habit: Small, suckering tree or large shrub, crooked branches, slender twigs forming oval-rounded crown • Full sun to part shade • Wildlife: Attracts birds, butterflies • Susceptible to diseases and insects as Black Cherry.

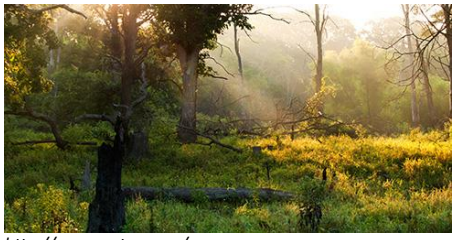
Staghorn Sumac *Shrub*	 gobotany.newenglandwild.org	*Rhus typhina* Thickets Old fields **Knotweed area** **Beach strand** **Transition areas**	*Anacardiaceae*	Soil: Prefers well-drained soil, not a plant for poorly drained areas; tolerates very dry, sterile soil;	• Found: 25 Boston Harbor Islands. • Height/Spread: 15-25'(potential to 30-40') /spread equal to or greater than height • Habit: spreads by root suckers to form large colonies • Growth rate: Fast from roots suckers; slow to medium on old wood. • Competes well with invasives • Stabilizes soil in eroding area
Bebb's Willow	 *webapps8.dnr.state.mn.us*	*Salix bebbiana* Thickets, Thicket-beach strand ecotone, old fields Could be sourced on-island **Beach strand** **Transition areas** **Knotweed area**	*Salicaceae*	Soil: wide range, does well in disturbed and wet areas. Marginal species in hardwood and conifer stands, forms dense thickets	• Found: 14 Boston Harbor Islands. • Height/Spread: 10-20'/20' • Habit: multistemmed shrub or a small tree, may develop wide trunks • Full sun • Can compete with invasives
Pussy Willow *Ornamental Tree, Shrub*	 *gobotany.newenglandwild.org*	*Salix discolor* Beach strand, seepage along roadway (needs verification) Possible to source on-island?	*Salicaceae*	Soil: Acidic, loamy, moist, rich, well drained soils	• Found: 4 Boston Harbor Islands. • Height/Spread: 15-25' /12-25' • Growth rate: Fast • Full sun, partial shade • Habit: Oval • Intolerant of dry soils. Prune as needed in late winter to early spring • Susceptible to blights, mildew, insects and disease, weak wood. Shallow roots may clog sewers or drains
Black Willow *Tree/Shrub*	  *http://www.bostonzest.com*	*Salix nigra* Moist depression near beach houses Possible to source on-island **Damp transition areas**	*Salicaceae*	Soils: Any moist; along streams and marshes	• Found: 6 Boston Harbor Islands. • Height/Spread: 30-60'/ • Habit: broad, irregular crown, superficial root system • Growth rate: Rapid • Full/part sun • Some insect damage, usually not lethal • Can compete with invasives
Common Elderberry *Ornamental shrub*	 *http://www.all-creatures.org*	*Sambucus canadensis* Woodlands Easily sourced on-island **Damp thicket** **Campground** **Boggy area** **Transition areas**	*Caprifoliaceae*		• Found: most Boston Harbor Islands • Rapid growth, tolerates severe cutback, currently growing at edges of path to overlook. • Wildlife: Outstanding • Can compete with invasives

