HENRY CABOT LODGE MEMORIAL PARK MANAGEMENT AND RESTORATION PLAN

Prepared for the
Friends of Lodge Park

by William Giezentanner
Mass Audubon's Ecological Extension Service
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Mass Audubon

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Contents

Introduction

The Henry Cabot Lodge Memorial Park at East Point in Nahant is an almost ten-acre open space located at the eastern extreme of Nahant.

This document aims to provide a land management plan for Lodge Park including visitor experience, invasive species management, re-establishment of native vegetation, lighting, and overall management including prioritization of DPW, volunteer, and contractor efforts.

Nahant at a Glance

- Total Land Area: 803 acres (1.3 square miles)
- Human Population in 2020: 3,340
- Open space protected in perpetuity: 154 acres, or 19.2% percent of total area*

* Calculated using MassGIS open space data

Land Acknowledgement

Land that is well managed sustains us in many ways – often referred to as ecosystem services. A few examples of what land provides when it is managed sustainably include:

- The air we breathe
- The water we drink
- The food we eat
- Sequestration of carbon
- Climate moderation
- Protection from flooding
- Recreation that renews our spirits
- The lumber we use to build our shelters
- Filtration and decomposition of our wastes
- Habitats for a diversity of plants and animals

The town of Nahant is situated within the ancestral lands of the Mattakeeset Tribe of the Massachusett Nation which was in Massachusetts Bay from present-day Salem to Brockton. Native American families and tribes allied in the Pawtucket Confederation. Archaeological records indicate that the town was first home to Native Americans long before the arrival of English settlers in 1629.

These lands were taken from the Indigenous people, creating a legacy of trauma that persists to this day. Indigenous stewardship of the land kept its ecological communities vibrant, strong, and interconnected for thousands of years, but far from being relics of the past, Indigenous peoples, including 37,000 individuals who currently reside in Massachusetts, are still at the forefront of environmental protection, ecological stewardship, and climate mitigation. This land helped sustain them for thousands of years before its occupation by Europeans. How we care for the land will determine how well it will sustain us and our descendants.

General Character and Landscape Context of Henry Cabot Lodge Memorial Park

Nahant is essentially an island with a predominantly rocky shoreline connected to the mainland by a rather narrow tombolo along which runs a causeway. The main portion of Nahant lies roughly three miles southeast of the mainland and is well treed but heavily developed, except for a swampy vegetated lowlands area, a golf course, two largely undeveloped headlands, a cemetery, and several small woodlots. Nahant Beach (also known as Long Beach) connects the upland portion of Nahant to the mainland at the Lynn shore. The community has an abundance of beaches, jagged cliffs, and sweeping ocean views. It is predominantly a residential community, but its natural amenities attract flocks of people seasonally for swimming and boating and year-round for activities such as walking, jogging, and bicycling.

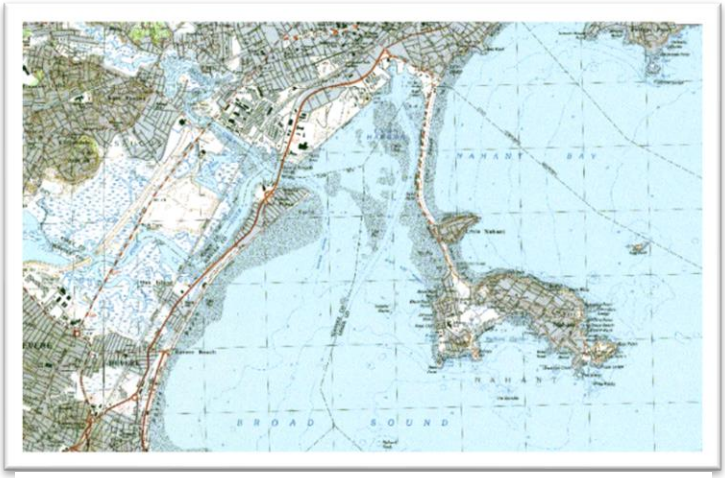

FIGURE 1 - USGS MAP OF NAHANT

East Point is a rocky headland at the far east end of the peninsula.

Physical History[1].

Nahant has been a Mecca for geologists. Some of its rocks date back almost 600 million years to the Cambrian period. These oldest layers are sedimentary rocks (limestone or siltstone, known as the Weymouth Formation) located along the cliffs of East Point that formed when grains (clay, silt, sand, gravel, stones, etc.) being transported by moving water (or wind) were deposited and cemented together over time. Fossils in these rocks include some of the oldest hard-shelled animals. These rocks formed when the continents were joined together in a "super-continent" and ended up here (and in western Europe and northern Africa) via the movements of earth's tectonic plates. Younger rocks of volcanic origin are also found, including Nahant Gabbro (460 to 490 million years old), intrusions of molten magma that formed sills and dikes, and layers of igneous rocks that flowed over the older sedimentary rocks. Then the forces of time folded and tilted and broke apart (faults) the various layers into the jumble that can be seen now.

The next chapter of Nahant's physical history began about 200,000 years ago when several ice ages came and went. The ice scraped away soft and fractured material and left behind bedrock and "till" consisting of clay, sand, and stones it had picked up as it moved down the continent from the north. Shortly after the last ice age, about 12,000 years ago the landscape began to change into much of what

[1] Geology of Nahant, Mal Hill, Associate Professor, Dept. Marine & Environmental Sciences, Northeastern University, Boston, MA 02115, 2013

we see today. Coastal erosion wore away at much of the weaker rocks that had connected Nahant to the mainland, leaving behind the "island" of Nahant that is connected to the mainland by a narrow, sandy bridge known as a tombolo, now called Nahant (or Long) Beach.

At East Point there have been major human-made changes that will be described in the next section.

Cultural History[2]

East Point has a long and colorful history. The Native Americans used Nahant as a summer fishing site. Until 1853 Nahant was a part of Lynn, which was settled by Puritan farmers in 1629 and incorporated as a Town in 1631. While Salem to the north and Boston to the south became world trading centers, attracting wealthy merchants, Lynn was an agricultural town through the early 1800s. Lynn farmers used Nahant as a pasture for domestic animals.

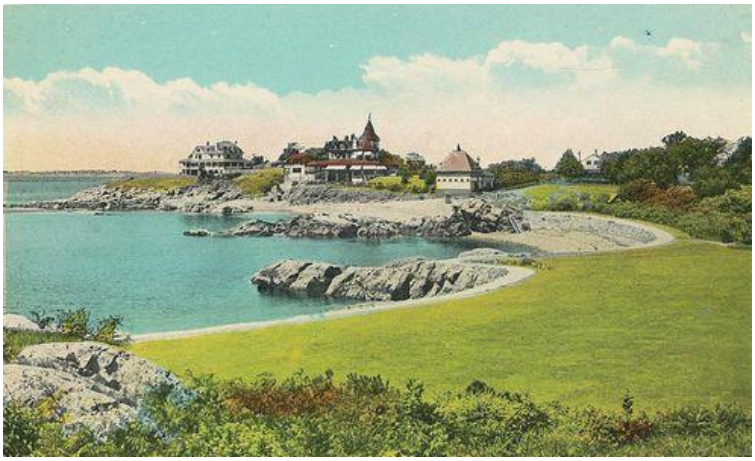

FIGURE 2 - HISTORIC VIEW OF EAST POINT

At low tide, the earliest European farmers in Lynn would drive their cows, sheep, goats, and swine across the beach connecting the peninsula to graze as the area would contain the livestock without the need for fencing. To live on the island, early settlers were required to cut down trees (for building structures in Lynn and to create more pasture) and to fish. East Point became known as Ram Pasture in those days. Until 1853 Nahant was part of Lynn, which was settled by Puritan farmers in 1629 and incorporated as a Town in 1631.

In the early 1800s it was occupied by a hotel with "almost 100 beds"[3] and in 1852 by a much larger hotel with "300 rooms and dinning for 600"[4]. Two steamships would constantly run from Boston during the summer season. The hotel burned in 1861 and the property was acquired by the family of Senator Henry Cabot Lodge. In 1868 Senator Lodge built his "cottage" and later added several outbuildings including a caretaker's house. The Senator's sister and her husband, George A. James, built a second "cottage" on the south side of the Point. Later it was acquired by Harmon P. Elliott.

Nahant's strategic location, overlooking the shipping lanes into the port facilities of Boston and Lynn, became important for coastal defense. During the Spanish-American War, the Massachusetts militia used a portion of East Point as a headquarters and signal station for coastal defense. During World War I, the military established an experimental station for electronic devices and systems to detect submarines. In 1941 the military took over East Point as a major part of the network of coastal

[2] Much of this section is based on information included in East Point, Nahant Through Time, by Gerald W. Butler, America Through Time, Arcadia Publishing, 2019

[3] The Sunday Herald, August 24, 1902

[4] East Point, Nahant Through Time.

fortifications. Two hardened concrete gun emplacements and control structures were built along with support structures and barracks. The gun emplacements and control structures were covered with earth and camouflaged. These facilities are massive and altered much of the point. At the end of the war the facilities were placed on "maintenance status" and the equipment was removed for salvage.

Again in 1952 the site was activated during the Korean War. Radar and antiaircraft guns were installed, and 125 enlisted men were quartered in the former James/Elliott "cottage" and barracks. Later in 1954, much of the eastern end of the point was covered with fill and the Army installed three underground Nike missile magazines with four-foot-thick reinforced concrete walls and aboveground launch facilities. These facilities were decommissioned in the early 1960s and in 1967 Northeastern University acquired most of East Point for research and instruction in marine science. Some structures were demolished, and debris was removed. The former Nike site was acquired by the town in 1974.

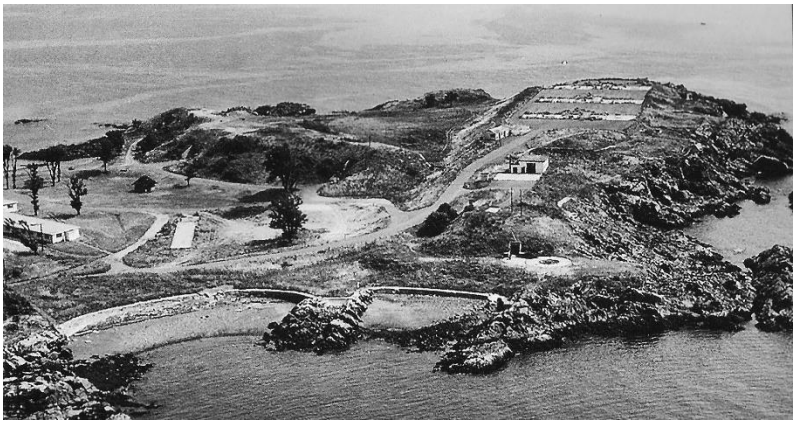

FIGURE 3 - VIEW OF EAST POINT IN 1968 WITH REMAINS OF NIKE SITE AT TOP RIGHT

Current Landscape

Over the past 50 years, the landscape of East Point has evolved. Trees have grown and some once cleared areas have grown up with shrubs and sapling trees. In 1986 the town began efforts to improve the site as a park. Demolition and removal of some of the remains of the Nike facilities was followed by earthwork to fill the concrete missile storage magazines and cover area with gravel and four-inches of loam and the area was seeded with salt-tolerant grasses, trees, and shrubs. Lodge Memorial Park was dedicated in 1988 and a plaque to the memory of Senator Henry Cabot Lodge, Jr. was unveiled. Landscape Architects Moriece & Gary, Inc. prepared a master plan for the site in 1990 that recommended the following:

FIGURE 4 - VIEW OF EAST POINT WITH LODGE PARK IN FOREGROUND

- Create an entrance sequence by narrowing the pavement to pedestrian scale, creating a curving pathway, and planting trees

- Rehabilitate the former storage building for park maintenance and provide four “handicapped” parking spaces
- Relocate utilities underground to the rehabilitated maintenance building
- Create naturalistic landforms over the site of the former missile bunkers
- Create a mound (near the existing Lodge Memorial) by filling six feet on top of the existing concrete to provide panoramic view from a low stone overlook with interpretive markers
- Create a flat grass “meadow” for playing informal games or picnicking
- Develop a system of undulating and curving trails for strolling, jogging, and bicycling
- Include sitting and picnicking areas along the trails
- Mass dense shrub plantings to deter access to hazardous areas and create sheltered niches to attract birds and other wildlife

The site plan also showed two low stone overlooks facing east at the edge of the cliffs.

The site includes a rocky intertidal area and rocky cliffs that run from the intertidal area to the vegetated upland about 60 feet above sea level. The vegetated upland is composed of two connected grassy knolls, areas of deciduous forest, grassland, shrubland, mowed grass, the formal Lodge and Volpe Memorials and the stone-dust paths that surround and traverse the area. There are also several benches along the pathway. The stone overlooks were never built.

Resource Inventory and Assessment

An approximately 1,800-foot-long loop trail runs through Henry Cabot Lodge Park and allows access to small areas of deciduous forest, shrubland, and larger areas of grassland, and mowed grass. There are also several less formal side trails to benches and viewpoints. The approximately 10-acre site is part of the larger East Point Headland. Northeastern University (20.4 acres) owns the majority of the headland. The area is highly valued by the community for its historical and passive recreational values.

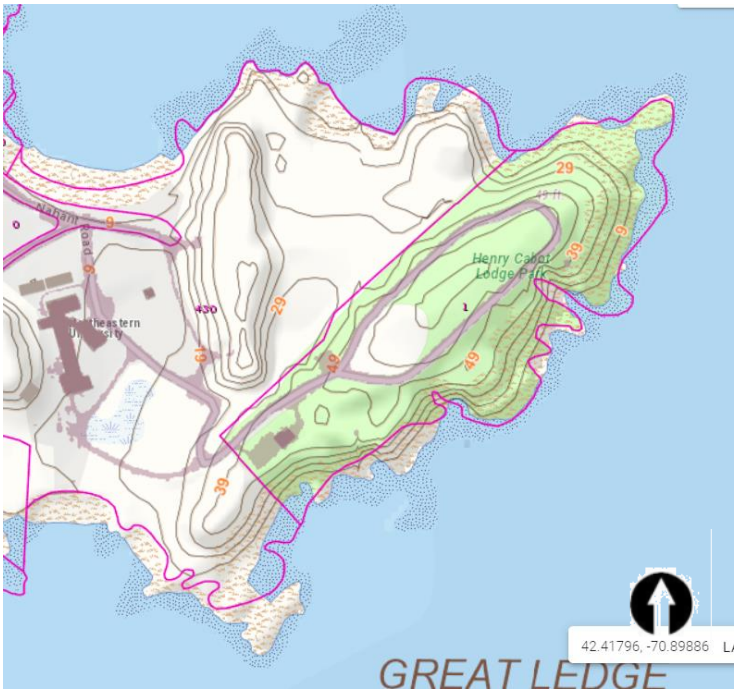

FIGURE 5 - TOPOGRAPHY - 10' CONTOURS

Ecological Features

The entire headland includes a variety of significant ecological features, including physical characteristics such as topography and soils, and natural habitats.

Topography

As shown in Figure 5, Lodge Park has steep, dramatic cliffs on its northern and eastern perimeter that rise 40 to 50 feet above sea level and a gently mounded, primarily grassy area above. The highest area is about 70 feet above sea level. The western edge slopes steeply down to the shrubland

between Lodge Park and the Northeastern facilities located in the earth covered World War II John B. Murphy bunker. Steep slopes and the precipitous rock cliffs present safety and trail location issues.

Soils

Much of the soil at East Point has been altered by the site's long history of manipulation for its past uses. Most of the Lodge Park area is classified as "udorthents-urban land complex" and consists of moderately well drained to excessively drained soils that have been disturbed by cuffing or filling. A small portion of the site along the eastern perimeter is classified as Chatfield-Hollis rock outcrop complex and consists of moderately steep soils on upland hills where the underlying bedrock is near the surface.

Natural Communities

Natural communities are divisions in plant communities based on conditions determined by the entire landscape. Soil composition, slope, aspect, elevation, and land use history are all factors that determine the distribution of natural communities on a site.

