

INVASIVE SPECIES MANAGEMENT PLAN

FORT FOSTER PARK, KITTERY, MAINE

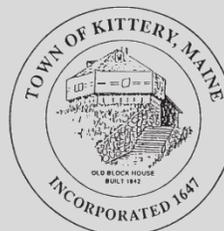
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INTRODUCTION

BACKGROUND AND PURPOSE

Non-native, invasive plants (invasives) dominate entire sections of Kittery’s Fort Foster Park. Invasives infringe on native plant populations and lead to a loss of biodiversity that ultimately is harmful to native plant and animal communities. Dense infestations of invasives can even limit public access for recreation. Beginning in August of 2018 the Town of Kittery began working with FB Environmental Associates (FBE) to conduct an invasive plant inventory and develop a comprehensive, effective, and feasible Invasive Plant Management Plan for Fort Foster Park. This Plan builds upon FBE’s survey of the park in summer of 2018 that inventoried the invasive species present and their associated location and density (FB Environmental, 2018).

The recommendations within this document focus on controlling existing infestations and eradicating new ones, with the goal of restoring the dominance of native plant communities throughout the park. The plan also aims to incorporate community education and engagement while fostering public acceptance and volunteer effort.

DEFINITIONS

A **native** plant is a part of a given ecosystem that has developed over hundreds or thousands of years in a region or ecosystem. (The word native should be used with a geographic qualifier. All plants are native somewhere, but only plants that have been established for hundreds or thousands of years in Maine are considered native to Maine.) A **non-native** plant is a plant introduced to a new place or new type of habitat where it was not previously found, whether intentionally or accidentally. Not all non-native plants are invasive. When many non-native plants are introduced to new places, they cannot reproduce or spread readily without continued human help (e.g., many ornamental plants). An **invasive** plant is one that is both non-native and able to establish in many areas, grow quickly, and spread to the point of disrupting existing native plant communities or ecosystems. A **naturalized** plant is a non-native species that does not need human help to reproduce and maintain itself over time in an area where it is not native. Naturalized plants do not, over time, become native members of the local plant community. Many naturalized plants are found primarily near human-dominated areas. Since invasive plants also reproduce and spread without human help, they are considered naturalized. Naturalized invasives are a small, but troublesome, sub-category of naturalized plants.

THREATS POSED BY INVASIVE SPECIES

Invasive plants pose a direct threat to Maine’s natural and working landscapes. The aggressive growth of these species can have negative effects on forest regeneration (following timber harvest, disease, fire, etc.), increase the cost of agriculture, and threaten recreational experiences (e.g., by rendering hiking trails impassable, disrupting views). Invasive plants out-compete native species for sunlight, nutrients, and space by growing quickly enough to crowd out native species. Thus, shifts to invasive species dominance may alter wildlife habitat by eliminating native foods, altering physical structure of an area, and destroying bird nesting opportunities.

Invasive species are considered the second greatest threat to worldwide biodiversity after habitat loss (Madren, 2011). Note however that these species (or any species for that matter) are not intrinsically evil. Most invasive plants in the U.S. were deliberately introduced. It is humans’ decisions regarding species introductions and land use that have led to the spread of these species. Conservation biologist Michael Klemens coined the term “subsidized species” to characterize invasive species that have attained population levels that have deleterious effects on ecosystem function and human activities.

RATIONALE

Considering the wealth and breadth of ecologically and historically significant features and recreational opportunities in the park, invasive species management is worthwhile as it provides a suite of benefits including:

1. Restoration of native land cover types
2. Improvement of recreational opportunities for park visitors
3. Improvement of access to a historically significant site

This management plan provides protocols for implementing invasive species control measures on state land, and will describe:

1. Which invasive plant species should be targeted
2. What management practices are required
3. When individual management practices should be implemented

This management plan is a living document and should be revisited and revised periodically to reflect the dynamic nature of invasive species and the state of knowledge of best management practices (BMPs). Project stakeholders will continue to help revise this management plan, with refinement of prioritized objectives, implementation efforts, and garnering community support for the plan.