American elm *Shade tree*	  *www.cirrusimage.com,* *http://hort.ufl.edu*	*Ulmus americana* Thickets **Allee** **VC area shade** **Officer's Row**	*Ulmaceae*	Soil**:** Prefers rich, moist soils. Common inhabitant of wet flats where standing water may accumulate in the spring and fall. Good salt tolerance	• Found: 4 Boston Harbor Islands • Height/Spread: 60-80'/30- • Habit: Vase form: Trunk divides into erect limbs arched above, terminating in slender Oak form: more widely spreading, less arching branches. Narrow form: branchlets clothing entire trunk. • Growth rate: Medium to fast, wide shallow roots • Subject to pests
Slippery Elm *Shade tree*	 *http://davesgarden.com*	*Ulmus pumila* Woodlands **Officer's Row** **Campground shade** **Woodland edges**	*Ulmaceae*	Soil: Tolerates variety	• Found: 8 Boston Harbor Islands • Height/Spread: 40-60'/25-35' • Habit: vase form, branches do not droop as much as *U. Americana,* less symmetrical • Wildlife: migrating birds eat seeds • Susceptible to Dutch Elm, but prolific so more trees escaped
Early Lowbush Blueberry *Groundcover*	  *gobotany.newenglandwild.org*	*Vaccinum angustifolium* Thickets **Campground** **Path to overlook** **Transition areas** **Orchard companion plant**	*Ericaceae*	Soil: Dry, sandy	• Found: 2 Boston Harbor Islands (Worlds End, Peddocks) • Height/Spread: • Top of eroding cliffs a typical habitat, but might attract people out there • Should think about propagating native strain rather than introducing cultivars
Nannyberry	 *gobotany.newenglandwild.org*	*Viburnum lentago* Thickets	*Caprifoliaceae*	Soil:	• Found: 3 Boston Harbor Islands • Height/Spread: • Ornamental understory tree • Shade tolerant
Northern Arrowwood	 *gobotany.newenglandwild.org*	*Viburnum recognitum* Thickets **Campground** **Path to overlook** **Transition Areas** **Damp thicket**	*Caprifoliaceae*	Soil: Tolerates damp, wide variety of conditions	• Found: • Height/Spread: Currently growing along path to overlook • Currently growing in damp thicket

Highbush Cranberry	 *gobotany.newenglandwild.org*	*Viburnum trilobum* Thickets **Campground** **Path to overlook** **Transition areas** **Damp thicket**	*Caprifoliaceae*		• Currently growing in damp thicket • Sun to part shade • Prefers damper and sunnier sites than V. recognitum
Native trees and shrubs - not currently on Peddocks					
Box Elder	 *http://6512andgrowing.com*	Y *Acer negundo* Not on Elliman list for Peddocks, Not good ornamental, but useful for stabilizing soil	*Aceraceae*	Beach strand Along streams and rivers	• Found: > 2 Boston Harbor Islands • Height/Spread: 30-50'/Same, irregular • Habit: Rounded, irregular branching, uneven crown; or small tree with multi-stemmed ragged appearance. • Growth rate: Fast when young, wood weak • Withstands periodic flooding.
Sugar Maple *Shade Tree, Ornamental*	 	Y *Acer Saccharum* Not on Elliman list for Peddocks **Allee**	*Aceraceae*	Upland forests with beech, red oak, white ash Soil: Deep, well drained, acidic to slightly alkaline soil,	• Found: 1 Boston Harbor Island • Height/Spread: 60-75'/ 40-50' at full maturity • Habit: Oval, rounded shape. • Growth rate: Slow to medium • Full sun, partial shade. Shade tolerant • Moist but not wet soils, some drought tolerance • Wildlife: Squirrels, deer, birds feed on seeds, buds, twigs, and leaves. Produces sweet sap • Shallow fibrous roots sensitive to compaction and salt
Thicket shadbush *Fruiting Shrub*	 	Y *Amelanchier canadensis* Not on Elliman list for Peddocks	*Rosaceae*	Bogs and swamps	• Found on 6 Boston Harbor Islands. • Height/Spread 6-20'/ Variable • Habit: Upright, suckering, multi-stemmed shrub • Full sun • Tolerates wet soils • Wildlife: Sweet edible fruit .
Running shadbush *Fruiting Shrub*		Y *Amelanchier spicata (stolonifera)* Not on Elliman list for Peddocks	*Rosaceae*	Forest edges, meadows, disturbed areas	• Found: 2 Boston Harbor Islands. • Height/Spread 4- 6' high/ Variable • Habit: Stoloniferous; forms thickets • Full sun to part shade • Wet to dry • Good fall color • Wildlife: Attracts birds