The natural communities of Lodge Park include Intertidal Rocky Shore, Maritime Rock Cliff, Maritime Shrubland, Cultural Grassland, and a small area of Maritime Forest/Woodland.

Intertidal Rocky Shore Community[5]

The intertidal rocky shore community is only accessible in small areas at East Point because of the steep cliffs (more of this community is accessible from the Northeastern University owned area of East Point). It is dominated by invertebrates and non-vascular plants, in a high-stress environment alternately covered by tides and exposed to desiccation and thermal stress. Microhabitats include tide pools of varying depth and sizes, rocks ranging in size from huge boulders and bedrock to cobbles, rock faces varying in degree of exposure to wave energy, and crevasses and surge channels within and between rocks. Wintering sea birds such as **Harlequin Duck** and **Great Cormorants** feed among submerged rocks close to shore. Wintering **Purple Sandpipers** forage among exposed rocks in low tide. This is also a foraging area for marine fish such as striped bass during high tide. Rocky shores provide habitat, including tidal pools, for many marine invertebrates that are important to community structure, including blue mussels; several species of herbivorous gastropods, especially periwinkle snails (an exotic marine species); a predatory snail, dog whelk; and sea stars. Note: **bold** indicates species that have been observed at East Point Headland – eBird Hotspot. See Appendix A - eBird Hotspot – East Point Headland.

Lodge Park includes a little less than 3 acres of intertidal rocky shore habitat.

The Heritage Program's *BioMap2 Nahant* town report lists the approximately 11-acre rocky intertidal area around East Point as a Core Habitat featuring an uncommon natural community. The BioMap2 Project was developed by Natural Heritage and Endangered Species Program (NHESP) as a guide for strategic biodiversity conservation in Massachusetts by focusing land protection and stewardship on the areas that are most critical for ensuring the long-term persistence of rare and other native species and

[5] See Mass. NHESP fact sheet https://www.mass.gov/doc/marine-intertidal-rocky-shore-community-0/download

their habitats, exemplary natural communities, and a diversity of ecosystems. In Massachusetts there are few truly rocky shores, so this community type is relatively rare. Any access improvements should include a high level of sensitivity to this uncommon natural resource. See the Appendix B for a summary of the BioMap2 Town Report related to East Point.

Maritime Rock Cliff Community[6]

Rock cliffs are arbitrarily defined as near vertical (>60% slope). The Maritime Rock Cliff Community occurs on the ocean side of East Point and other coastal bedrock outcrops, above the rocky intertidal community, but within the salt spray zone where they are very exposed to storms. Vegetation grows in small pockets where the soil may be augmented by droppings from gulls, cormorants, and other cliff-perching birds.

The Maritime Rock Cliff Community is sparsely vegetated by low, scattered, salt- and wind-hardy, plants, such as knotted pearlwort, saltworts, common rush, seaside plantain, **poison ivy**, blue toadflax, **seaside goldenrod**, Scotch lovage, common hairgrass, and native and non-native red fescues. Species from the top of the headland, often form a Maritime Shrubland community, that occur in less exposed ledges. Plants of extremely exposed maritime rock cliffs and outcrops tend to be tough, non-native herbaceous perennials including **mugwort**, **black mustard**, smartweed, and **curly dock**. Note: **bold** indicates species included in an inventory of East Point plants - See Appendix D – Plant Inventory of East Point.

Harbor seals use the rocks below the cliffs to haul out and rest. The exposed rock face itself does not provide habitat for specialized fauna. Note: **bold** indicates species that have been reported at East Point.

Lodge Park includes approximately 3 acres of rock cliffs.

Maritime Shrubland[7]

The Maritime Shrubland community occurs within the area of direct influence of the ocean and salt spray on the rocky headland. It is dominated by patches of dense shrubs with scattered areas of more open low growth or bare ground and has less than about 25% tree canopy. Plants in these communities are exposed to the direct influences of salt and constant ocean wind, which select for stress-tolerant species. The species of Maritime Shrublands do not withstand flooding by saltwater, but they tolerate or recover from salt deposits on their leaves. Fire was an important part of this environment prior to the establishment of fire suppression regimes in settled areas. Without regular disturbance, the community may succeed to forest.

Maritime Shrublands are within the northeastern oak and oak-pine forest region; species of these communities are species of oak forests. They often have dense patches of shrubs, up to about 3m (10 ft.) tall, with various species dominating in different areas. Huckleberry, **bayberry**, or **red cedar** areas are often distinctive. **Black cherry**, beach plum, chokeberry, lowbush blueberry, and bearberry may be abundant. Catbrier and **poison ivy** often cover other plants or grow in dense patches on their own. Non-native species are often abundant including **Oriental bittersweet** and **honeysuckle**. The

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[6] See Mass. NHESP factsheet https://www.mass.gov/doc/maritime-rock-cliff-community-0/download

[7] See Mass. NHESP factsheet https://www.mass.gov/doc/maritime-shrubland-0/download

herbaceous layer is usually sparse. Note: **bold** indicates species included in inventory of East Point plants.

Shrub thickets provide nesting areas for **Northern Harriers**, **Eastern Towhees**, and **Song Sparrows**. Maritime Shrublands are heavily used during fall migrations for cover and forage; many of the plants have fruit attractive to migrants. White-footed mice can also be very abundant, and in the openings, meadow voles may be common. Long-tailed weasels occur in the grass-dominated areas where they hunt meadow voles. Note: **bold** indicates species that have been observed at East Point Headland – eBird Hotspot. See Appendix A - eBird Hotspot – East Point Headland.

Lodge Park includes approximately 2 scattered acres of shrubland.

Cultural Grassland Community[8]

The grassland community at Lodge Park is maintained by frequent mowing and is primarily of conservation interest for the grassland bird community and/or pollinators.

Grassland birds are found in a variety of habitats: for example, **Bobolinks** in taller grasses found in relatively large (>10 acres) hayfields and **Eastern Meadowlarks** in shorter grasses found in pastures. Other grassland birds include **Killdeer** and **Horned Larks**. Meadow voles, meadow jumping mice, and northern short-tailed shrews would be expected in most grasslands. They would be hunted by garter snakes, long-tailed weasels, **American Kestrels**, and wintering **Northern Harriers**, **Snowy Owls, Snow Buntings**, and **Short-eared Owls**. Note: **bold** indicates species that have been observed at East Point Headland – eBird Hotspot. See Appendix A - eBird Hotspot – East Point Headland.

The approximately 3.7 acres of grassland at Lodge Park is generally considered too small for most ground-nesting birds.

Maritime Forest/Woodland[9]

Maritime Forest/Woodlands have a mixture of deciduous and evergreen trees in the canopy that is lower than typical in more inland areas, averaging about 30 feet (10m) tall. Many trees are multiple-stemmed and contorted from pruning by winds carrying salt and sand. **Black oak**, scarlet oak, white oak, **other oaks**, hickories, American holly, sassafras, black gum, **black cherry**, and red maple are commonly present. Pitch pine and **red cedar** occur in variable, generally low, amounts. Vines may be dense, especially on the edges of openings; vines often include greenbrier, **poison ivy**, Virginia creeper, grape, and the non-native **Oriental bittersweet**. The shrub and herbaceous components can be diverse and include species usually found in less acidic areas. Shrubs may include **bayberry**, inkberry, winged sumac, **shadbush**, and sweet pepperbush. The understory often includes non-native shrubs that can form dense thickets of Japanese barberry, **honeysuckles**, common buckthorn, and/or **multiflora rose**. The herbaceous layer is also highly variable and may include bracken fern, Canada mayflower, partridgeberry, starflower, Pennsylvania sedge, and other **sedges and grasses.** Microtopography and local conditions strongly influence the species assemblage. Note: **bold** indicates species included in inventory of East Point plants.

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[8] See Mass. NHESP factsheet https://www.mass.gov/doc/cultural-grassland-0/download

[9] See Mass. NHESP factsheet https://www.mass.gov/doc/maritime-forestwoodland/download

There are no animal species known to be restricted to Maritime Forests/Woodlands. Animal species are those of typical coastal oak areas such as the birds **Eastern Towhee**, **Gray Catbird**, **Common Yellowthroat**, **Ovenbird**, and **Black-and-white Warbler**. Small mammals such as meadow voles, white-footed mice, and gray squirrels are common. Moths, butterflies, and other insects of the southeastern oak and oak-pine forest occur in maritime forests. Generally, in more salt-influenced environments like Lodge Park, fewer animals will be expected. As in all communities on peninsulas the more remote occurrences have fewer species than those closer to the mainland sources. High **white-tailed deer** densities may have an impact on the abundance of native species, particularly woody seedlings such as oaks, as well as on herbaceous plants. Note: **bold** indicates species that have been observed at East Point Headland – eBird Hotspot. See Appendix A - eBird Hotspot – East Point Headland.

There is just .1 acre of this community within the boundary of Lodge Park. The area is part of a much larger forested area on the Northeastern University property. Some of the area classified as shrubland is trending toward becoming forest.

FIGURE 6 - LONG-EARED OWL

Wildlife

Birdwatchers and botanists have recorded wildlife at East Point. Part of the headland is also a BioMap2 Core Habitat, meaning the area (the Marine Intertidal Rocky Shore) is Important for protection and careful stewardship to assure the long-term persistence of rare and other native species and a diversity of ecosystems. The East Point Headland is also a hotspot in the Cornell University eBird project which encourages birdwatchers to enter their observations into a database.

The Massachusetts State Wildlife Action Plan[10] (SWAP) lists grasslands and rocky coastlines as two of 24 habitats that protect Species of Greatest Conservation Need (SGCN). Grasslands have 71 SGCN (2 reptiles, 15 birds, 1 mammal, 2 beetles, 9 lepidoptera (butterflies and moths), 5 bees, and 38 plants) and rocky coastlines are habitat for 4 SGCN, all birds.[11]

Birds

Birdwatchers have reported a total of 197 species (see Appendix A – eBird Hotspot – East Point Headland for complete list). Seventy species of birds have been reported during the breeding season (June and July) indicating that many of them may breed at the site or nearby. Shrublands and fields are critical wildlife habitats that are essential for the survival of many wildlife species. The loss of these

[10] https://www.mass.gov/service-details/state-wildlife-action-plan-swap

[11] See Appendix C State Wildlife Action Plan Habitats at East Point for complete lists.

habitats through conversion to other land uses, residential development or through succession, is resulting in the decline and disappearance of some wildlife dependent on early successional habitats. See Mass Audubon's report on the State of The Birds for more details on these declines (https://www.massaudubon.org/content/download/21633/304821/file/mass-audubon_state-of-the-birds-2017-report.pdf).

Grassland species including **Bobolink** and **Savannah Sparrow** have been reported at the site. Although not regularly seen at East Point, their presence is notable as these species have seen dramatic declines in the Northeast and the rest of the country as the amount of farmland has decreased.

Shrubland species including **Eastern Towhee**, **Alder Flycatcher**, **Brown Thrasher**, and **White-throated Sparrow** have all been reported at East Point. Although not all of these are regularly seen at East Point, they too have seen dramatic declines in the Northeast and the rest of the country as the amount of shrubland has decreased.

Forest species including **Canada Warbler**, and **Long-eared Owl** have been reported at East Point. Although not regularly seen at East Point, these species too have seen dramatic declines in the Northeast.

Amphibian and Reptiles

There are no inventories of amphibians or reptiles at East Point or Nahant. The Massachusetts Herpetological Atlas Project[12], an ongoing effort, originally running from 1992 through 1998, has reported only 2 species, Red-backed Salamander and Garter Snake for Nahant.

Other Wildlife

Nahant may provide some habitat for generalist species. Common habitat generalist mammals that are likely to occur within the area include: Virginia opossum, racoon, eastern gray squirrel, red squirrel, eastern chipmunk, meadow vole, white-footed deer mouse, eastern cottontail, **coyote**, **red fox**, long-tailed weasel, striped skunk, and **white-tailed deer**. Migratory bird species use a mix of forest, edge, and field habitats that are available within the site and surrounding habitats. Butterflies, bees, and other insects help pollinate the wildflowers and are food for many of the small mammals and birds that use the habitats. **Whales** are sometimes seen offshore, and **Harbor Seals** have been seen resting on the rocks of East Point.

The waters and tidepools around East Point are full of marine aquatic species including fish, crabs, lobsters, snails, and a host of other invertebrates.

Goals for the Rehabilitation and Stewardship of Lodge Park

At its inception Lodge Park was established as a site for open space conservation, habitat for wildlife, passive recreation, and as a Memorial to Sen. Henry Cabot Lodge. In 1999 the Nahant Open Space Management and Land Acquisition Committee prepared a Management Plan for Henry Cabot Lodge, Jr., Memorial Park. It opened with this Statement of Purpose, "The natural beauty of East Point, with its

[12] https://massherpatlas.org/

commanding ocean view, enhances the quality of life for the residents of the Town of Nahant while providing a habitat for wildlife."

The management plan stated that "The natural grassy area is intended for passive recreation such as walking, painting, photography, birdwatching, and simply enjoying the view. The area will be maintained as a natural open meadow. [With] the provision for occasional small, low growing 'islands' of natural vegetation such as bayberry or wild rose that will enhance the site and provide cover and forage for birds."

The scope for this current management plan includes stewardship of the site's wildlife habitat, enhancing the visitor experience, and lighting.

Stewardship of Wildlife Habitat

The goal for stewardship of the site is to **restore areas of more native communities** over time and include.

- **Grassland management and restoration to reestablish more native species**
- **Management of invasive species**
- **Enhancement of wildlife habitat**
- **Develop a schedule of maintenance activities**

Enhance Visitor Experience

The goals for enhancing the visitor experience and passive enjoyment of the site include.

- Improve the welcome and orientation experience
  - Right-of-way from parking to Lodge Park
  - Signage
  - Passive recreation
- Assess safety issues and recommend improvements
- Review location of viewpoints and benches and recommend improvements
- Improve interpretation

Lighting

The goals for lighting include.

- Review impacts of lighting
- Recommend changes consistent with International Dark-Sky Association[13] standards

Permitted and Prohibited Uses

Many towns have a set of permitted and prohibited uses for their public open spaces, but the town's website doesn't have such a list. The following is an example of such uses to consider for Lodge Park.

[13] https://www.darksky.org/

Permitted Uses (DRAFT)

Lodge Park is open to the public to enjoy multiple passive activities including walking, painting, photography, birdwatching, and simply enjoying the view.

- Open Dawn to Dusk
- Parking at the parking area at Canoe Beach (with town resident sticker). Limited handicapped parking to the left of the Lodge Memorial.
- Dog walking with the following restrictions (See Summary of Nahant's Dog Laws https://nahant.org/dog-officer/)
    - All dogs must be always leashed
    - Please keep dogs on the trails for the safety of the area's wildlife
    - Please bring plastic bags to pick up and properly dispose of all dog waste

Uses Requiring a Special Permit (from Town Hall)

- Organized group activities with more than 6 participants
- Visits between dusk and dawn (stargazing, etc.)

Prohibited Uses (DRAFT)

- Littering, dumping, discarding trash, fill, or landscape debris (lawn clippings, brush, leaves)
- Disturbing wildlife or vegetation, introducing animals or plants
- Swimming
- Rock climbing
- Fires or the use of fireworks
- Carrying or using alcoholic beverages or unlawful drugs
- Possessing guns or weapons of any variety
- Hunting or trapping
- The use of motorized vehicles
- Smoking
- Metal detecting
- Use of drone and/or model airplanes

Management Recommendations

The following section will address land management in time of climate change, past management efforts, stewardship of wildlife habitat, measures to enhance the visitor experience and manage passive recreation uses, lighting modifications to conform to the International Dark Skies Association standards, and other wildlife enhancement opportunities. It will also recommend a schedule of management activities.

Management of Natural Areas in a Time of Changing Climate

The management of natural resources has largely assumed a stable climatic background. Now there is widespread agreement among scientists and the public that the climate is changing because of human activities – largely attributed to the burning of fossil fuels resulting in the production of carbon dioxide.