PRIORITIES

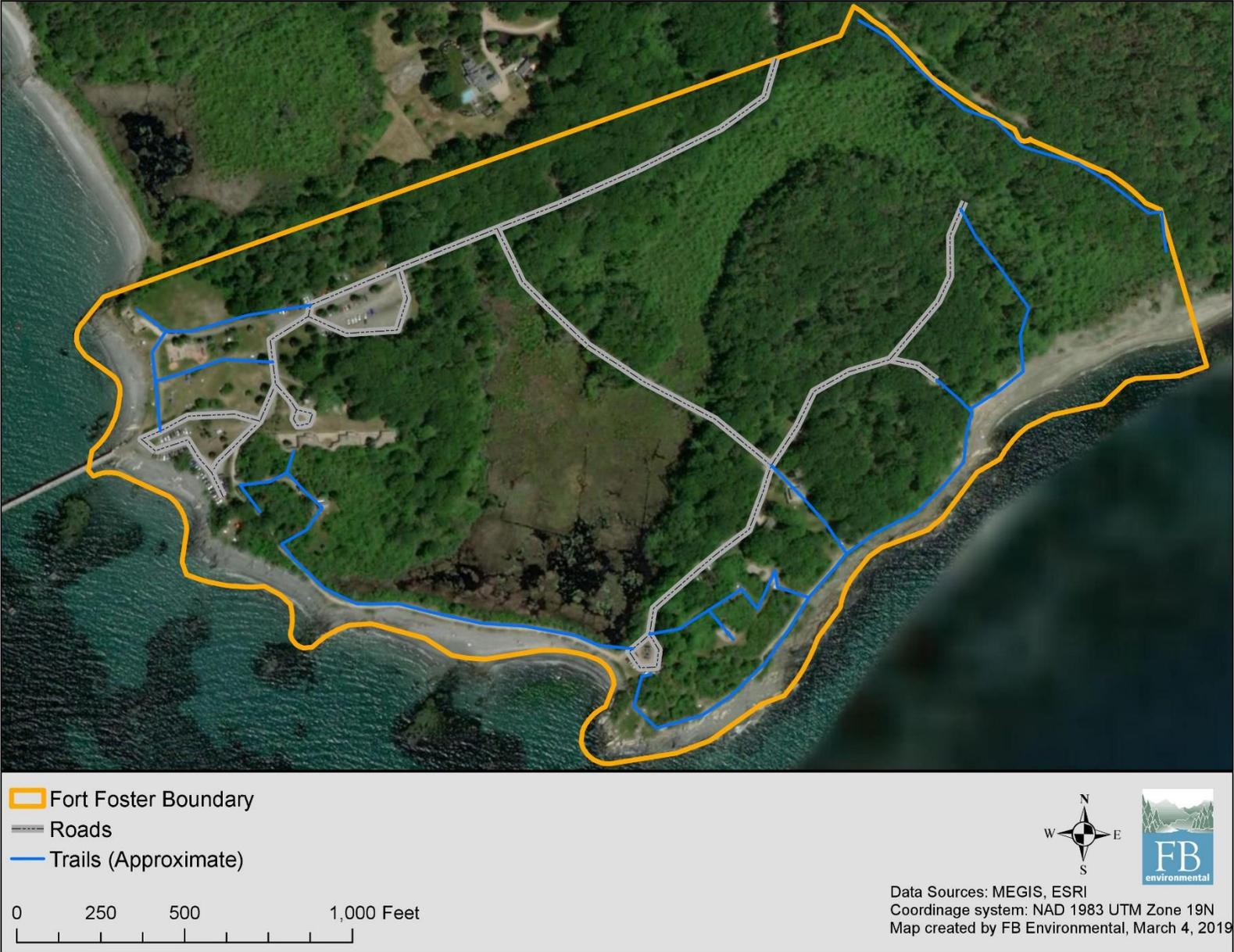
A stakeholder meeting was held on Thursday May 9, 2019 to discuss a prioritization scheme for the invasive management plan. The meeting was attended by Kittery Town Manager Kendra Amaral, Public Works Commissioner Dave Rich, and members from both Kittery's Parks and Conservation Commissions. A prioritization scheme for this plan was developed in this initial stakeholder meeting:

1. Target species that have not fully established where the potential exists to completely eradicate them. Such species identified were black swallowwort (*Cynanchum louiseae*) and common reed (*Phragmites australis*) as these species within Fort Foster that are not yet omnipresent and, with diligent effort, could possibly be eradicated.
2. Contain, suppress, and exclude invasives on a site-by-site basis. This plan outlines specific site management recommendations rated by relative cost and impact that will allow the town to select which areas can be prioritized based on available budget and resources.
3. Prevent invasion in areas that are not currently dominated by invasives.