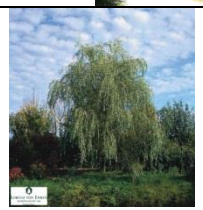
Bitternut hickory *Shade tree*	 *http://sites.ipfw.edu*	Y *Carya cordiformis* Not on Elliman list for Peddocks Likely part of canopy historically **Allee** **Base of Slopes**	*Juglandaceae*	Soil: Grows on poor soils, enjoys moist, humus-y Swamps, along watercourses. with other hickories, elm, ash, Virginia creeper and sumac	• Found: 1 Boston Harbor Island. • Height/Spread: 50-75'/30-50' • Growth rate: Slow, but fastest Hickory • Full sun to part shade • Medium to wet • Nuts inedible by humans • Best planted from seed • No serious insect or disease problems, long lived (200 years)
Shagbark hickory *Shade tree*	 	Y *Carya ovata* Not on Elliman list for Peddocks Likely part of canopy historically **Allee** **VC Shade** **Campground Shade**	*Juglandaceae*	Uplands, often S. facing, with oaks, other hickories Soil: Prefers well-drained loams, adaptable to wide range of soils.	• Found: 1 Boston Harbor Island. • Height/Spread: 60- 80'/30-50' • Habit: Straight, cylindrical trunk with oblong crown • Growth rate: Slow • Sun: Full sun to part shade • Medium water needs • No serious insect or disease problems, long lived (>300 years) • Best planted from seed
American Chestnut *Shade tree*	 *www.scientificamerican.com*	Y *Castanea dentata* Not on Elliman list Likely part of canopy historically **Allee** **Campground Shade**	*Fagacaeae*	Formerly part of mature Oak/Hickory forest canopy in this area Soil: Sandy loam	• Height/Spread 50-75'/50-75 • Growth rate: Rapid • Full Sun • Medium water needs • Cultivars and blight resistant species trees are becoming available through the American Chestnut Foundation and suppliers such as FedCo
Atlantic white cedar		Y *Chamaecyparis thyoides* Not on Elliman list for Peddocks	*Cupressaceae*	Soil: moist, sandy Fresh-water bogs, swamps stream banks. Often on shallow-peat covered soils underlain with sand.	• Found: 1 Boston Harbor Island. • Height/Spread 40-50'/ 10-20' wide • Habit: Slender column in youth. Narrow, spire-like crown at maturity devoid of branches ½ to ¾ of length. • Growth rate: medium (25' in 20 years), depending on seed provenance (source), rates may approach fast. • Full sun • Obligate wetland species
American holly *Evergreen, Ornamental Tree*	  *http://forestry.tennessee.edu*	Y *Ilex opaca* Not on Elliman list for Peddocks	*Aquifoliaceae*	Soil: wide range	• Found: 1 Boston Harbor Island. • Habit: Pyramidal shape • Height/Spread: 40-50'/18-40' • Growth rate: slow to medium • Full sun, partial shade • Good drought tolerance. • Wildlife: Winter cover for songbirds and mammals, berries used by bluebirds and thrashers. • Berries require male and female plants.

Common juniper *Shrub, ornamental*		Y *Juniperus communis* Not on Elliman list for Peddocks	*Cupressaceae*	Rock outcrops and waste lands; withstands wind Soil: Wide range, tolerates alkaline soils	• Found: 1 Boston Harbor Islands. • Height/Spread: 5-10’ (rarely to 15’)/ 8-12’ • Growth rate: slow. • Full sun • Culture: Transplants readily, extremely hardy, adaptable but not as heat tolerant as other junipers
Black Gum *Shade Tree*	 *gobotany.newenglandwild.org*	Y *Nyssa sylvatica* Not on Elliman list for Peddocks, but occurs at WE **Allee** **Damp shade**	*Nyssaceae*	Wetlands Soil:, loamy, moist, rich, sandy, silty loam, well drained	• Found: 1 Boston Harbor Island. • Height/Spread 30-50'/ 20-30' • Habit: oval, rounded • Growth rate: Slow - medium • Full sun, partial shade • Likes medium - wet soils • Wildlife Value: Fruits attract many birds and wildlife.
Hop Hornbeam *Shade tree, ornamental*		Y *Ostrya virginiana* Not on Elliman list for Peddocks, but occurs at WE	*Betulacaeae*	Understory species on dry woodland slopes Soil: Found on dry, gravelly rocky soil. .	• Found: 1 Boston Harbor Island. • Height/Spread: 25-40’/ 16-40’ • Habit: Very graceful small tree, many horizontal or drooping branches rounded • Growth rate: Slow, 10 to 15’ over 15 year period. • Full sun or partial shade.
Sycamore *Shade tree*	 *wikipedia.org*	Y *Platanus occidentalis* Not on Elliman list for Peddocks, listed for Webb poss planted by DCR. Typically found W. and S. of BOHA	*Platanaceae*	Bottomlands, along riverbanks and streams Soil: deep, moist,rich	• Found: 1 Boston Harbor Island • Height/Spread: 75-100’/ 75-100’; to 150’, one of our tallest eastern native deciduous broadleaf trees. • Habit: Irregular, massive trunk, wide-spreading open crown. • Growth: medium to fast. • Full sun • Medium to wet •
Red Pine *Shade tree*	 *wikipedia.org*	Y *Pinus resinosa* Not on Elliman list for Peddocks	*Pinaceae*	Soil: dry, sandy, loose	• Found: at least 1 Boston Harbor Island. • Height/Spread: 66-115’/variable • Habit • Growth rate: • Full sun • Salt and heat intolerant • Needles in fascicles of 2