Massachusetts is already experiencing the effects of climate change, from hotter summers with more periods of drought, warmer winters with less snow cover but more precipitation, rising sea levels, more frequent severe weather events, and inland flooding in winter and spring.

Climate impacts that may affect conservation land are predicted to:

- Increase the number of extremely hot days and degraded air quality
- Compromise infrastructure like trails (e.g., more erosion, blowdowns, and flooding)
- Increase the risks from storm events
- Increase non-native plants and pests
- Increase vector-borne illnesses (like West Nile and Lyme disease).

Some of these impacts are likely to affect the future management of public open space in complex ways. Manomet Center for Conservation Science and the Massachusetts Division of Fisheries and Wildlife have published a study[14] promoting two primary objectives for the management of sites and habitats – managing resilience and managing change. Unfortunately, the report does not address the management of grasslands. Still, the concepts of resilience and managing change may be useful to keep in mind.

Management for Resilience and Managing Change

Mass Audubon generally pursues four principles for increasing the resilience of conservation land.

1. **Reduce non-climate stressors** – for example, controlling invasive plants and pests.
2. **Restore form and function** – for example, removing a dam to promote spawning of diadromous fishes.
3. **Increase complexity** – for example, increasing diversity and microclimates.
4. **Create linkages** – for example connecting to adjacent land and creating corridors.

The previously mentioned Manomet report does make recommendations for forests and freshwater wetlands that are relevant to some other areas in Nahant.

Forested Habitats

- **Diversify the age structure and species composition** of the forested landscape in advance of climate change, this could increase resilience of forested ecosystems and overall resistance to the impacts of a changing climate.
- **Control of white-tailed deer densities**. High levels of browsing by white-tailed deer have adversely affected the structure, composition, and functioning of Massachusetts forested ecosystems, particularly through the elimination of preferred food species such as red oak, and thereby reduced their diversity and resilience. Also, overgrazing by deer has opened the way for increased rates of infestation by non-native plants.

[14] Manomet Center for Conservation Sciences & Massachusetts Division of Fisheries and Wildlife, Habitat Management, April 2010 (https://www.manomet.org/wp-content/uploads/old-files/Climate%20Change%20and%20Massachusetts%20Fisheries%20and%20Wildlife%20Reports,%20Vol.%203%20April%202010.pdf)

- **Control invasive species and pests.** Damage caused by non-native plants and insect pests will become more serious under climate change. Forest managers will need to:
    - detect and track infestations and outbreaks in their early stages, and
    - take aggressive actions to eliminate these problems before they escape control.
- **Manage change**. Past management has been primarily guided by the concept of preserving natural habitats and associated species. Adaptive management is recognizing that preserving the status quo may not always be possible. When preservation of a habitat or species is no longer feasible, we will need to adapt management practices to guide change. One strategy may be to plant more southern species that will help maintain diversity or other ecological values.

Description of Past Management Efforts at Lodge Park

The 1999 management plan for Lodge Park was prepared by Nahant Open Space Management and Land Acquisition Committee. It outlined the purpose of the park and its management and a calendar for the maintenance of both the natural and the more formal areas of the park as well as ways to address safety and accessibility concerns. It was prepared with advice from "the Soil Management Division of the U. S. Department of Agriculture and the Ecological Management Division of the Massachusetts Audubon Society." The purpose of the management plan was to preserve and enhance "the natural beauty of East Point, with its commanding ocean view, [to enhance] the quality of life for the residents of the Town of Nahant while providing a habitat for wildlife."

Memorial Area Management

The grass area adjacent to the Lodge and Volpe memorials was to be kept relatively short and mowed at least twice during the annual growing season. The plan noted that the "Open Space Committee may enlist the assistance of volunteers to help with the weeding of planting beds and with the planting of bulbs and annuals" in this area.

Grassland Management

The approach to the management of the remainder of the site was to maintain "…an open, natural grassland." The plan recommended mowing in the fall and/or early spring every two or three years (after mid-September or before mid-April) "…to prevent the disturbing of nesting birds and to allow wildflowers to bloom and set seed." It was also recommended that the area be divided into two sections to be "…mowed in alternate years to ensure that some cover and forage is always present. This regime will provide diversity of habitat for birds and for invertebrates such as butterflies and other pollinating insects."

There have also been occasional "sink holes" occurring in the grassland caused by the settling of fill material into the former Nike missile magazines. Fill has been added to these sink holes.

The Friends of Lodge Park have reported that the general outlines of the 1999 management plan have been followed. However, changes in Department of Public Works staffing and lack of resources in some years have resulted in some inconsistency in the implementation of the recommended management activities. Missing a year or two can result in things getting out of control when it comes to managing grasslands. For example, invasive plants have gotten a foothold in some of the grassland areas. Beginning in the fall of 2021 black felt is being used to cover areas that have become infested with Japanese knotweed. See below for more on invasives management.

Visitor Experience

In addition to the passive recreation activities of walking, painting, photography, birdwatching, and simply enjoying the view, there have been occasional community events like Maypole Dancing, poetry readings, and music. There have also been cooperative efforts between the town and Northeastern University to prepare interpretation of the site including an audio tour of East Point.

The visitor's experience of arrival and orientation is not clear. Recommended improvements to the visitor experience will be covered below.

Stewardship of Wildlife Habitat

Providing and managing the grassland area as wildlife habitat is a major purpose of Lodge Park. This section will discuss management of the grassland area and recommend a strategy for restoration over time. It will also include recommendations for other wildlife enhancements.

Cultural Grassland Management

Periodic mowing of the vegetation is necessary to maintain open fields. Grasslands can range from grass-dominated, frequently mown hayfields to infrequently mown, wildflower-dominated fields. Each type provides habitat for a different suite of species based on plant composition, size, moisture, and other factors. This open habitat type has become less common in Massachusetts as agricultural land has grown into forest or been developed for housing or commercial use. As a result, remaining grasslands are valuable habitat for a range of plants and animals that are also becoming less common. Several rare birds make use of grassland for nesting however they prefer very large fields, generally 50 acres or larger with the most uncommon grassland birds found only in sites over 100 acres. Fields as small as 10 acres may host breeding bobolinks (bobolinks have not been reported at Lodge Park during the breeding season) and other ground nesting species and should be managed for bird habitat. While Lodge Park's small field (3.7 acres) provides habitat for some birds, it should be managed for plants and invertebrates, both of which provide cover and food for a variety of birds and small mammals.

Challenges to grassland management include succession, encroachment by shrubs, impacts to wildlife, and invasive species. In the absence of some form of disturbance, most New England grasslands will naturally transition to an old field, a young forest, and eventually a mature forest. This process is termed succession. Encroachment is a more insidious form of succession where even well-tended fields slowly shrink as shrubby vegetation on the field edge grows further into the field year-by-year. The loop path at Lodge Park is a barrier that helps prevent encroachment.

All fields need to be disturbed on a regular basis to avoid succession and encroachment. The ultimate tension in grassland management is that disturbance is required to maintain the habitat, yet the disturbance may result in an impact to wildlife making use of the grassland. The goal of management is to plan the disturbance in a way that minimizes impacts to grassland-dependent species.

The most common forms of disturbance are mowing, grazing, and burning. Since burning is logistically complex and expensive, grassland management at Lodge Park will generally be limited to mowing.

There are two types of grasses

Cool-season grasses—grow best in spring and fall when cool nights follow warm days. Kentucky bluegrass, fescue, timothy, and orchard grass, all introduced species, are commonly grown, and are often planted with cool season legumes like alfalfa and clover. June grass, bluejoint and Canada wildrye are native cool-season grasses. These grasses form a dense cover that provides poorer habitat for some ground-nesting birds.

Warm-season grasses—develop most rapidly during the warm summer months. They include native prairie and Northeast species such as big bluestem, little bluestem, Indiangrass and switchgrass and are often planted with native wildflowers such as aster, black-eyed Susan, and blazing star to increase diversity and to provide additional food and cover. They grow in summer when cool season grasses are inactive, and they can be harvested (or mowed) later in the year providing a long period of time for ground-nesting birds to fledge.

Grazing can be an appropriate method for grassland management; however, it requires a dedicated farmer willing to take on all aspects of animal husbandry including erecting and maintaining fencing and providing water for the animals. A field being actively grazed would be inaccessible to the general user, and conflicts between livestock and dogs may arise. For these reasons, mowing will be the more likely grassland management technique at Lodge Park.

Mowing variables include timing, frequency, type of equipment, blade height, and fate of the mown material.

- Timing and Frequency – A field that is mown earlier in the season and more frequently in a season will tend to be dominated by cool season grasses. A field mown once every two or even three years and later in the fall or early spring will tend to have a higher component of wildflowers. Mowing should be prohibited during bird nesting season, mid-May to the middle of August. Thus, any field smaller than 10 acres can be mown in September/October or even November to provide nectaring plants for invertebrates. Some are recommending not mowing until early spring (March or April) as the dry stems of grasses and wildflowers provide wintering habitat for a variety of insects.
- Type of equipment – Fields can be mown with a rotary deck mower or a sickle bar mower. A sickle bar, or hay mower, is preferred for the larger fields to be managed as grasslands. A rotary mower tends to leave clumped material which can inhibit re-sprouting in the spring and smother insect larvae.
- Blade height – Any mowing should leave roughly 6 inches of standing material to provide habitat for invertebrate larvae.
- Treatment of mown material – Small wildflower fields, like those at Lodge Park, can be managed for invertebrate habitat and the cuttings left in place.

Mowing should include removal of woody shrubs growing on the field edge to resist their natural expansion into the field. If necessary, a heavy mower should be used to clear back shrubs on field edges. Management should include removing shrubs and trees growing into the grassland to maximize its size.

How the mowing is done also influences the wildlife. Mowing from the outside toward the center has the potential to trap small mammals, fledgling birds, reptiles, and amphibians in the center. Mowing from the middle and working outward allows more wildlife to have a chance to escape.

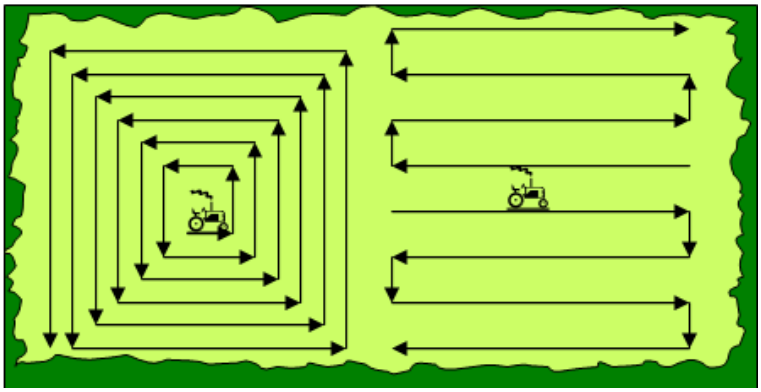

FIGURE 7 - MOW FROM THE CENTER - OUT

Regular mowing should prevent colonization by woody invasive species, although once they are established, invasive shrubs and vines can persist even in a mown field. Once woody species such as glossy buckthorn or multi-flora rose are established throughout a field, the most effective approach for their control is targeted use of a broad-leaf herbicide which affects the shrubs but does not impact grasses.

Vines such as oriental bittersweet and swallowworts can be pernicious grassland invaders. These species can be removed by hand and kept at bay with regular work parties dedicated to their removal. It is particularly important to control black swallowwort as soon as it is discovered since this species, related to milkweeds, spreads its wind-dispersed seeds far and wide, expanding in a field relatively quickly and reducing habitat quality for butterflies. In fact, the plant is toxic to some butterflies including Monarchs. If manual control is not successful, herbicides may be necessary. Small patches of swallowwort are located on the eastern side of the loop path near the cliffs.

Characteristics of the field and the intended management routine should be reviewed each year. Property stewards should meet annually to review condition of fields, identify threats that are not being addressed by the current management approach, and formulate adjustments to management to reduce those threats. Efforts should be made to survey the field for breeding bird activity and use by butterflies, perhaps by using volunteer effort such as the annual Xerces Society butterfly count or members of the Massachusetts Butterfly Club.

Grassland Restoration[15]

The goal of restoration is to reduce invasive, non-native species and increase native species. Restoration involves much more work and expense than consistent management. Warm-season grasses, many of which are native to the U.S., may be a viable alternative to (non-native) cool-season grasses. Warm-season grasses are more difficult to establish, but they offer some important benefits. They require less

[15] See Chapter 3 of Managing Grasslands, Shrublands, and Young Forest Habitats for Wildlife https://www.wildlife.state.nh.us/nongame/documents/ne-guide.pdf

fertilizer, lime, and herbicides, and are more tolerant of drought. Their extensive root systems help combat erosion. They also offer better nesting cover (growing in bunches, with space between for movement and nests), a more dependable food source, and better winter cover, since they don't mat down during heavy snows. The NRCS and UMass Cooperative Extension may provide advice and possible cost-share funds to plant warm-season grasses.

Lodge Park seems to be a good site for establishing a warm season grassland with a mixture of native wildflowers. The soil is well drained, the seaside location should provide a long-enough growing season (100 to 140 days), and the relatively flat aspect should all contribute to the growth of the desired species. Still, the process of establishing a more native grassland will involve a degree of experimentation.

FIGURE 8 - LITTLE BLUE STEM GRASS, AN EXAMPLE OF A NATIVE WARM SEASON GRASS

STRATEGY FOR RESTORATION

The recommended strategy for restoration would be to work in small areas over a period of several years. Before planting an area, it will need to be prepared by reducing the existing growth and mulch. This can be done by burning, tilling, covering with black felt for two growing seasons, and/or application of herbicide, or a combination of some or all of these. While burning was not recommended for management it may be worth considering for restoration because the areas will be relatively small and easy to control. A burn plan would need to be prepared and implemented by trained personnel.

The two areas currently covered in black felt may be places to start. When the felt is removed the area may be ready to plant. A seed selection of warm season grasses and native wildflowers that follows the recommendations of Managing Grasslands, Shrublands, and Young Forest Habitats for Wildlife, Chapter 3, would then be applied to the areas. Since these areas were infested with Japanese knotweed, they will need monitoring during the growing season and invasives will need to be removed by hand pulling or application of herbicides. (For more on control of invasives see the section on Invasive Species Management).

Each year another area would be selected for preparation and each year areas already treated would be managed to control invasives.

Invasive Species Management

Invasive species pose one of the greatest threats to the biodiversity, natural landscapes, agricultural interests, recreational activities, and scenic beauty of conservation properties. There are many ways to deal with this threat including initial prevention, early detection, and control through manual removal, mechanical treatment, pesticide application, biological control, grazing and fire. Invasive species are difficult to eradicate and without multiple seasons of dedicated management, infestations will rebound despite one's best efforts. Prioritization of targeted management is essential to successfully managing an area for invasive species.

The goals for invasive species management at Lodge Park should be:

- Establishing invasives-free zones,
- Restricting the spread and reducing the extent of heavily invaded zones.

Management of invasives species should follow an adaptive approach – a continuous process that allows for flexibility in management based on the inclusion of the most recent management options. As new information becomes available on plant biology and treatment methods, it will be incorporated into future management decisions. An adaptive approach will also allow property managers to learn from the efficacy of current treatment methods and adjust future management actions.

Prevent Spread of Existing Invasives and Introduction of New Invasions

The primary element of a proactive prevention plan is limiting the introduction of new invasive species. Spread of existing invasives will be reduced by limiting soil disturbance and implementing restoration when soils are disturbed, by washing equipment that has been used in heavily invaded areas before moving to an un-invaded area, and by implementing practices to reduce likelihood of seed spread by individuals working on invasives control projects. Soil disturbance from plowing, tree removal, trail building, etc., should be limited and all disturbed soil should be covered with leaf litter at the very least with larger areas restored with a fast-growing native seed mix. All equipment used for maintenance operations in heavily invaded areas should be cleaned (e.g., with a leaf blower) before moving to non-invaded areas; and staff and volunteers should take special care to pat down, wipe, and/or rinse clothes and shoes after working with invasive plants.