SITE DESCRIPTION

LOCATION AND HISTORY

Fort Foster Park encompasses approximately 88 acres on the southwest tip of Gerrish Island in Kittery, Maine. The namesake of Fort Foster was inspired by American Civil War Era Brevet Major General John G. Foster of New Hampshire. Between 1898-1946 Fort Foster was home to World War I and World War II gun batteries. The property has since been acquired by the Town of Kittery and is a very popular destination for hiking, dog-walking, birdwatching, and beach recreation. The Park is bound by the Atlantic Ocean along the southeastern border and the Piscataqua River on the southwestern border. The remaining park perimeter is bound by private property (demarcated with fencing in most areas). Fort Foster is comprised of wetland, upland, and shoreline ecosystems.



Map 1. Fort Foster Boundary Map.

NATURAL RESOURCES

Within The Park boundary there are three prominent coastal and freshwater wetlands (Map 1). These wetlands provide important functions including flood control, wildlife habitat, nurseries for fish and native aquatic plants, and nutrient cycling. Maintaining a predominantly native plant population in wetlands is critical because healthy, functioning wetlands with native plant communities foster biodiversity and increase resiliency to environmental disturbances, such as large storm and wave events.

The New England cottontail (*Sylvilagus transitionalis*) is currently listed as an endangered species in the State of Maine and is the state’s only endangered terrestrial mammal. Any action that may negatively affect the cottontails’ daily life could be considered a “take” under the Endangered Species Act. A take is any action or attempt to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect an endangered species. This could also include an incidental take, when an action has an unintentional negative impact on an endangered species (U.S. Fish and Wildlife Service, 2013). This park is the only site within the Town of Kittery known to be inhabited by New England cottontails, so it is important to prevent altering cottontail habitat in a way that may negatively affect their population.

An assessment by Cory Stearns of Maine Department of Inland Fisheries and Wildlife (MDIFW) show that cottontail habitat in Fort Foster is predominantly clustered among the thick vegetation along The Park’s southern shoreline (Map 2), which is dominated by invasives. Before any invasive management activities begin, we recommend that Mr. Stearns review and approve management strategies for cottontail habitat.



Map 2. New England Cottontail habitat map.

INVASIVE PLANT SPECIES AT FORT FOSTER

The State of Maine has established a list of 52 plants ranked as “Severely Invasive” and 31 plants ranked as “Very Invasive” (Maine Natural Areas Program, 2019). At least eight of these species have been documented within Fort Foster Park (Table 1). Species with the greatest threat to wetlands in the park include purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis*). These two plants are known to spread rapidly, forming monocultures that outcompete native wetland species in relatively short time spans. Fortunately, in Fort Foster Park both species have relatively low population densities. Oriental bittersweet (*Celastrus orbiculatus*), honeysuckle (*Lonicera morrowii*), and glossy false buckthorn (*Frangula alnus*) are the major threat to the forested upland communities throughout The Park. These species are documented to have the greatest density and distribution throughout the park. The following section provides descriptions of invasive plants that were documented in Fort Foster during FBE’s site visits in August 2018.

Table 1. Common and scientific names of Maine invasive plant species found in Fort Foster Park.