Cottonwood *Shade tree*	 *http://www.gpnc.org*	Y *Populus deltoides* Not on Elliman list for Peddocks; might be there now. Competes with other aggressive plants **VC area shade** **Transition Areas** **Parade-ground edges**	*Salicaceae*	Soil**:** Common on moist alluvial soils; tolerates dry	• Found: at least 3 Boston Harbor Islands. • Height/Spread: 75-100'/50-75' • Habit: Broad vase-shaped habit in old age, open irregular branching • Growth rate: Fast • Full sun • Medium to wet substrate • Easily grown; adaptable; trees over 70- deteriorate. • Used for shade in difficult areas. Can be messy in manicured landscape. May suffer damage in storms.
Winged Sumac *Shrub.* *Ornamental*	 gobotany.newenglandwild.org	Y *Rhus coppalinum* Not on Elliman list for Peddocks	*Anacardiaceae*	Soil: tolerant of slight acidity; textures from coarse to fine.	• Found: 2 Boston Harbor Islands • Height/Spread: 7 -15'/ 10-20' • Full sun to part shade • Most populations have male and female flowers on separate plants • Germination of seed enhanced passage through the digestive system of rabbits and birds
White Oak *Shade Tree*	 *http://en.wikipedia.org*	Y*Quercus alba* Not on Elliman list Elliman 2003 does not list any Quercus for Peddocks	*Fagaceae*	Soil**:** Intolerant of alkaline, shallow, or abused urban soils. Sensitive to compaction and grade changes.	• Found: 1 Boston Harbor Island • This tree grows at a slow to medium growth rate • Height/Spread: 50- 80'/50-80' • Habit: oval, rounded shape • Full sun, partial shade • Wildlife Value: Excellent wildlife plant. Mast associated with deer/white-footed wood mouse/deer tick cycle
Swamp White Oak *Shade tree*	 *http://www.nature.org/*	Y*Quercus bicolor* Not on Elliman list Elliman 2003 does not list any Quercus for Peddocks	*Fagaceae*	Lowlands, swamps	• Height/Spread: 50- 60'/50-60' • Habit: Open, round-topped crown, short, limby trunk • Full sun • Wildlife value: Excellent wildlife plant. Mast associated with deer/white-footed wood mouse/deer tick cycle
Scarlet Oak *Shade tree,* *Ornamental*	  	Y*Quercus coccinea* Not on Elliman list Elliman 2003 does not list any Quercus for Peddocks **Allee** **Campground Shade**	*Fagaceae*	Soil**:** Wide range except alkaline, some drought tolerance	• Found: 1 Boston Harbor Island • Height/Spread: 60- 80'/ 40-50' • Habit: rounded shape • Growth rate: Medium • Full sun • Wildlife Value: Excellent wildlife plant. Mast associated with deer/white-footed wood mouse/deer tick cycle