EARLY DETECTION/RAPID RESPONSE

Any comprehensive invasive species control program must also include early detection (ED) of new invaders and rapid response (RR) to eliminate new invasions before they become well-established. ED efforts will be directed at the list of early detection species identified by the Massachusetts Invasive Plants Advisory Group (MIPAG). MIPOAG's current ED list is presented in Table 1, and updates can be found on the MIPAG website: http://www.massnrc.org/mipag/. Land Stewards should be trained to identify the ED species which are not yet well-known in this part of the state such as Japanese stiltgrass and mile-a-minute vine. The stewards should be prepared to collaborate on planning and implementing the rapid response element to eliminate new invasions as quickly as possible.

Table 1. Early Detection (ED) invasive plants as identified by the Massachusetts Invasive Plant Advisory Group (MIPAG).

Common name(s)	Species	Comments
Flowering Rush	*Butomus umbellatus*	Aquatic perennial herb
Brazilian waterweed	*Egeria densa*	Submerged aquatic
Tall mannagrass, Reed mannagrass	*Glyceria maxima*	Perennial grass
Giant Hogweed	*Heracleum mantegazzianum*	Biennial or short-lived perennial herb
Hydrilla	*Hydrilla verticillata*	Submerged aquatic
Parrotfeather	*Myriophyllum aquaticum*	Submerged aquatic
Yellow floating heart	*Nymphoides peltata*	Floating-leaved perennial aquatic herb

Common name(s)	Species	Comments
Mile-a-minute	*Persicaria perfoliate, Polygonum perfoliatum*	Once established this species spreads rapidly; annual herbaceous vine
Kudzu	*Pueraria montana* ssp. *lobata*	Woody vine
Tansy ragwort, Stinking willie, Stinking Billy	*Senecio jacobaea*	injurious to livestock; biennial herb
Pale swallowwort	*Cynanchum rossicum*	Kills Monarch Butterfly caterpillars; Perennial herbaceous vine
Tall pepperweed, Broadleaved pepperweed	*Lepidium latifolium*	Perennial herb
Japanese stiltgrass	*Microstegium vimineum*	Annual grass

LIMIT SPREAD OF HIGHLY NOXIOUS INVADERS

Special attention should be paid to particularly aggressive invaders, such as those species with wind-dispersed seeds, aggressive root suckering, allelopathic characteristics, rapid growth, and high resistance to control. Species in this category are shown in Table 2.

Table 2. Particularly aggressive invasive species. (Bold indicates species included in Lodge Park plant inventory or reported by others.)

Black swallowwort	***Cynanchum louiseae***
Common reed	*Phragmites autralis*
Garlic mustard	***Alliaria petiolata***
Japanese knotweed	***Fallopia japonica***
Japanese stiltgrass	*Microstegium vimineum*
Purple loosestrife	***Lythrum salicaria***
Tree of heaven	*Ailanthus altissima*
Water chestnut	*Trapa natans*

CONTROL SPECIES WITH RECENT OR LIMITED PRESENCE

Early invasions are much more easily eradicated than well-established stands of any species. Removing young woody plants before they reach a fruiting size prevents further spread, and it is critical to remove aggressively rooting species before they establish a dense underground network. Vining species are more easily removed before they tangle with native shrubs and trees.

CONTROL RELATIVELY EASILY MANAGED SPECIES

Japanese barberry and garlic mustard are examples of species that can be controlled with dedicated manual effort. Such species should be the focus of eradication efforts before they spread.

LIMIT EXPANSION OF HEAVILY INVADED AREAS

An area that is completely covered in invasive species or has several species of invasive plants growing in the same location should be contained to prevent further spread of the infestation. This can be done by identifying the boundary of the heavily invaded area(s) and creating a treatment area buffer zone (e.g., 50 feet around the perimeter of infestation) for targeting management efforts. This allows conservation

stewards to prevent encroachment of invasives in cleaner areas without getting overwhelmed or tackling a project that is too big for the available resources.

If highly noxious species are present in the densely invaded area extra measures may need to be taken to really prevent further spread of the infestation. Some options include increasing the treatment area to a 100-foot buffer zone or hiring outside contractors to treat the infestation chemically.

Treatment Methods

Different invasive species respond to different management techniques, several of which are summarized here and detailed in Appendix E. Manual control, pulling plants by hand or with light tools such as loppers or weed wrenches, may be effective for small infestations and where volunteer capacity permits repeated effort. Large infestations and certain problematic species will require more intensive management, often involving the use of herbicides. Herbicides can only be applied by an individual duly licensed by the Department of Agricultural Resources. Because licensure requires liability insurance coverage, while volunteers could obtain this license, it is more likely that herbicide will be applied by a contracted professional or town employee. Management plans should identify infestations and recommended approaches for control. The property managers should plan and budget for involvement of professionals as necessary. Table 3 provides information on species that can be managed at various times of year.

FIGURE 9 - WEED WRENCH

DISPOSAL OF REMOVED INVASIVES

Invasive plants that have been hand pulled or cut can be piled on site to decompose or bagged and brought to an area for invasive plant containment. The site(s) used to dump invasives should be monitored to ensure that invasive plants are not establishing themselves from the materials deposited there. Staff and volunteers should take extreme care to avoid spreading seed or other material from which plants can resprout, (e.g., Japanese knotweed can sprout from any stray plant part).

Restoration

Many of the invasive species are adapted to pioneer disturbed soils. For this reason, all control efforts and general site work that results in exposed soil should incorporate restoration with fast-growing native species. Small patches of exposed soil, for example from root wrenching a shrub, should be tamped down by foot, and covered with leaf litter from on-site. Non-forested sites such as fields, should be seeded with a grass mix including annual rye (*Lolium perenne*) which can provide a quick cover to open soils and allow non-invasives time to self-germinate.

Table 3: Season-specific Management for Commonly Found Invasive Plant Species.

Common Name	Spring	Summer	Fall
Autumn Olive	**manual**		**chemical**
Black swallowwort		**chemical/manual**	
Burning Bush	**manual**		**chemical**
Bush honeysuckle	**manual**	**chemical**	
Common reed			**chemical**
Garlic mustard	**chemical/manual**		
Glossy Buckthorn	manual		chemical
Japanese Barberry	manual		chemical
Japanese knotweed		**chemical**	
Japanese stiltgrass		chemical/manual	chemical
Multiflora rose	**manual**	**chemical**	
Oriental Bittersweet	**manual**		**chemical**
Purple loosestrife		**biological**	
Spotted knapweed		chemical/manual	
Tree-of-Heaven	manual		chemical

Record-Keeping

All invasive plant species management actions (town staff, contractor, or volunteers) should be documented with a field datasheet and records kept in a central file (a shared Google drive). Information collected should include the location, date, species targeted, phenology of plant (vegetative, flowering, fruiting), type of management used (manual, mechanical, chemical), the size of the infestation and an estimate of what percent of the area was managed (See Appendix E for a sample field sheet). Recording these data allows Town staff and volunteer stewards to track progress in management efforts, adapt tactics in future years if needed, and have a sense of the expanse of targeted invasive species.

Wildlife Enhancement Recommendations

There are several actions that can enhance wildlife habitat quality and make Lodge Park a more interesting destination.

Brush piles

Strategically placed piles of brush in the forested areas or at the edges of the field can be assembled to provide resting/escape cover and den sites for wildlife. They may also help block access to off-trail areas. Brush piles are used for cover by eastern cottontails and other small mammals. Songbirds may use brush piles for perch sites, especially if the piles are located near feeding or nest sites. See https://extension.psu.edu/management-practices-for-enhancing-wildlife-habitat for more information on steps for enhancing wildlife habitat.

Snags

Leaving dead or partially dead standing trees provide several important benefits to a variety of wildlife. Snags provide cavities for nesting and resting, perches for hunting and displaying, and an abundant supply of food for insect eaters. There are numerous species of birds and mammals that use snags at some point in their life cycles. The best method to provide snags for wildlife is to retain existing snags in places where they will not create a dangerous situation for people using the nearby area.

Nest boxes

Nest boxes, platforms, and other types of nesting structures provide nest sites for wildlife in areas where natural nest sites (particularly cavities) are absent or available only in low numbers. They are also used to attract wildlife to specific areas even when nest sites are not limited. Nest boxes can be used to provide nest sites for birds such as bluebirds, tree swallows, wrens, and wood ducks. Nest boxes also provide nest sites for mammals like squirrels and bats. Platforms and other structures are used to provide nest sites for species like ospreys, eastern phoebe, barn swallow, and some waterfowl. Special colonial nest boxes can be erected for purple martins. Bat boxes can also be erected along the field edges. See Mass Audubon's website shttps://www.massaudubon.org/learn/nature-wildlife/birds/birdhouses for instruction for building and placing nest boxes.

FIGURE 9 – PURPLE MARTIN NEXT BOXES

Nest boxes can be monitored by volunteers, and results shared with Cornell Lab of Ornithology.[16]

Pollinator Plantings

Pollinator-friendly plantings support numerous kinds of native bees, as well as honeybees, butterflies, hummingbirds, and other pollinators. Planting a diverse mix of flowering plants that provides a sequence of blooms from early spring to late fall will have the most impact. Even a small patch of the right flowers can help, as it adds to the larger landscape mosaic in which the pollinators live and search for food. For a list of plants and guidelines for planting see https://extension.unh.edu/resources/files/Resource005973_Rep8387.pdf. Also, see the plant list for native declining pollinators from the MCA Native Pollinator Task Force, https://www.svtweb.org/mca-native-pollinator-task-force .

Visitor Experience

The experience of a park visitor involves everything they think, sense, and feel from arrival to departure and will then linger in their memories. Of course, we want those memories to be positive. This section will make recommendations to enhance visitor experience.

Entryway Design and Maintenance

A well-designed and maintained entryway sets the tone for the use and care of an area. Confusing parking, outdated or faded signage, and/or litter give the impression of neglect and questionable safety. A clearly visible entrance: well-marked and logical parking that is visible; informative signage; and evidence of frequent maintenance can draw visitors and immediately set the tone of respectful enjoyment of the property.

[16] See https://nestwatch.org/

Parking

The parking for Lodge Park is across from Canoe Beach on Nahant Road and along Swallow Cave Road. There are spaces for 9 cars on Nahant Road and another 10 along Swallow Cave Road. There are also 4 parking spaces at the top of Lodge Park for the elderly, handicapped or others who would have difficulty making it up the hill to the park. The Friends of East Point believe that the parking is adequate for the level of intended use.

FIGURE 10 - ENTRANCE AREA AND PARKING

Orientation and Access

There is no orientation kiosk or sign to provide general information about the park or how to access it through the Northeastern University campus. There are several outdated signs about parking, handicap access, and a more recent sign about the audio tour.

A park entrance sign with a map and some information about the park and its history could be located at the entrance gate. The map should show the route to the park through the Northeastern campus.

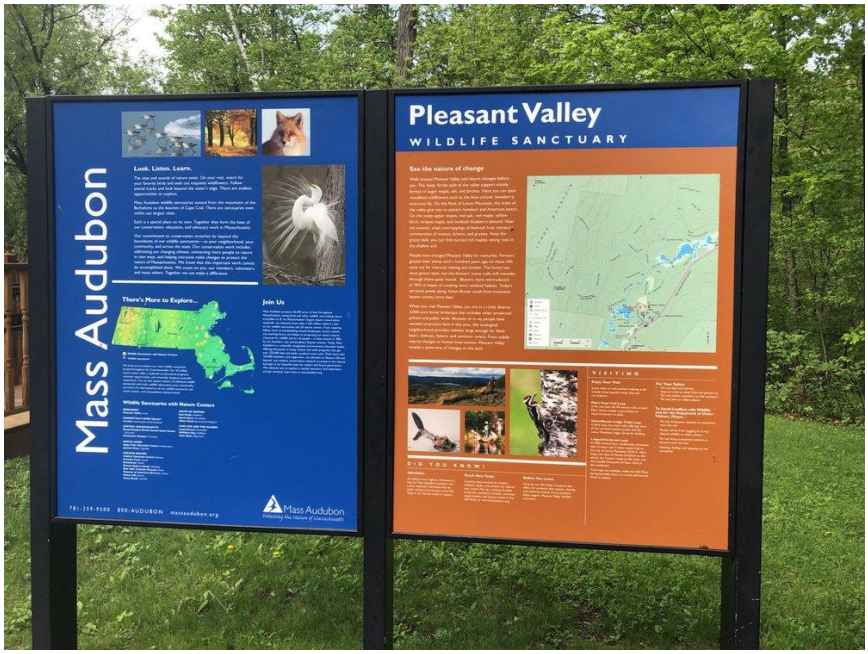

FIGURE 11 - EXAMPLE OF AN ENTRANCE/ORIENTATION SIGN

The route through the Northeastern campus should also be marked and easy to follow, perhaps with paint on the pavement or posts along the way. The 1990 Moriece & Gary plan recommended that the route through the Northeastern campus be narrowed to a more pedestrian scale. Defining the route with paint (footprints) or posts will make the route feel more pedestrian friendly. A second park

entrance sign with a map and some information about the park and its history could be located near the actual park entrance, near the existing handicapped parking area.

Entryway Maintenance

Entryway and parking areas should be visited on a regular basis by property managers and volunteer stewards and monitored for dumping and litter, damage to signage and other infrastructure, condition of the parking lot, and parking lot capacity and use. Volunteer stewards should make note of potential incipient issues and hazards such as potholes, erosion, and dead tree limbs and communicate potential problems to the DPW. They should collect any small litter and report to DPW staff larger piles of dumped materials and other issues requiring immediate attention.

Viewpoints and Benches

Many visitors will enjoy a few viewpoints and benches. There are ten benches (of different designs) currently scattered about Lodge Park. Six to eight seems like an appropriate number for the size of the park. The location of some of the existing benches may warrant some examination and relocation.

As noted above, the desire to get a better view of the cliffs and ocean will inevitably draw some visitors off the loop path. Providing a couple of well-defined viewpoints with some form of railings (like those along the beach at Willow Road or perhaps just boulders interspersed with plantings) may help prevent the proliferation of unofficial trails to potentially dangerous areas. The area of the former Battery 206 (A on Figure 12) is a good location for a more intentional viewpoint.

FIGURE 12 - VIEWPOINTS

There are currently 4 benches in the area. Reducing the number of benches to 3 and some careful management of the vegetation could make this area a pleasant site with good views. Another bench near the concrete ruins of the Naval Administration Building (B) has encouraged some visitors to make an unofficial path toward the cliffs. The path down form the Loop is too steep and prone to erosion. This area could also be designed as a more intentional viewpoint. The third viewpoint is on the west

side of the Loop path (C). It has 4 benches and overlooks the area between Lodge Park and the John B. Murphy gun emplacements. There are no safety issues at this location.

Viewpoints A and B should be intentionally designed, preferably with the services of a landscape architect.

Interpretation

Lodge Park's rich history provides great opportunities for interpretation. The cooperative audio-tour created by the Town of Nahant and Northeastern University for East Point is an example. The possible subjects for interpretation include Geology, Pre-colonial History, Colonial History, 1800s Hotels, The Estates, Spanish American War, World War I, World War II, The Korean War, The Cold War, the Northeastern University Marine Science Center, and the site's Natural History. How to interpret all these riches is worth examining. It is recommended that the Friends of Lodge Park seek a grant to design and implement an interpretive program consisting of online information and a few interpretive signs.

Types of Interpretation

The audio-tour, keyed to nine specific locations and accessed by a QR code, provides much information at relatively low cost. A visitor must have a smartphone and be motivated enough to download the UniGuide app.

A printed self-guided tour is another type of interpretation. Northeastern University in collaboration with the Nahant Historical Society, Safer Waters in Massachusetts, and the Town of Nahant, has also prepared a draft of a printed guide with eight stops. Such a guide could be available for download (QR code at the entry sign) with a map of the site or be available in hard copy. Again, for the digital version, a visitor would have to be motivated enough to take the steps to download the guide.

Signs are another type of interpretation. Signs are relatively expensive and subject to deterioration over time. They can also contribute to clutter. Still a few signs, like the example from the Coast Guard Station, are a convenient and durable way to interpret a few select vistas. Signs are the most convenient kind of interpretation for visitors.

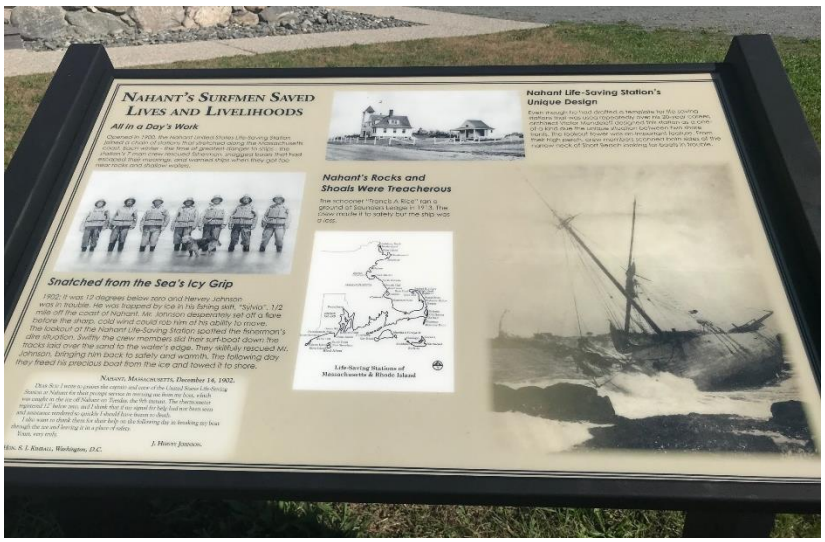

FIGURE 13 - COAST GUARD STATION SIGN

In addition to the entry sign, two or three other locations may be appropriate for this type of interpretive sign. They should interpret what can still be seen along the trails. One could be a viewing site of the Murphy Battery, telling with few words and good graphics about these two 16-inch guns with a range of 26 miles. Another might be at the proposed viewpoint at Battery 206, again with few words and good graphics.

Passive Recreational Uses

A vital role of the park managers is to provide all citizens with ample opportunity to engage in a wide range of recreational uses. At the same time, Lodge Park is small and from its inception has been a location dedicated to passive recreation, habitat for wildlife, and a memorial for Sen. Lodge. Passive recreation means leisure activities commonly practiced by an individual or small group that are usually unorganized and noncompetitive, including, but not limited to, picnicking, birdwatching, nature observation, kite flying, bicycling, and walking. These activities have no or minimal impact on the site's natural resources.

Safety Issues

The 1999 management plan stated that "There has always been a concern for public safety at East Point. Occasionally visitors will venture too close to the edge of the rocky headland. The dilemma for Town officials is balancing the desire of visitors for the freedom to enjoy the park fully and the need to keep them safe." There are signs that warn visitors of the danger, but it is clear from several well-worn unofficial paths leading to the cliffs that some visitors ignore them. In fact, there have been approximately 6-8 deaths in the last decade. The current number of safety signs (5) seems appropriate; perhaps a few could be moved for more impact. There is also a low, broken-down guard rail that surrounds part of the park. Dense planting of thorny shrubs (green fencing) or brush piles can help prevent access to dangerous areas but may not be totally effective. Some visitors will always be determined to get a photo or look down the cliffs for a better view of a bird or a seal. Picking a few locations for more controlled access may help satisfy some visitors and provide some places to get views. These areas should be well-defined with barriers on the side toward the cliffs. See Viewpoints A and B in the previous section.

Ticks

Tick-borne diseases are a safety concern. Tick exposure can occur year-round, but ticks are most active during warmer months (April-September). Lodge Park is a likely place to be in contact with a tick. Not all tick bites will result in a disease. To help prevent tick bite diseases a warning sign (https://www.cdc.gov/lyme/resources/toolkit/2ColorTrailSign.pdf)might include:

- Stay on trails
- Apply repellant
- Check for ticks after each outing
- Shower soon after being in tick habitat
- Call your doctor if you get a fever or rash

Prevention and Remediation of Human Impacts

Having a cadre of volunteer stewards who look after Lodge Park or other public open space can be a great help for the town.

Dumping/Pollution

Litter or dumped materials should be cleaned up as soon as possible. Delayed cleanup gives the impression that a property is not well-monitored and well-cared for, which is discouraging to users and invites further misuse. Stewards should monitor parking areas and road frontages at least monthly and immediately inform staff of new dumping that they can't pick up themselves. Each report should include a photograph, some indication of location, and an assessment of what materials have been

dumped. Small piles of innocuous materials such as paper or household trash should be removed as soon as possible by the steward. Removal of larger piles or anything including potentially hazardous material should be coordinated by staff with DPW or another appropriate partner. Locations experiencing repeated dumping should be posted with signs reading "No Dumping Including Yard Waste". If dumping continues, it should be reported to Nahant police with a request for more frequent patrol of the site.

Prohibited and Illegal Use

Once established, illegal and prohibited uses of public open spaces can be very difficult to discontinue. ATVs, paintball, forts and firepits are examples of activities that should be 'nipped in the bud'. Individuals will often engage in these types of prohibited uses on a whim; however, if there is no sign of a reaction, such as closing informal access points, posting signage, engaging neighbors, or cleaning up litter, the use may continue and intensify.

Stewards should regularly inspect Lodge Park including areas off trail with an eye for unpermitted uses. Such use should be reported immediately to staff, no matter how minor. Staff and stewards should develop an appropriate response focused on:

- Repair of impacts, including cleaning litter, removing constructs, etc., which demonstrates that the site is being cared for.
- Education about permitted uses.
- Outreach to these users, e.g., through letters to neighbors or information distributed in local media or through the school system.

More problematic illegal and offensive uses such as drinking parties, drug use, and casual assignations should lead to involvement of Nahant police and a specific plan to add patrols until the activities are driven out.

Travel off Official Trails

Travel off official trails should be discouraged by clearly stating on all signs and kiosks that visitors should remain on trails. In those areas where un-official trails become apparent, large sticks and branches can be placed on the trail to indicate that travel is not allowed. Where needed, "*Area Closed*" or "*Ecological Restoration Area. Do Not Enter*" signs can be posted.

Property stewards should endeavor to understand use of the site for geocaching or other informal activities that specifically involve leaving official trails. Stewards should engage these user groups to understand the use and make a recommendation to staff regarding potential impacts of off-trail use. If any such use is determined to be having a specific impact on a known resource, action should be taken in cooperation with the specific user group to minimize impact, or if deemed necessary, to alter or discontinue this use.

Dog Waste

Signs should be posted to encourage dog owners to clean up after their pets. Signs should include information about impacts to wildlife and water quality and the safety of visitors as well as other pets. A culture of picking up dog waste often evolves based on the behaviors of others: when a dog owner sees others picking up, s/he will adopt this as standard behavior; when a dog owner observes uncollected dog waste, s/he often assumes that this is the local practice and follows suit. Stewards should work to

identify local, dog-owning 'ambassadors' who would be willing to speak with other dog walkers about the importance of picking up their dog's waste. In addition, stewards should endeavor to clean up uncollected dog waste on a regular basis to avoid giving the impression that it is okay to leave your dog's waste.

Trash Bins

If trash receptacles are made available, they must be emptied on a regular basis. Overflowing trash can lead to further litter and leaves the impression that the property is not well cared for. All trash bins should be of the same design and be a dark green color.

Trails

A well-designed, comfortable, and safe trail network facilitates enjoyment of an area and protects the conservation values of the site. The existing trail network is an integral part of the park's passive recreational value, providing citizens with a means for exploring and enjoying the park. Trails should be located to minimize redundancy and enhance the visitor experience by not exceeding the capacity of the park to accommodate trails. To the greatest extent possible, all trails should be located outside of sensitive natural resource areas, such as habitat for sensitive wildlife, steep slopes, or soils that are too wet or prone to erosion.

Sustainable Trails

Climate change is having a big impact on trails because of more intense weather events. Northeastern U.S. saw a 55% increase in the amount of rain or snow falling in the heaviest 1% of storms between 1958 and 2016. Some climate models project monthly precipitation between December and April will increase 1 inch by the end of this century. Both the Appalachian Mountain Club and the Long Trail Club have noted the impacts on trails of extreme weather events. Trail managers have noted more erosion, more frequent blowdowns, and more wet trail areas that stay wet longer. These factors can all have a big impact on the visitor experience and on maintenance.

The US Forest Service defines a sustainable trail as one that will

- withstand the impacts of normal use and natural elements,
- cause negligible soil loss,
- encourage users to stay on trail,
- not adversely affect area's natural or cultural resources, and
- require minimal maintenance.

Periodic assessment of the trails is recommended. Trail assessments provide a detailed evaluation of tread conditions that can be used for planning and budgeting purposes. They provide detailed information of each section of trail which is useful in developing trail restoration plans as well as seeking funds for the restoration of trails. They can help managers see the larger picture so that sound restoration or maintenance priorities can be developed. Like buildings, trails should be viewed as assets which depreciate and thus need periodic refurbishment or structural upgrading. Larger structures on trails such as benches, guardrails, viewpoints, and any other structure will deteriorate over time and will need regular inspection to ensure that they are sound. Comprehensive trail assessments are usually done every 5 to 10 years to evaluate conditions.

A trail assessment would evaluate the existing trail network, section by section. Problem areas would be identified and alternatives for solving those problems would be presented and discussed. Based on that discussion each solution would be described in detail (i.e., width, linear feet of trail, materials, permitting requirements, and costs, etc.). Design, construction, and maintenance of the trail network shall be guided by the standards and guidelines in *Trail Solutions: IMBA's Guide to Building Sweet Singletrack*[17] and the *U.S. Forest Service Trail Construction and Maintenance Notebook*. The particulars of trail design will vary based on site conditions and use. Nevertheless, the staff, and volunteers will pursue the following principles in trail design.

Trail width – The loop path is 8 to 10 feet wide, other major trails should be 4-6 feet wide in areas of heavy use like viewpoints so that visitors can walk side by side or pass. Lesser used trails like the trail down the center of the field should be 3-4 feet wide to minimize impacts to natural resources and to encourage a closer experience with nature, with the expectation that some width expansion may be inevitable with use. Vegetation should be regularly clipped back (or mowed with the mower height set at 12 inches) 2 feet beyond the tread width to accommodate use so that it does not grow into the trail and present an opportunity for ticks to attach to visitors. Selected trails through rapidly encroaching vegetation may need to be trimmed wider.

Trail surface – trails should normally retain a natural soil surface except the loop path where it is designed to meet accessibility standards. Trails through grasslands will be maintained with periodic mowing and need not be cleared down to mineral soil. In rare circumstances where the existing substrate cannot be made into a sustainable surface, supplemental surfacing material may be used. Accessible trails will meet standards set by the *U.S. Forest Accessibility Guidelines Service*[18].

Signage Design Standards

Signs should have a consistent look and include, at minimum:

- Roadside/Entry sign – a highly visible sign identifying the property by name. Sign should be located close to the road (at entrance gate), be oriented so it is easily visible, and be designed with contrasting text and background to enhance legibility from a passing car.
- Interpretive signs – similar design and materials to entry sign, mounted for easy viewing.
- Boundary markers – exterior boundaries should be indicated in the field with small plastic markers, ideally custom ordered with text identifying the land as owned by the Town of Nahant.

Parking area should have a weatherproof structure such as a capped wooden kiosk or metal or composite sign including the site name, ownership, a trail map, and a list of approved uses. Such a kiosk/sign could include a plexiglass- or Lexan-covered bulletin board or a chalk board for recording wildlife sightings, but information on sightings should be regularly updated. Information boards should

[17] For an on-line version of much of the same information see http://www.crgov.com/DocumentCenter/View/1430/Sustainable-Trail-Development-Guidelines-PDF?bidId=

[18] https://www.americantrails.org/images/documents/FSTAG_2013-Update_190413_201340.pdf

include a reminder to check for ticks in all seasons. The design of any structure or sign should be consistent with other town-owned open space.

Connectivity Between Open Spaces

Connecting open spaces benefits both people and wildlife providing habitat connectivity through the less developed parts of our landscape and potentially creating an extended trail network.

User Conflicts

If conflicts between user groups arise, the stewards and staff will make reasonable efforts to engage the involved parties and reach a resolution that accommodates the users while adhering to the purposes of the park.

Safety/Education

Emergency Vehicle Access

The town strives to provide a safe experience for all its visitors, yet visitors must assume a certain degree of risk when visiting Lodge Park. Risks inherent in use of park land include, but are not limited to, uneven ground, falling tree limbs, wildlife encounters, and the fact that not every part of every open space will be accessible to emergency vehicles. Lodge Park provides access for emergency vehicles on the Loop path.

To facilitate emergency response, the park staff and volunteers should schedule annual meetings with the Nahant Fire and Police Departments to discuss emergency situations and vehicle access issues.

Accessibility for People with Disabilities

The town aims to provide passive recreational opportunities for users of all physical abilities. Lodge Park has parking for those with disabilities near the maintenance building. The DPW staff and volunteers may identify opportunities for creating additional accessible trails according to the standards laid out in the *U.S. Forest Service Accessibility Guidelines*[19].

Outreach and Education

The DPW staff and volunteers may coordinate with others to offer annual walks and educational activities to engage the citizens of Nahant about the natural resources at Lodge Park and the many benefits it provides the town, including passive recreation, mitigation of climate change, wildlife habitat, and a variety of ecosystem services. The stewards may use outlets such as a trail guide and web site, and foster connections with other groups within the town, such as scouts, the recreation department, and schools to reach a broader audience of the citizenry than is currently engaged.

Lighting[20]

There is one light source within Lodge Park. Some nearby light sources that illuminate the campus and streets may have fixtures that produce “light trespass” and impacts the park and abutters. It is

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[19] https://www.fs.usda.gov/sites/default/files/FSTAG-2013-Update.pdf

[20] See Outdoor Lighting Basics https://www.darksky.org/our-work/lighting/lighting-for-citizens/lighting-basics/

FIGURE 14 - ACCEPTABLE AND UNACCEPTABLE LIGHTING FIXTURES RECOMMENDED BY THE INTERNATIONAL DARK SKY ASSOCIATION

recommended that these light sources be converted over time to “acceptable” fixtures as recommended by the International Dark Sky Association (IDA) (see Figure 14).

Artificial lighting serves both safety and security purposes. However light pollution has become a world-wide concern. The brightening of the night sky by outdoor lighting affects a wide range of natural resources as well as human quality of life and is increasingly targeted by efforts to have a more sustainable future. Light scattered through the atmosphere brightens the night sky, causing stars and objects to be rendered invisible due to the reduced contrast. Light pollution also prevents the human eye from fully adapting to the dark-and reaching its maximum sensitivity. Sometimes, the more light there is at night, the less we can see. Light pollution tends to be most acute in urban environments, where glare can result in light trespass, have pronounced ecological effects, and potentially influence circadian rhythms of humans, plants, and other animals.

A variety of technical and societal approaches exist to minimize light pollution and conserve energy and have proven effective. The IDA recognizes the need for lighting but advocates that any required lighting be used wisely. To minimize the harmful effects of light pollution, lighting should

- Only be on when needed
- Only light the area that needs it
- Be no brighter than necessary
- Minimize blue light emissions
- Be fully shielded (pointing downward)

Types of Light

Outdoor lighting usually makes use of light sources that are more intense than most common residential lighting. Common light sources include low-pressure sodium (LPS), high-pressure sodium (HPS), metal halide, and light emitting diodes (LEDs).

LPS is very energy efficient but emits only a narrow spectrum of pumpkin-colored light that some find to be undesirable. Yet, LPS is an excellent choice for lighting near astronomical observatories and in some environmentally sensitive areas. HPS is commonly used for street lighting in many cities. Although it still emits an orange-colored light, its coloring is more “true to life” than that of LPS. In areas where it’s necessary/desirable to use white light, two common choices are metal halide and LEDs. One of the advantages of LED lighting is that it can be dimmed. Thus, instead of always lighting an empty street or parking lot at full brightness, LEDs can be turned down, or even off, when they aren’t needed and then brought back to full brightness as necessary. This feature both saves energy and reduces light pollution during the night.