Red Oak *Shade Tree*		*Quercus rubra* Not on Elliman list Elliman 2003 does not list any Quercus for Peddocks **Allee?**	*Fagaceae*	Soil: acidic, drought tolerant, loamy, moist, sandy, well drained, clay. Found with red maple and ferns	• Found: 6 Boston Harbor Islands. • Height/Spread: 60-75'/45' • Habit: rounded shape • Growth rate: Fast • Full sun • Some drought tolerance • Wildlife Value: Excellent. Mast associated with deer/white-footed wood mouse/deer tick cycle
Black Oak *Shade tree*	 www.bio.brandeis.edu 	*Quercus velutina* Not on Elliman list Elliman 2003 does not list any Quercus for Peddocks **Allee?**	*Fagaceae*	Soil**:** Prefers moist, rich, well-drained, acid soils; also found on poor, dry, sandy, or heavy clay hillsides.	• Found: 11 Boston Harbor Islands • Height/Spread: 50-60' / variable • Habit: variable - crown narrow or wide spreading not often used as landscape tree • Long lived, withstands wind and storms • Full sun
Silky Willow *Shrub*		*Salix sericea* Not on Elliman list for Peddocks	*Salicaceae*	Soil: Clay, loam, sand Obligate wetland	• Found on 1 Boston Harbor Island. • Height: 6-13' • Habit: suckers, colonies • Growth rate: Rapid • Sun to shade • Wildlife: native bees, Acadian hairstreak
Sassafras *Shade Tree, Ornamental*	  http://www.naturallandscapesnursery.com, http://williamcullina.com	*Sassafras albidum* Not on Elliman list for Peddocks, occurs at Webb and World's End Possibly part of canopy historically **Transition areas** **Forest understory**	*Lauraceae*	Soil**:** acid, moist, wet, well drained, loam, some drought and salt tolerance	• Found: 2 Boston Harbor Islands • Height/Spread: 30-60'/ 25-40' • Habit: Rounded shape and aromatic smell • Growth rate: Slow • Full sun, partial shade
Arbor-vitae *Evergreen*		*Thuja occidentalis** Not on Elliman list for Peddocks	*Cupressaceae*	Soil**:** Wide range	• Found: 1 Boston Harbor Island. • Height/Spread: 40-60'/10-15' • Habit: pyramidal shape • Growth rate: Slow-medium • Full sun • Wildlife: Winter shelter, seeds are eaten squirrels and birds
Non-native trees and shrubs					

Catalpa	  *gobotany.newenglandwild.org*	*Catalpa bignonioides* Beach strand Non-native	*Bignoniaceae*		• Can be coppiced as showy hedge, would not recommending introducing new plant material but might work with what's there
White Poplar *Shade tree*	  *gobotany.newenglandwild.org*	*Populus alba** Not native, invasive on Harbor Islands **Not Recommended**	*Salicaceae*	Soil: Easy to grow, does well under any conditions	• Found; 9 Boston Harbor Islands • Height/Spread 40-70' /40-70', to 90'+. • Habit: wide-spreading, broad, crown; spreads by root suckers; susceptible to breakage • "Bleeds" if pruned in winter/spring • Diseases include cankers, leaf spots, rusts, powdery mildew. Insects include borers, aphids, caterpillars and scale
European beech *Shade tree, Ornamental*	 *wikipedia.org*	*Fagus sylvatica var. atropurpurea** Not on Elliman list for Peddocks, non-native	*Fagaceae*	Soil: Acidic, loamy, moist, sandy, well drained, clay soils.	• Found on 1 Boston Harbor Island. • Height/Spread: 50-60'/ 35- 45' • Habit: Oval • Growth Rate: slow to medium • Full sun • Prefers moisture but has some drought tolerance
Apple *Fruit tree*		*Malus pumila** Fields Roxbury Russet, Baldwin, Tolman Sweet **Orchard**	*Rosaceae*	Soil: Deep, loamy, slightly acidic. Avoid heavy clay soils, any that waterlog easily Dwarfing rootstocks require greater soil fertility	• Found on at least 4 Boston Harbor Islands • Height/Spread: 12-15'/12-15 • Full sun • Wildlife: Attracts birds, butterflies • Bloom: April - May • Plant more than one variety (or crabapples) to facilitate pollination
Crabapple sp. *Fruit tree*	 *http://www.wildflower.org*	*Malus sp.** Thickets Most non-native Overly aggressive on Harbor Islands Useful for grafting rootstock **Orchard**	*Rosaceae*	Soil: Adaptable	• Found on at least 3 Boston Harbor Islands • Height/Spread 14-18'/11-15' • Full sun • Bloom: April – May • Prune May- June (after flowering, before flower buds form for the following year) • M. coronaria and M. angustifolia native to Eastern US, although not to New England
Austrian Black Pine *Shade tree*	 *http://en.wikipedia.org*	*Pinus nigra* Woodlands	*Pinaceae*	Soil: adaptable, more salt and wind tolerant than red or Scotch pines	• Found on at least 1 Boston Harbor Islands • Height/Spread 66-180'/25-35' • Habit: Erect, pyramidal form • Growth rate: moderately fast • Full sun • May live up to 500 years • Needles in fascicles of 2