Color of Light Sources

The color of light is also very important. Both LED and metal halide fixtures contain large amounts of blue light in their spectrum. Because blue light brightens the night sky more than any other color of light, it’s important to minimize the amount emitted. Exposure to blue light at night has also been shown to harm human health and endanger wildlife. IDA recommends using lighting that has a color temperature of no more than 3000 Kelvins.

Prioritizing Management Actions

Management activities should be prioritized according to the following considerations.

- **Safety issues** – any actions related to the safety of visitors will be given highest priority in terms of decision-making, staff and volunteer resources, field work scheduling, and funding. The Park or a portion of the property or trail may be closed until a specific safety issue is remedied.
- **Natural resources** – as a major purpose of Lodge Park is to provide wildlife habitat, natural resource management activities will be a high ongoing priority. In practice this means: any proposed improvements for recreational or other use must not impact natural resource values; staff and volunteer effort will be directed to addressing natural resource management needs, as appropriate; and the volunteers and staff will seek funding, as appropriate, to address natural resource management needs.
- **Cultural resources** – elements of Lodge Park that embody the cultural heritage of Nahant and East Point will be protected and managed to the extent they do not interfere with visitor safety or natural resources.
- **Passive recreational access** – Improvements and maintenance activities for all approved passive recreational uses will be reviewed, planned, funded, and implemented, to the extent possible, if they do not interfere with the above management priorities.

Safety issues can be brought to attention by volunteers, but most will need to be addressed by the DPW. Some may require outside contractors to implement fixes. Volunteers may be instrumental in seeking funding and doing some of the work.

Addressing natural resource issues will require an on-going commitment from both DPW staff and volunteers. Some actions like application of herbicides will require a licensed contractor. We often recommend that a town employee maintain an applicator's license to reduce costs. Protecting cultural resources and managing recreational uses will likewise require staff and volunteers and depend on the needs as they arise.

Regulations that May Affect Management Decisions

All open space land management activities are required to follow all local, state, and federal laws, bylaws, codes, rules, and regulations as well as property-specific easements or terms. These include, but may not be limited to:

Federal	Clean Water Act (Section 404)
State	Massachusetts Wetlands Protection Act
	Massachusetts Pesticide Control Act
	Article 97
	Forest Cutting Practices Act
Town	Nahant Wetlands Code
	Nahant Wetlands Protection Bylaw
	Nahant General Bylaws
Property-specific	Purpose statement
	Easements

Recommended Schedule of Annual Maintenance Activities

The recommended strategy for restoration would be to work in small areas over a period of several years. Each year another area would be selected for preparation and each year areas already treated would be managed to control invasives.

	Winter Dec- Feb	Spring Mar- May	Summer Jun - Aug	Fall Sep- Nov
Monthly Property Visits	X	X	X	X
Permitting (trails, viewpoints, invasive control, etc.)	X			
Annual Work Plan Review Meeting with Staff and Stewards	X			
Safety Meeting with Staff, Stewards, Police and Fire Dept.		X		
Trail Walk/Clean Up (downed limbs, drainage issues, signage needs, plow damage)		X		
Invasive Plant Management	X		X	X
Building Projects (kiosks, signposts, trails, boardwalks, etc.)		X	X	X
Mowing for Manicured Areas			X	
Mowing for Grassland Fields	to mid-April		mid-late Sept	X
Mowing for Wildflower Fields				late Sept-Oct
Boundary monitoring for encroachments, signage, etc.	X			X
Year-in-review meeting with Staff and Stewards	X			

Costs Associated with Management Plan

This plan has recommended several actions that will cost money, either as a one-time cost or continuing annual budget needs.

One-time Costs

The following table shows estimates based on costs for similar projects and Google searches.

Design

Entrance Orientation Signs, Wayfinding Markers, and Viewpoint Improvements should all have the attention of professional design. The services of landscape architect and/or graphic designer should be sought.

Parking/Entrance Improvements

No change was recommended for parking, but some of the existing signs are out-of-date and inconsistent in design. They should be replaced with new consistent signs. Two Entrance/Orientation Signs are also recommended.

Wayfinding Markings

Either pavement painting or posts to mark the route across the Northeastern Campus.

Viewpoints and Benches

Two viewpoints with railings and benches are recommended as are several other benches to have a consistent design.

Trail Improvements

Establishing the viewpoints will involve some trail improvements.

Interpretive Signs

Four interpretive signs are recommended.

Grassland Restoration

There will be an initial cost for restoring the grassland and some on-going costs.

Green (or Living) Fencing

Green fencing is recommended in approximately 500' of areas along the loop trail. This can be achieved by letting the existing vegetation (mostly invasive multiflora rose) increase or by planting a less invasive plat like holly.

Element	Number of units	Cost/Unit	Cost
Design*			$5,000
Parking Signs (replace old)	5	$60	$300
Entrance Orientation Sign	2	$2,000	$4,000
Wayfinding Markers (paint)			$300
Wayfinding markers (posts)			$450
Viewpoint trail Improvements			$2,000
Viewpoint railings (stainless)	500 feet	$50/ft	$25,000
Interpretive signs	4	1,000	$4,000
Grassland invasives removal	4 acres	$300/acre	$1,200

Element	Number of units	Cost/Unit	Cost
Seeding with native grasses	4 acres	$640/acre	$2,560
Other native plantings			$3,000
Green fencing	350 small shrubs	$30	10,500
Total			$58,310
Contingency (20%)			$11,700
Total with contingency			$70,010

*Note: The amount for design is arbitrary. There are several items that would benefit from additional design work including entry signs, viewpoint areas, and interpretation. A good strategy may be to combine all of these into a single package and consult with a landscape architect and/or graphic designer to give a cost estimate for the entire package and then to seek a grant for that amount.

Continuing Costs

Several items will involve continuing costs. These include mowing and continuing invasives control as well as replacing signs and benches with more consistent designs as needed.

Safety Signs

Safety signs of a consistent design should replace existing safety signs as the old signs need to be replaced.

Benches

Benches of a consistent design should replace existing benches as they need to be replaced.

Element	Number of Units	Cost /Unit	Cost
Mowing around memorial area	½ acre – 2wice/yr.	$50/acre	$50/yr.
Mowing grassland	2.5 acres 1/2/yr.	$50/acre	$125/yr.
Continuing Invasives control			$300/yr.
Safety sign replacement	6 over several yrs.	$50	$300
Benches	8 over several yrs.	1,000	$8,000
Other maintenance			$500/yr.
Total			$975/yr.

Prioritizing Implementation

The management plan recommends several actions mostly associated with the one-time costs. These include the following in order of priority:

Orientation, Parking, and Wayfinding

Improving the arrival and orientation of visitors should be a high priority. The existing, outdated parking signs need to be replaced and supplemented with new parking signs, orientation sign, and wayfinding markers.

These items would cost a total of about $5,500, excluding design.

Safety

Measures to improve safety include new signs to consistently replace existing signs and green (living) fencing.

These items would cost a total of about $13,000.

Railings are a safety item, but it is recommended that they be installed in conjunction with improvements to the viewpoints (see Visitor Amenities).

Invasives Management

Removal of invasives from the grassland and reseeding is estimated to cost approximately a total of about $4,600. This activity can be scheduled over several years.

Managing the invasives at Lodge Park will be an ongoing effort that is estimated at $300/year

Visitor Amenities

Benches (replacing the existing benches with a standard design), Viewpoint improvements (including railings and trail improvements), interpretive signs, and planting other native plants is estimated to cost approximately a total of $50,400 excluding design.

Appendix A – eBird Hotspot – East Point Headland

The following list of 197 species was generated using eBird (ebird.org). It includes birds seen in the fields, forests, wetlands, the adjacent Massachusetts Bay, and flying over the area. Underlined species have been observed during the breeding season.

Waterfowl
- Brant
- Canada Goose
- Mute Swan
- Wood Duck
- Northern Shoveler
- Mallard
- American Black Duck
- Green-winged Teal
- Greater Scaup
- Greater/Lesser Scaup
- King Eider
- Common Eider
- Harlequin Duck
- Surf Scoter
- White-winged Scoter
- Black Scoter
- Long-tailed Duck
- Bufflehead
- Common Goldeneye
- Hooded Merganser
- Common Merganser
- Red-breasted Merganser
- Ruddy Duck

Grouse, Quail, and Allies
- Ring-necked Pheasant

Grebes
- Horned Grebe
- Red-necked Grebe

Pigeons and Doves
- Rock Pigeon
- Mourning Dove

Cuckoos
- Yellow-billed Cuckoo
- Black-billed Cuckoo

Swifts
- Chimney Swift

Hummingbirds
- Ruby-throated Hummingbird

Shorebirds
- American Oystercatcher
- Black-bellied Plover
- American Golden Plover
- Semipalmated Plover
- Killdeer
- Whimbrel
- Ruddy Turnstone
- Sanderling
- Purple Sandpiper
- Pectoral Sandpiper
- Spotted Sandpiper
- Greater Yellowlegs

Alcids
- Dovekie
- Common Murre
- Thick-billed Murre
- Razorbill
- Black Guillemot

Gulls, Terns, and Skimmers
- Black-legged Kittiwake
- Bonaparte's Gull
- Laughing Gull
- Ring-billed Gull
- Herring Gull
- Iceland Gull
- Great Black-backed Gull
- Lesser Black-backed Gull
- Glaucous Gull
- Common Tern
- Forster's Tern

Loons
- Red-throated Loon
- Common Loon

Storm-Petrels
- Wilson's Storm-Petrel

Petrels, Shearwaters, Diving Petrels
- Cory's Shearwater
- Cory's Great Shearwater

Frigatebirds, Boobies, Gannets
- Northern Gannet

Cormorants, and Anhingas
- Great Cormorant
- Double-crested Cormorant

Herons, Ibis, and Allies
- American Bittern
- Great Blue Heron
- Great Egret
- Snowy Egret
- Little Blue Heron
- Green Heron
- Black-crowned Night Heron
- Glossy Ibis

Vultures, Hawks, and Allies
- Black Vulture
- Osprey
- Northern Harrier
- Sharp-shinned Hawk
- Cooper's Hawk
- Bald Eagle
- Broad-winged Hawk
- Red-tailed Hawk
- Rough-legged Hawk

Owls
- Snowy Owl
- Long-eared Owl
- Short-eared Owl

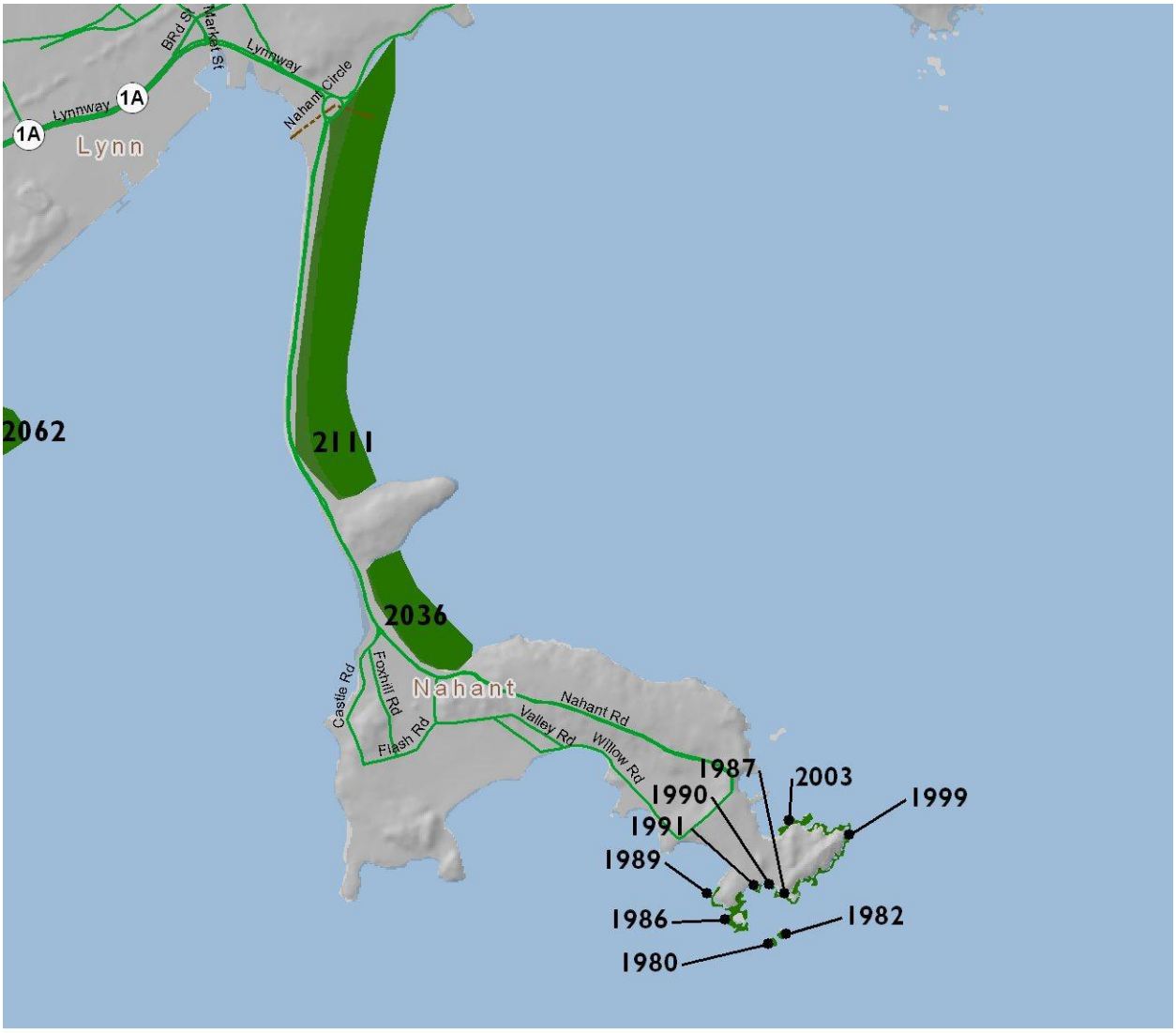
Kingfishers
- Belted Kingfisher

Woodpeckers
- Yellow-breasted Sapsucker
- Red-bellied Woodpecker
- Downy Woodpecker
- Hairy Woodpecker
- Northern Flicker

Falcons and Caracaras
- American Kestrel
- Merlin

Falcons and Caracaras (cont.)
Peregrine Falcon
Tyrant Flycatchers and Allies
Olive-sided Flycatcher
Eastern Wood Pewee
Acadian Flycatcher
Willow Flycatcher
Least Flycatcher
Eastern Phoebe
Eastern Kingbird
Vireos
Blue-headed Vireo
Warbling Vireo
Red-eyed Vireo
Jays, Magpies, Crows, Ravens
Blue Jay
American Crow
Fish Crow
Common Raven
Tits, Chickadees, and Titmice
Black-capped Chickadee
Tufted Titmouse
Larks
Horned Lark
Martins and Swallows
N. Rough-winged Swallow
Tree Swallow
Bank Swallow
Barn Swallow
Kinglets
Ruby-crowned Kinglet
Golden-crowned Kinglet
Nuthatches
Red-breasted Nuthatch
White-breasted Nuthatch
Tree Creepers
Brown Creeper
Gnatcatchers
Blue-grey Gnatcatcher
Wrens
House Wren
Winter Wren
Carolina Wren
Starlings and Mynas
European Starling
Catbirds, Mockingbirds, Thrashers
Gray Catbird
Brown Thrasher
Northern Mockingbird
Thrushes
Veery
Swainson's Thrush
Hermit Thrush
Wood Thrush
American Robin
Waxwings
Cedar Waxwing
Old World Sparrows
House Sparrow
Wagtails and Pipits
American Pipit
Finches, Euphonias, and Allies
House Finch
Purple Finch
Common Redpoll
Red Crossbill
White-winged Crossbill
Pine Siskin
American Goldfinch
Longspurs and Snow Buntings
Lapland Longspur
Smith's Longspur
Snow Bunting
New World Sparrows
Chipping Sparrow
Clay-colored Sparrow
Field Sparrow
American Field Sparrow
Dark-eyed Junco
White-crowned Sparrow
Nelson's Sparrow
Savannah Sparrow
Song Sparrow
Lincoln's Sparrow
Swamp Sparrow
Eastern Towhee
Yellow-breasted Chat
Yellow-breasted Chat
Blackbirds
Bobolink
Eastern Meadowlark
Baltimore Oriole
Red-winged Blackbird
Brown-headed Cowbird
Common Grackle
Wood Warblers
Ovenbird
Northern Waterthrush
Black-and-white Warbler
Tennessee Warbler
Orang-crowned Warbler
Nashville Warbler
Mourning Warbler
Common Yellowthroat
Hooded Warbler
American Redstart
Cape May Warbler
Northern Parula
Magnolia Warbler
Bay-breasted Warbler
Blackburnian Warbler
Yellow Warbler
Chestnut-sided Warbler
Blackpoll Warbler
Black-throated Blue Warbler
Palm Warbler
Pine Warbler
Yellow-rumped Warbler
Black-throated Green Warbler
Canada Warbler
Wilson's Warbler
Cardinals, Grossbeaks, & Allies
Northern Cardinal
Rose-breasted Grossbeak
Indigo Bunting
Dickcissel

Appendix B – *BioMap2* Summary



BioMap2 Core Habitat

BioMap2 Critical Natural Landscape

1 Mile

Elements of *BioMap2* Cores

This section lists all elements of *BioMap2* Cores that occur at East Point.