Scotch Pine *Shade tree*	 *http://en.wikipedia.org*	*Pinus sylvestris* Listed in Elliman notes, but not in Excel sheets for Peddocks	*Pinaceae*	Soil: Prefers moist, well drained. Does not tolerate flooding, some drought tolerance	• Found possibly on 1 Boston Harbor Island • Height/Spread 50-60'/30-40' • Habit: Erect, pyramidal form • Growth rate: moderately fast • Full sun • Needles in fascicles of two
Pear *Fruit Tree*	 *http://www.massgeneral.org*	*Pyrus communis** Not on Elliman list for Peddocks, non-native **Orchard**	*Rosaceae*	Soil: Acidic, deep, heavy, moist, but well drained soil. Other soil types are tolerated, but may produce a lighter crop. Sensitive to salt. Tolerates drought, floods	• Found: 2 Boston Harbor Islands. (Bartlett), • Height/Spread: 12-20'/12-20' • Habit: oval, rounded shape. • Growth rate: Fast • Full sun • Wildlife value: attractive to birds, squirrels. • Need a compatible pollinator within 100 feet for standard size • Bartlett, Endicott var. candidates for historic orchard. Endicott from Danvers, MA, oldest fruit tree in US
European Turkey-Oak *Shade tree*	 	*Quercus cerris** Non-native **Not Recommended**	*Fagaceae*	Soil: Grows well in clay soils	• Found: 1 Boston Harbor Island • Height/Spread: 40-60'/40-60' • Habit: conical-oblong, haystack to round-headed • Adaptable, little known outside arboreta • Has withstood droughts, -25° F
English Oak *Shade tree*	 	Quercus robur* Non native Overly aggressive **Not Recommended**	*Fagaceae*	Soil: prefers well-drained, pH tolerant	• Found: 9 Boston Harbor Islands. • Height/Spread: 75-100'+ /75-100' (in US av. 40-60') • Habit: Massive, open-headed, short trunk; too large for the average landscape; • Growth rate: Slow to medium • Full sun. • Mildew is often a serious problem
White Willow *Shade Tree*	 	*Salix alba** Not native	*Salicaceae*	Soil: Prefers moist soil, frequently found along streams, ponds,	• Found: 1 Boston Harbor Island. • Height/Spread: 75-100/50-100' . • Habit: Large, low-branching flexible • Growth rate: Extremely fast • Full sun • susceptible to storms; drops leaves, twigs, and branches all season

Weeping Willow *Shade Tree*		*Salix babylonica** Not native	*Salicaceae*	Soil: wide range, prefers moisture, some drought tolerance	• Found: 2 Boston Harbor Islands. • Height/Spread: 30-40'/35' • Habit: rounded, weeping shape • Growth rate: Fast • Full sun, partial shade • Wildlife: Browse for deer
Common Lilac	 http://davesgarden.com	*Syringea vulgaris* Thickets	*Oleaceae*		• Poss historic landscape component
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Native forbs currently on Peddocks					
Common milkweed	 https://gobotany.newenglandwild.org	*Asclepias syriaca* Old fields **Beach strand** **Transition areas (meadow)**	*Asclepediaceae*		• 24-36” • Tolerates mowing • Monarch butterflies
Bushy Aster	 http://www.ct-botanical-society.org	*Aster dumosus* Dry fields **Transition areas (meadow)**	*Asteraceae*		• 12”-36” • Occasional mowing improves flowering at SAIR • Blooms Aug-October • Cultivars commercially available do not resemble wild type • Wet or dry soil • More open panicle than A. ericoides
Heath Aster	 http://wisplants.uwsp.edu	*Aster ericoides* Old fields **Transition areas (meadow)**	*Asteraceae*	Meadows, prairies	• 6”-36” spectacular in large clumps • Colony forming, creeping rhizomes • Tolerates occasional mowing • Cultivars can be very different from wild type • Dry to moderate soil • Blooms Aug-Oct
New York Aster	 https://gobotany.newenglandwild.org	*Aster novi-belgii* Thickets, marsh edges **Boggy area** **Beach strand** **Transition areas**	*Asteraceae*		• 12”-54” • Perennial, self-sows readily • Blooms July-Oct • Usually in wet soil, tolerates dry • Tolerates mowing
Lady fern	 North Creek Nurseries	*Aythrium filix-femina* **Transition areas (forest understory)**	*Dryopteridaceae*	Typically grows in wet areas, often with Black Spruce, White Spruce	• Groundcover for damp shady areas

Marsh straw sedge	 https://gobotany.newenglandwild.org/species/carex/hormathodes/	*Carex hormathodes* Dry pebbly field	*Cyperaceae*	Salt marshes, coastal beaches	• Probably not available commercially; available on-island • 10-30 “, clump forming • Poss choice for ‘beach meadow’ • Blooms Jun, July
Broom sedge	 https://gobotany.newenglandwild.org	*Carex scoparia* Thicket beach-strand ecotone	*Cyperaceae*		• Avail NEWP • Full sun, wet/moist also listed for dry areas on some sites. • 1-3’ bunch-type sedge
Swan’s sedge	 http://www.missouribotanicalgarden.org	*Carex swanii* Thickets	*Cyperaceae*	Found with black oak, Little Bluestem, Chokecherry, Common cinquefoil	• For lush look medium to wet soil • Native dry to mesic soils. • Full to part sun • 6”-30” • Best ID’d June
Poverty Oatgrass	 www.pwrc.usgs.gov	*Danthonia spicata* Dry roadsides	*Poaceae*		• Avail Prairie Moon
Hay scented fern	 Wiki, Otter Creek WV	*Dennstaedtia punctilobula* Thickets	*Dennsteadtiaceae*		• Can be aggressive • Can decrease germination of tree/shrub seedlings • Can withstand occasional mowing • Poss good choice around yurts?

Intermediate Woodfern	 http://www.ct-botanical-society.org/ferns/dryopterisinte.html	*Dryopteris intermedia*	*Dryopteridaceae*	Moist, rich woods Found with Red Maple, Paper Birch, Quaking Aspen, Big-toothed Apen, Blue-bead Lily, Canada Mayflower	• Evergreen, symmetrical clump •
Field Horsetail	 http://www.cas.vanderbilt.edu	*Equisetum arvense* Thicket beach-strand ecotone	*Equisetaceae*		• Withstands some mowing (SAIR near slagpile), • Great woodland groundcover for damp areas (SAIR) • Avail from NE Nursery • Can be aggressive
Daisy Fleabane	 http://www.ct-botanical-society.org	*Erigeron annuus* Old fields	*Asteraceae*		• Blooms June- October • Sows prolifically from seed in disturbed areas • 20”-60”
Rough fleabane	 http://minneflora.com	*Erigeron strigosus* Old fields	*Asteraceae*		• Occasional mowing improves flowering (SAIR) • 12-30 inches • Adapts to a variety of conditions, self sows • Bloom June-September (later if cut back)
Grass-leaved Goldenrod	 minnesotawildflowers.info	*Euthamia graminifolia* Thickets	*Asteraceae*	Moist, sunny areas, also tolerates dry	• Blooms July-October • 12”-48”

Red Fescue	 http://www.wnps.org	*Festuca rubra ssp pruinosa* Old fields	*Poaceae*		• Only 'pruinosa' ssp is native, to coastal, near coastal areas • Elliman does not specify ssp • Does not tolerate heavy foot traffic • Susceptible to disease under hot, fertile, moist conditions • May clump or form mats, used in lawns as cool season component • Does well in shade
Beach Pea	 gobotany.newenglandwild.org	*Lathyrus japonicas* Beach strand	*Fabaceae*		• Blooms cool season, outstanding beach border plant, propagate by locally collected seed • Edible pods
Sea Lavender	 http://www.vfthomas.com	*Limonium carolinanium (nashii)* Salt marsh, sheltered beaches	*Plumbaginacae*		• Can be difficult to grow out of natural habitat
Common woodrush	 gobotany.newenglandwild.org	*Luzula multiflora* Old fields	*Juncaceae*	Woodlands, meadows	• 4"-16" cool season perennial

Old Field Toadflax	  gobotany.newenglandwild.org	*Linarea canadense* Old fields	*Scrophulariaceae*	Dry, sunny, rocky areas	• Blooms April-September