Core 1986, 1987, 1989, 1990, 1991, 1999, 2003

Priority Natural Community		
Intertidal Rocky Shore	Total area = 11 acres	S2

S2 = Imperiled communities, typically 6-20 sites or few remaining acres in the state.

Appendix C – State Wildlife Action Plan Habitats at East Point

Species in bold have been reported at Lodge Park

SPECIES OF GREATEST CONSERVATION NEED ON ROCKY COASTLINES

Taxon Grouping	Scientific Name	Common Name
Birds	*Calidris maritima*	**Purple Sandpiper**
	Clangula hyemalis	**Long-tailed Duck**
	Histrionicus histrionicus	**Harlequin Duck**
	Somateria mollissima	**Common Eider**

SPECIES OF GREATEST CONSERVATION NEED IN GRASSLANDS

Taxon Grouping	Scientific Name	Common Name
Reptiles	*Heterodon platirhinos*	Eastern Hog-nosed Snake
	Opheodrys vernalis	Smooth Greensnake
Birds	*Ammodramus savannarum*	Grasshopper Sparrow
	Asio flammeus	**Short-eared Owl**
	Asio otus	**Long-eared Owl**
	Bartramia longicauda	Upland Sandpiper
	Chaetura pelagica	Chimney Swift
	Circus cyaneus	**Northern Harrier**
	Colinus virginianus	Northern Bobwhite
	Dolichonyx oryzivorus	**Bobolink**
	Eremophila alpestris	**Horned Lark**
	Falco sparverius	**American Kestrel**
	Pooecetes gramineus	Vesper Sparrow
	Progne subis	Purple Martin
	Scolopax minor	**American Woodcock**
	Sturnella magna	**Eastern Meadowlark**
	Tyto alba	Barn Owl
Mammals	*Synaptomys cooperi*	Southern Bog Lemming
Beetles	*Cicindela purpurea*	Purple Tiger Beetle
	Nicrophorus americanus	American Burying Beetle
Lepidoptera	*Abagrotis nefascia*	Coastal Heathland Cutworm
	Callophrys irus	Frosted Elfin
	Cycnia inopinatus	Unexpected Cycnia
	Erynnis persius persius	Persius Duskywing
	Euchlaena madusaria	Scrub Euchlaena
	Dargida rubripennis	The Pink-streak
	Grammia phyllira	Phyllira Tiger Moth
	Heterocampa varia	Sandplain Heterocamp
	Ptichodis bistrigata	Southern Ptichodis

Taxon Grouping	Scientific Name	Common Name
Bees	*Anthophora walshii*	Walsh's Anthophora
	Epeoloides pilosula	Macropis Cuckoo Bee
	Macropis ciliata	Ciliary Oil-collecting Bee
	Macropis nuda	Naked Oil-collecting Bee
	Macropis patellata	Patellar Oil-collecting Bee
Plants	*Agalinis acuta*	Sandplain Gerardia
	Aristida purpurascens	Purple Needlegrass
	Asclepias purpurascens	Purple Milkweed
	Calystegia spithamaea	Upright False Bindweed
	Carex bushii	Bush's Sedge
	Carex mesochorea	Midland Sedge
	Carex polymorpha	Variable Sedge
	Corema conradii	Broom Crowberry
	Crataegus bicknellii	Bicknell's Hawthorn
	Crocanthemum dumosum	Bushy Rockrose
	Cyperus houghtonii	Houghton's Flatsedge
	Dichanthelium ovale ssp. pseudopubescens	Commons' Panic-grass
	Dichanthelium scabriusculum	Rough Panic-grass
	Eleocharis microcarpa var. filiculmis	Tiny-fruited Spike-sedge
	Gamochaeta purpurea	Purple Cudweed
	Gentiana linearis	Narrow-leaved Gentian
	Hypericum hypericoides ssp. multicaule	St. Andrew's Cross
	Lathyrus palustris	Marsh-pea
	Lechea pulchella var. moniliformis	Beaded Pinweed
	Liatris novae-angliae	New England Blazing Star
	Linum intercursum	Sandplain Flax
	Linum medium var. texanum	Stiff Yellow Flax
	Lupinus perennis	Wild Lupine
	Malaxis bayardii	Bayard's Adder's Mouth
	Nabalus serpentarius	Lion's Foot
	Panicum philadelphicum ssp. gattingeri	Gattinger's Panic-grass
	Scleria pauciflora	Papillose Nut-sedge
	Scleria triglomerata	Tall Nut-sedge
	Senna hebecarpa	Wild Senna
	Silene caroliana ssp. pensylvanica	Wild Pink
	Sisyrinchium fuscatum	Sandplain Blue-eyed Grass
	Spiranthes vernalis	Grass-leaved Ladies'-tresses
	Symphyotrichum concolor	Eastern Silvery Aster
	Symphyotrichum praealtum	Willow Aster
	Triosteum perfoliatum	Broad Tinker's-weed
	Viola adunca	Sand Violet
	Veronicastrum virginicum	Culver's-root
	Verbena simplex	Narrow-leaved Vervain

Appendix D – Plant Inventory of East Point

By Linda Pivacek and John Benson

Common Name	Latin Name	Community	Habitat Value	Management
Trees				
Norway maple	*Acer platanoides/ pseudoplatanus*	MF, MS	Structure, shade, diseased ones host insects	Invasive. Dense shade kills understory
autumn olive	*Eleagnus umbellata*	MS	Fruits edible by birds, humans	invasive
ash (green?)	***Fraxinus pennsylvanica***	MS	larval host swallowtails, sulfurs, mourning cloak, attracts pollinators and birds, cover	Need to confirm sp, should encourage to replace non-native trees
Japanese flowering crabapple	*Malus floribunda/sp.*	MS	Attracts pollinators, I mostly see mammals, robins, starlings, on fruit but am sure other birds eat it too?	Reduce size if competing with natives
crabapple	*Malus prunifolia/sp.*	MF	Attracts pollinators, mammals like fruit	Reduce size if competing with natives
pine (Japanese black?)	*Pinus sp.*	MF	winter cover	Reduce size if competing with natives
eastern white pine	***Pinus strobus***		cover, seeds	
eastern cottonwood	***Populus deltoides***	FM	larval host swallowtails, mourning cloak, viceroy	easy to establish
black cherry	***Prunus serotina***	MF	May host over 80 sp. of lepidoptera	competes well with invasives
flowering pear	*Pyrus calleryana*	MS		invasive in many states, potentially in MA
English oak	*Quercus rubra*	MF	Oaks host hundreds of species of insects	several young ones, a few larger
(black?) oak	***Quercus velutina***			
black locust	*Robinia pseudoacacia*	MF	Diseased ones host insects for insectivores, pollinator value	invasive in this area

Common Name	Latin Name	Community	Habitat Value	Management
Trees (cont.)				
elm, (American?)	***Ulmus (americana)***	MF	larval host many leps, favored by orioles for nesting	covered by bittersweet in central depression
elm sp. (possibly Scotch)	*Ulmus (glabra?)*	MF	Structure, shade	May shade out natives
Shrubs				
shadbush (smooth?)	***Amelanchier laevis***	MS	Attracts pollinators early season	This one was growing under invasives, not part of the new planting
Scotch broom	*Cytisus scoparius*	MS		
burning bush	*Euonymus alatus*	MS	cover	invasive
eastern red cedar	***Juniperus virginiana***	MS	great shelter plant, berries edible by birds	saw young ones under sumac/ bittersweet
European privet*	*Ligustrum vulgare*	MS	cover, berries	invasive
bush honeysuckle sp.	*Lonicera sp.*	MS	nectar, berries	invasive, outcompetes natives
northern bayberry	***Morella pensylvanica***	FM, MS	Larval host plant, migrating tree swallows devour high fat berries, winter birds eat berries	would spread fast if invasive cover removed
staghorn sumac	***Rhus hirta***	MS	Hairstreak host, many insects use fruits for food, refuge, soil stabilizer on slopes	competes well with phragmites and other invasives
bristly locust*	*Robinia hispida*		cover, pollinator value	
Carolina rose	***Rosa carolina***		special value to native bees	stabilizes slopes/ dunes
mulfiflora rose	*Rosa multiflora*	MS	cover for nests, pollen source	Invasive, but not the worst
rugosa rose	*Rosa rugosa*	MS	pollen source, hips edible	invasive; rats find cover under root mats and survive on hips
Virginia rose	***Rosa virginiana***	FM, MS	special value to native bees	stabilizes slopes
blackberry	***Rubus sp.***	MS	special value to bees, songbirds, nesting cover for both	not sure if this one is native
raspberry (black?)	***Rubus sp.***	MS	good cover, bee value	

Common Name	Latin Name	Community	Habitat Value	Management
Vines				
Asiatic bittersweet	*Celastrus orbiculatus*	MS	Cover, berries	Invasive, kills native trees and shrubs
Virginia creeper	***Parthenocissus quinquefolia***	MS	provides cover and berries for birds	competes with invasives
dewberry	***Rubus hispidus/ flagillaris***	MS	pollen and berry source	good groundcover
Climbing nightshade	*Solanum dulcamara*	MS	plant parts toxic to humans	invasive
poison ivy	***Toxicodendron radicans***	MS	berries favored by yellow-rumped warblers	nice fall color
Forbs				
common yarrow	***Achillea millefolium***		special value to native bees, beneficial insects	native/non-native mix
garlic mustard	*Alliaria petiolata*			invasive in woodlands
common ragweed	***Ambrosia artemisifolia***	BS	Seed source, native, but highly allergenic	I weedwack it so grasses/native forbs will dominate
everlasting	***Anaphalis Pseudognaphalium***		painted lady host plant, seeds	
mugwort, common wormwood	*Artemesia vulgaris*	BS	seed source	highly invasive and allergenic
common milkweed	***Asclepias syriaca***		high pollinator value, larval host plant	clear around to facilitate spreading
spearscale orache	*Atriplex patula*	BS		
devil's beggar-ticks	***Bidens frondosa***		special value to bees, beneficial insects	encourage, esp in wet areas
doll's daisy	***Boltonia asteroides***		pollen, seed	native further south, but has decent wildlife function
black mustard	*Brassica nigra*	BS	early pollen source, but root excretions may suppress natives	
sea rocket	***Cakile edulenta***	BS	Stabilizes sand, attracts pollinators	Proto-dune species, great for beach
chicory	*Cichorium intybus*	BS	Pollinator, seed value	overly aggressive in some cases
thistle (common?)	*Cirsium (vulgare)*		some pollinator value	can be invasive
Queen Anne's lace	*Daucus carota*		pollinator value	

Common Name	Latin Name	Community	Habitat Value	Management
Forbs (cont.)				
Deptford pink*	*Dianthus armeria*			
leafy spurge*	*Euphorbia esula*			invasive
Japanese knotweed	*Fallopia japonica*		cover	invasive; repeated cutting/ competition from aggressive natives will kill it.
scratch bedstraw*	***Galium aparine***			aggressive against invasives
yellow avens*	***Geum aleppicum***			
common St Johns-wort*	*Hypericum perforatum*			
everlasting vetchling*	*Lathyrus latifololia*			problematic in rich soils but not so much here
ox-eye daisy*	*Leucanthemum vulgare*			not usually a problem in this area
butter and eggs toadflax	*Linaria vulgaris*		provides nectar	not usually invasive
purple loosestrife	*Lythrum salicaria*	FM	provides nectar	invasive in wetlands, same niche as Joe Pye-weed
white sweet clover*	*Melilotus alba*		USDA lists as low wildlife value	Thick stands inhibit growth of natives
yellow sweet clover	*Melilotus officinalis*		USDA lists as low wildlife value	Thick stands inhibit growth of natives
common evening primrose	*Oenothera biennis*		Pollen, seed, hosts primrose moth	competes very well with invasives
lady's thumb smartweed	*Persicaria maculosa*		seed	not the worst
American pokeweed	***Phytolacca americana***		berry source for migrating birds	very aggressive, can function as invasive without competition
dwarf cinquefoil*	***Potentilla canadensis***		special value to bees	outstanding groundcover
sulphur cinquefoil*	*Potentilla recta*		some pollinator value	
dock (bitter)?	*Rumex sp.*	BS	seed source	taproot will hold soil
moss stonecrop*	*Sedum acre*			

Common Name	Latin Name	Community	Habitat Value	Management
Forbs (cont.)				
seaside goldenrod	***Solidago sempervirens***	FM, BS, MC	Outstanding for pollinators and seed eaters	Great root system for stabilizing beach
goldenrod (rough, wrinkled)	***Solidago sp.***		Larval host plant, pollen, seed source	competes with invasives
red sand-spurry*	*Spergularia rubra*			
heart-leaved American-aster	***Symphotrichum cordifolum***		pollen, seed, hosts lepidoptera	can compete with invasives in shade
heath American aster	***Symphotrichum ericoides***		Larval host, pollen, seed	can compete with shorter invasives
New York American aster	***Symphotrichum novi-belgii***	FM	pollen, seed, hosts lepidoptera	can compete with invasives with sufficient light
common tansy	*Tanacetum vulgare*		some pollen value, but somewhat invasive	
red clover	*Trifolium pratense*		some pollinator value	Leave until better replacements grow
white clover*	*Trifolium repens*		some pollinator value	Leave until better replacements grow
common mullein	*Verbascum thapsis*		pollinator and seed value	
beach cocklebur	***Xanthium strumarium***	BS	Seeds were a favorite food of Carolina parakeet	somewhat similar to burdock, which is not native
Grass-like				
American beach grass	***Ammophila breviligulata***	BS	Builds beach, protects from erosion and over-wash	Moving road away from beach would provide a more effective wetland buffer
tufted hair-sedge	***Bulbostylis capillaris***	MC	seed source, possible insect host	
nut flatsedge	***Cyperus sp. (esculentus?)***		Larval host plant, seed source	
fescue	***Festuca (rubra)***		seed	
path rush	***Juncus tenuis***		seed source	groundcover for sun or shade
fall witch/panic/ crabgrass	***Panicum sp/Digitaria cognata***		Host for skippers, seed source	not sure which grass here but all native
switch panicgrass	***Panicum virgatum***	BS	Roots to 8' for soil stabilization, exc. Seed source, host for skippers	would help with existing erosion problem

Common Name	Latin Name	Community	Habitat Value	Management
Grass-like (cont.)				
common reed	*Phragmites australis*	FM	cover, have seen downy woodpeckers foraging on it	invasive, sign of run-off/siltation
grasses	*Poa, Festuca, other sp.*		seed	Grasses dominated at edges and on top of higher bunker
little bluestem	***Schizachyrium scoparium***		larval host skippers, seed, cover	indigenous populations of native grasses valuable
Key: MS = Maritime Shrubland, BS = Beach Stand, MC = Maritime Erosional Cliff, SM = Salt Marsh, FM = Freshwater Marsh, MF = Maritime Forest				
Bold indicates native species.				

Names from GoBoanty (gobotany.newenglandwild.org).

88 species, 43 native, (unidentified grasses likely to be non-native)

More importantly, there are native layers throughout of sumac, bayberry, black cherry, etc. that would quickly spread if non-natives were removed. For example, much bayberry and some eastern red cedar still under blackberry and bittersweet on slope. If bittersweet removed, shrubs would get very large providing food and excellent storm cover. Layer of sumac already out-competing knotweed on E. edge. Recent road cut shows native forbs moving in.

Top of bunker had wet seep leading to maritime erosional cliff, sedge growing at the top of this cliff. There were lots of birds in the thicket/shrub area surrounded by mown paths. Birds were drinking and bathing in pools on concrete near "valley" between bunker and upper road. Tremendous variation in habitat here between open sunny thicket, "old field" slopes, woods, bayberry/blackberry slope, erosional cliff, rocky cliffs, beach, and the "valley", not to mention the bunker itself (saw birds flying into it).

Appendix E – Invasive Plant Management Options

Some invasive species and small infestations can be managed manually or mechanically, others are best managed with targeted, careful use of herbicides applied by a licensed herbicide applicator.

Herbicide Application Options

Foliar spray- This method is usually applied with a type of sprayer (backpack, mist blower, or tank). The percent of solution depends on the target species, the time of year, and type of sprayer. Glyphosate will target all species while Triclopyr will only target broadleaf plants and will have minimal impact if any on grasses.

Bloody glove- A more intensive method of herbicide application often used in place of foliar spray when impacts to non-target species is a concern. Herbicide is applied directly to leaves and stems of target species from a soaked cotton glove worn over a rubber glove.

Cut and paint- The stem of the plant is cut so a cross section is showing. The outer edge of the stem is then painted in herbicide; if the stem is hollow herbicide can be injected into the hollow stem. Triclopyr or Glyphosate can be used for treatment.

Girdling- This method used for trees involves making a shallow cut through the bark and outer cambium tissue; the plant is slowly killed due to the inability to transport water and nutrients up the trunk. Girdling is particularly effective for species that sprout aggressively from root suckers, particularly black locust, since it seems to bypass the signal to respond to a dead main stem by sprouting from root suckers. Care must be taken not to cut too deeply into the trunk as too deep a cut can sever all phloem tissue which transports nutrients down into the roots of the plant and is necessary to transport herbicide into the roots. If the phloem is all cut, downward transport will cease, and black locust will respond by sprouting aggressively from root suckers.

Basal bark- Herbicide is applied to the outer surface of the stem. Triclopyr is used because glyphosate will not penetrate the stem. There should not be any standing water present or moisture on the stem. The application can be made with a paint brush or backpack sprayer from the base of the stem to about 1 foot up the stem.

Recommended herbicides:

Triclopyr- Triclopyr is a selective herbicide that will affect broad leaf plants and will have minimal to no impact on monocots. This is since it stimulates cell growth elongation. Since monocots grow naturally by elongating their cells it will have little to no affect where since dicots grow laterally, they burst their cell walls and cause damage to the plant when they are stimulated for cell elongation. Since this herbicide can be mixed with water or oil it can be used for foliar sprays, cut and paint, or basal bark applications. It is recommended to use this herbicide when there is a dense native grass understory surrounding a target plant.

Glyphosate- Glyphosate is a broad-spectrum herbicide meaning it will kill most plants it is applied to. It is an amino acid inhibitor, so it inhibits the growth of plants. Foliar sprays should be applied while the plant is actively growing but cut and paint applications can be done during the fall/winter months. This herbicide can be used for foliar sprays and cut and paint applications. Since water is used as the base of the solution it cannot be used for basal bark treatments because water-based solutions will not

penetrate the bark layer. During cut and paint treatments the herbicide will need to be applied before the cambium layer seals for it to be effective.

Table E-1. General Management Options.

Bold indicates species included in the plant inventory or other source.

Method	Good for Volunteers?	Timing	General guidelines	Target Species
Cut and paint	Yes	Late August to November	Preferably done in the fall when woody plants are translocating energy towards roots. Can be done to all trees/ shrubs except black locust (signals root suckering). Preferred treatment for multiflora rose. If berries are present, take extra precaution to not spread seed. Best when left in local area and burned in brush pile. Good for volunteers working together with staff: have volunteers cut and haul brush while licensed applicator paints herbicide.	Common Reed (stem injection) **Japanese knotweed** (stem injection) **Burning Bush** **Oriental bittersweet** **Multiflora rose** (preferred) **Bush Honeysuckle** (fall) Glossy buckthorn **Autumn olive**
Hand pull	Yes	Spring and Summer	Great for herbaceous plants with taproot and shallow root system. Best for small infestations. All trees/ shrubs can be hand-pulled when in seedling stage. Garlic mustard should be hand-pulled when second year plants start sending up seed stalk and all plant parts should be bagged and kept out of the sun (seeds can still develop if sunlight is available).	Spotted knapweed **Garlic mustard** All seedlings for trees and shrubs

Method	Good for Volunteers?	Timing	General guidelines	Target Species
Mechanical (weed wrench/ shovel)	Yes	Spring through Fall, although better before seed set.	Great for small shrubs/ trees. Best when done in early spring when leaves start coming out but before berries develop. Shovels can be used to dig up herbaceous plants with fibrous root systems (black swallowwort) care needs to be taken to make sure all root system is dug up. Soil should be tamped down after removal or native species planted soon after disturbance to keep additional invasives from re-colonizing area.	**Japanese knotweed** **Burning Bush** Japanese barberry **Black swallowwort** **Autumn olive** Tree of heaven
Basal bark herbicide	No	August through October	This method is best when done in late summer mid fall (Aug-Oct) when flow is towards roots. Can be performed on all trees/ shrubs.	**Burning Bush** **Autumn olive**
Biological	Yes	Dependent on insect.	This method of treatment works well for purple loosestrife. It is the least disruptive method of treatment currently available. Usually agents are released in July/ August. The affect the biological agent will have on the environment should be taken into consideration and the relative easiness of other forms of treatment. Depending on infestation size this could be a good way to treat spotted knapweed.	**Purple loosestrife** (preferred) Spotted knapweed (needs research)

Method	Good for Volunteers?	Timing	General guidelines	Target Species
Foliar spray herbicide	No	When leaves are out.	For trees/ shrubs best when done in the fall when flow is towards roots. Can be done any time for herbaceous plants. When spraying the least amount of herbicide at the smallest effective percentage should be used. The surrounding habitat (wetland vs upland), nesting/ breeding animals, and whether it is a necessary treatment should be considered.	All species
Girdling	If certified in chainsaw safety	Fall	A chainsaw is used to create a ~2" wide cut all around the tree between knee and waist height taking care to remove only the outer layer of cambium, then the fresh cut is painted with herbicide.	Larger trees
Bloody glove	No	When leaves are out.	A rubber glove is worn on the hand with an absorbent cotton glove over it. The cotton glove is dipped in a glyphosate solution (strength depending on target species) then used to directly apply herbicide to leaves, stems, and inflorescences of target plants. Herbicide is absorbed directly into the plant via the stem and leaves, however, breaking the stem aids in more rapid absorption.	Small patches of common reed, seedlings, etc. particularly in wetlands where impacts to non-target species is a concern.

Table E-2. Species Specific Management Options.

Species	Biology	Control Recommendations		Monitoring Period
		Manual	Chemical	
Autumn Olive	Autumn Olive flowers in May-July (plants must be at least 3 years old to flower). Seeds are produced August – November and nuts usually ripen in September. Adults produce less seed in the shade then the sun. Autumn Olive reproduces primarily by seed.	Seedlings can be hand-pulled. Bigger plants can be removed with weed wrenches. Care should be taken to get entire root system. Plants re-sprout vigorously when cut without the use of herbicide.	A foliar treatment with at 2% solution of Triclopyr or Glyphosate can be used when leaves are present. A 25% solution of Triclopyr or Glyphosate can be used for cut-and-paint. A 20% solution of Triclopyr is recommended for basal bark treatments.	3 years No information available on seed viability.
Black Swallowwort	Black swallowwort spreads vegetatively and by seed. It flowers in June-August. The seeds are released from August to October;	Plants can be dug up with a shovel. The entire root system would need to be removed and this method is very time consuming.	A 2% foliar spray of Glyphosate or Triclopyr is recommended before mid- July. Chemical treatment is recommended from May- June, this would be before the plants flower so there would not be a possibility of spreading seed.	6 years Seeds remain viable up to five years
Winged Euonymus (Burning Bush)	Burning Bush reproduces by seed and vegetatively.	Small plants can be hand pulled while a weed wrench will need to be used for larger plants. Care should be taken to remove entire root system.	A 2% foliar solution of glyphosate is recommended when leaves are present. A 20% solution of glyphosate or triclopyr is recommended for cut and paint and a 20% solution of triclopyr should be used for basal bark application.	5 years No information on seed banking,

Species	Biology	Control Recommendations		Monitoring Period
		Manual	Chemical	
Bush Honeysuckles (Tartarian and Morrow's)	The berries are mildly poisonous if eaten.	small plants can be hand pulled or removed with a weed wrench. Care should be taken to remove all roots and not to spread berries.	Foliar spraying can be done if there are leaves present a 2% solution of triclopyr or glyphosate is recommended. A 25% solution for cut and paint treatments can be used, put the solution right into the hollow stem and around the stem edge. This is best during the fall when all of the plant fluids are headed towards the root system.	3 years Few seeds viable for more than one year.
Common Reed	Common Reed reproduces by seed and vegetatively. Inflorescences develop in late June.	Plants can be cut. The shoots should be removed to prevent re sprouting.	A 2% solution of Glyphosate is recommended. Since Phragmites is an aquatic species, an aquatic safe herbicide must be used. The best results are when the herbicide is applied in the late summer or early fall when Phragmites is actively growing and in full bloom. Remove dead stems if possible, by mowing or clipping.	2 years Seed viability is typically low, although it may vary year to year.
Garlic Mustard	Garlic mustard is a biennial plant and is allelopathic.	Basal rosettes and second year plants can be hand pulled. Plants should be pulled at base near ground to ensure that the root is removed.	A 2% glyphosate solution can be sprayed in April/ May before the basal rosettes go to seed and in September/ October when other plants are dormant.	6 years The seed bank is viable for 5 or more years.
Glossy Buckthorn	Reproduces by seed.	seedlings can be hand-pulled and larger plants can be removed with a weed wrench.	Cut and paint with a 20% solution of glyphosate or25% triclopyr. A 2% foliar spray can be used while there are leaves. Remove dead stems, if possible, by mowing or lopping.	7 years Seeds remain viable for 5-7 years.
Japanese Barberry	Japanese Barberry spreads by seeds and vegetatively. The seeds have a 90% germination rate.	Small plants can be removed by hand pulling or using a weed wrench.	A 2% foliar spray can be used when leaves are present (April). Both glyphosate or a triclopyr solution can be used. A 25% cut and paint solution of glyphosate or triclopyr can be used, it is most effective in the fall when sap flow is towards the root system.	2 years Do not persist in seed bank.

Species	Biology	Control Recommendations		Monitoring Period
		Manual	Chemical	
Japanese Knotweed	Most of the literature recommends spraying after flowering; this makes it harder for the plant to have enough reserves to re-sprout that year. When the plant is in flower (August) there are a lot of bees around this species; care should be taken to avoid spraying bees when present and if possible, efforts should be made to spray multiple times a year before flowering.	Due to its extensive root system hand pulling Japanese Knotweed is not recommended as an efficient form of control.	A 2% solution of Triclopyr or Glyphosate is recommended for foliar spraying and is recommended to be done soon after flowering. For cut and paint techniques a 25% solution of glyphosate or triclopyr is recommended.	4 years Seeds do not remain viable beyond one year, but rhizomes and other plant parts can sprout up to three years after treatment.
		The method being used at Lodge Park has been to mow and then cover the infested areas with black felt for 2 growing seasons. This is a good approach, but some rhizomes and plant parts may still sprout. A follow up method would be to cover the areas with ¼ inch hardware cloth after the felt is removed and then seed with native grasses and wildflowers. If the knotweed does sprout the hardware cloth will cut the sprouts when they get more than ¼ inch in diameter while the grasses and wildflowers will grow through the hardware cloth.		
Japanese Stiltgrass	Japanese stiltgrass emerges in late August.	Small patches can be hand pulled and bagged. Be sure to remove entire root system.	A 2% glyphosate or triclopyr solution can be used for foliar spray in August/September.	7 years Seeds remain viable for 5-7 years.
Multiflora Rose	It flowers from April to June and fruits seeds July-Dec. It reproduces by seed and vegetatively.	Hand-pulling small plants are recommended as long as all the roots are removed. It is not recommended for established plants.	Foliar application is best when near flowering time. A 2% of triclopyr or glyphosate can be used. Cut and paint or basal bark applications can also be applied in the fall. A 25% solution of triclopyr or glyphosate is recommended for cut and paint and 20% of triclopyr can be used for basal bark treatments.	20 years Seeds of multiflora rose are viable for up to 20 years.

Species	Biology	Control Recommendations		Monitoring Period
		Manual	Chemical	
Oriental Bittersweet	The seeds are viable for several years but can sprout from roots and runners.	Seedlings are easy to hand-pull. Bigger vines can be removed by unwinding them from their host and using a weed wrench to uproot them. This can be done year-round, but use caution when berries are present.	You can foliar spray with a 2% solution of Glyphosate or Triclopyr. A 20% solution can be used for basal bark treatment. A 25% solution is recommended for cut and paint treatments, both Glyphosate and Triclopyr can be used.	5 years Seeds do not remain viable, but resprouts from roots.
Purple Loosestrife	Galerucella spp. beetles are recommended for bio control agents.	Plants can be removed by hand pulling. All roots should be removed.	An aquatic safe herbicide (Rodeo) should be used. A 2 % foliar spray is recommended in late August early September.	Ongoing Produces nearly inexhaustible seed bank. Bio-control will not eliminate plant.
Spotted Knapweed	Plants may contain carcinogenic compounds and skin irritation can also occur; gloves should be worn when handling	Plants can be hand pulled and bagged. Care should be taken to get entire root system and not to distribute seeds if present.	A 2% Glyphosate foliar spray can be used. Plants are most susceptible if sprayed in the late stages of flower buds (late June).	10 years Seeds can survive for 8 or more years.

Species	Biology	Control Recommendations		Monitoring Period
		Manual	Chemical	
Tree-of-Heaven	Tree-of-heaven flowers in May-June, and fruits starting in July. It reproduces by seed and vegetatively. Plants need to be 2 or 3 years old to produce viable seed. It re-sprouts vigorously when cut without herbicide.	Small plants can be removed by hand- pulling or using a weed wrench. Care should be taken to remove entire root system.	A 2% solution is recommended for foliar spray. Either Triclopyr or Glyphosate can be used. Triclopyr is recommended for cut and paint (30% solution) and basal bark (20% solution) treatments.	2 years Few seeds remain viable after one year.

Invasive Species Treatment Record

Property: Date:

Location: UTM (WGS84/NAD83):

Weather (include 24 hours before and after for chemical treatment)

	Current	24 hours before	24 hours after
Temp.			
Wind speed/direction			
Cloud Cover			
Precipitation			

Method: Chemical Manual Mechanical Biological

Chemical

Chemical used: % Solution Used: Amount of solution used:

Amount of herbicide used: Mix date:

Adjuvants/Carriers etc.:

Method of Application:

Name of applicators:

Biological

Biological control agent: # Released: Stage:

Mechanical/ Manual

Equipment used:

Acres/number of plants treated: % of infested area treated:

Growth stage of target:

Target Species:

Comments:

Date current treatment mapped w/ GPS:

Efficacy notes:

Date/type of last treatment:

ATTACH MAP OF TREATMENT AREA

or hand draw on back of this sheet