Canada Mayflower	  gobotany.newenglandwild.org	*Mianthemum canadense* Not on Elliman list but on Peddocks		Forest understory	• Currently growing under Norway maples on S. drumlin, E. Head.
Common Evening Primrose	 http://uswildflowers.com	*Oneothera biennis* Old fields	*Onagraceae*		• occasional mowing improves flowering at SAIR • bush-like if sheared • flowers fully open in evening • 24”-60” •
Sensitive Fern	 gobotany.newenglandwild.org	*Onoclea sensibilis* Thickets	*Dryopteridaceae*		•
Witchgrass	  http://biology.missouristate.edu, http://www.pittstate.edu	*Panicum capillaire*	*Poaceae*		•
Switchgrass	  gobotany.newenglandwild.org	*Panicum virgatum* Not on Elliman list	*Poaceae*		• The only Panicum sp that Elliman mentions is ‘capillaire’, or annual witchgrass. Panicum virgatum is common on other islands may need more investigation

Common Cinquefoil	 https://gobotany.newenglandwild.org	*Potentilla simplex*	*Rosaceae*		• Probably not available commercially • Not particularly showy • Recommended for stabilizing eroding slopes (Cleveland Museum of Natural History)
Sweet Everlasting	 http://www.minnesotawildflowers.info	*Pseudonaphalium obtusifolium*	*Asteraceae*	Old fields	• Avail Prairie Moon
Little Bluestem	 http://www.wnmu.edu	*Schizachryium scoparium*	*Poaceae*	Old fields	•
Goldenrod sp	 http://species.wikimedia.org	*Solidago canadensis, juncea,nemoralis,puberula,rugosa,*	*Asteraceae*	Old fields	•
Seaside Goldenrod	 gobotany.newenglandwild.org	*Solidago sempevirens*	*Asteraceae*	Salt marsh, beach strand	• Successfully transplanted from beach strand into beds near visitor center by NR volunteers

Salt Marsh Hay	 http://www.chesapeakebay.net	*Spartina patens*	*Poaceae*	Salt marsh	• Does well in cultivation but can be outcompeted
Blue Vervain	 gobotany.newenglandwild.org	*Verbena hastata*	*Verbenaceae*	Thicket edges on East Head	• Biennial • 24”-60” • Prefers damp areas • Blooms July-sept
Non-native forbs currently on Peddocks					
Asparagus	  http://species.wikimedia.org	*Asparagus officianalis*	*Liliacaea*	Dry pebbly field	•
Oxeye daisy	 http://texasinvasives.org	*Chrysanthemum leucanthemum*	*Asteraceae*	Old fields	•
Chicory	 minnesotawildflowers.info	*Cichorium intybus*	*Asteraceae*	Old fields	• No need to plant tend to come on their own • Becomes bushy and attractive with repeated cutting • Unattractive and weedy if allowed to spread unchecked.

Common Sunflower	 www.missouriplants.com	*Helianthus annuus*	*Asteraceae*	Beach strand	• Native to Midwest, introduced to NE •
Tiger Lily	 gobotany.newenglandwild.org	*Lilium lanceifolium*	*Liliaceae*	Thickets	• Possible historical planting, would be appropriate near historical areas
					•

This is a nearby example of a somewhat stable forest community that could be used as a long term restoration goal for areas with tree canopy:
The oak-hickory forest on the southeastern side of World's End is the only forested community in the Harbor Islands dominated by native trees. Black oak (Quercus velutina), red oak (Quercus rubra), and white oak (Quercus alba) are the primary canopy trees. Red maple (Acer rubrum), bitternut hickory (Carya cordiformis), hop hornbeam (Ostrya virginiana), white pine (Pinus strobus), and hemlock (Tsuga canadensis) occur as canopy associates and in the forest understory. A fine stand of black gum trees (Nyssa sylvatica) grows in a moist section of this forest. Witch hazel (Hamamelis virginiana) and highbush cranberry (Viburnum trilobum) are common shrubs. The stand's herbaceous flora has many native species typical of mature oak forests: wild sarsaparilla (Aralia nudicaulis), striped wintergreen (Chimaphila maculata), whorled loosestrife (Lysimachia quadrifolia), Indian cucumber-root (Medeola virginiana), partridge berry (Mitchella repens), interrupted fern (Osmunda claytoniana), false Solomon's-seal (Smilacina racemosa), carrion-flower (Smilax herbacea), blue-stemmed goldenrod (Solidago caesia), New York fern (Thelypteris noveboracensis), and wild oats (Uvularia sessilifolia).

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National Park Service
U.S. Department of the Interior



Olmsted Center for Landscape Preservation
Boston National Historical Park
Charlestown Navy Yard, Quarters C
Boston, MA 02129
Phone: 617.241.6954
Fax: 617.241.3952
www.nps.gov/oclp/