Common Name	Scientific Name
Oriental bittersweet	<i>Celastrus orbiculatus</i>
Black swallowwort	<i>Cynanchum louiseae</i>
Common reed	<i>Phragmites australis</i>
Glossy false buckthorn	<i>Frangula alnus</i>
Japanese barberry	<i>Berberis thunbergii</i>
Morrow's honeysuckle	<i>Lonicera morrowii</i>
Multiflora rose	<i>Rosa multiflora</i>
Purple loosestrife	<i>Lythrum salicaria</i>

JAPANESE BARBERRY (*BERBERIS THUNBERGII*)

Japanese barberry is a shrub that can grow 2 to 4.5 ft. (0.6-1.3 m) tall. It was first introduced as an ornamental plant when seeds from Russia were planted in the Arnold Arboretum in Boston, MA in 1875. The species now covers much of New England and Midwest states and occurs in a broad range of habitats. Japanese barberry can be identified by long woody grooved stems with small, smooth-edged, and oval leaves growing in clusters of two to six. At each cluster node is a single spine, a defining feature from the European variety. The leaves range in color from green to bluish-green, to dark red. In late spring the plant has pale yellow flower clusters that transition to bright red oblong berries in late summer through the winter. Japanese barberry seeds spread by small mammals and birds that eat the red fruit. This shrub is found throughout Fort Foster Park, most commonly as individual plants and occasionally in dense thickets.



ORIENTAL/ASIATIC BITTERSWEET (*CELASTRUS ORBICULATUS*)



Oriental bittersweet was introduced as an ornamental from China around 1860. It is a deciduous, climbing woody vine that can grow to lengths of 60 ft. (18.3 m). The alternate, elliptical leaves are light green in color and 2 to 5 in. (5-13 cm) long. Small flowers develop in the spring. Fruits are round and green when young, ripen to yellow in the fall, and split to reveal showy, scarlet berries that persist into winter. Some shade tolerance allows it to also grow in open forests, encircle trees, and girdle them. Vines can completely cover other vegetation, shade, out-compete, and kill even large trees. Bittersweet berries and their seeds can be dispersed widely and quickly via birds. Bittersweet is found throughout Fort Foster Park, and in places where it entangles trees, it poses a significant risk to larger tree species.

BLACK SWALLOWWORT (*CYNANCHUM LOUISEAE*)

Black swallowwort was introduced intentionally as an ornamental plant from Southern Europe in the 1850's. It is a vine that can form extensive patches that suffocate native plants. Opposite leaves grow to approximately 3 to 4 in. (7.6-10 cm) in length. Clusters of small dark purple star flowers emerge in June and give way to oblong seed pods in late summer. Seed pods can be green to brown depending on their developmental stage, and the number of pods is directly dependent on the amount of light the plant receives. One of the reasons black swallowwort is such an effective invader is because it is polyembryonic, which means that a single seed can contain multiple embryos and produce multiple seedlings (Michigan Department of Natural Resources, 2012). A square meter patch of black swallowwort is capable of producing 1, 000 to 2,000 seeds per year, which could give rise to double or triple the number of seedlings (Cornell University Cooperative Extension, 2019). Black swallowwort is not fully established in Fort Foster Park, but it is gaining ground in sunny, early successional areas.



MORROW'S HONEYSUCKLE (*LONICERA MORROWII*)

Morrow's honeysuckle is a native of eastern Asia and was first introduced into North America in the late 1800s. It has been planted widely as an ornamental and for wildlife food and cover. It is a multi-stemmed, upright, deciduous shrub that grows up to 7 ft. (2.1 m) tall. The leaves are opposite, round, and hairy underneath. Honeysuckle is often one of the first shrubs to leaf out in the spring. The fragrant flowers are tubular, white to cream-colored, and develop in mid- spring. Abundant berries ripen to orange or red in color and often persist throughout winter. The bark is light brown and often pubescent on young stems. Several species of exotic bush honeysuckles occur, and distinguishing individual species can be difficult. Morrow's honeysuckle readily invades open woodlands, old fields, and other disturbed sites. It can spread rapidly due to birds and mammals dispersing the seeds and can form a dense understory thicket which can restrict native plant growth and tree seedling establishment. Morrow's honeysuckle is present throughout Fort Foster Park. It also provides protective habitat and possible food for the endangered New England cottontail.



Illinoiswildflowers.org

GLOSSY FALSE BUCKTHORN (*RHAMNUS FRAGULA*)

Glossy false buckthorn (or glossy buckthorn) is native to Europe and was first introduced into the United States in the mid-1800s as an ornamental. It is a large shrub or small tree that can grow to heights of 30 ft. (9.1 m). The dark green leaves are shiny and alternate (sometimes opposite) with distinctly prominent venation. The flowers are inconspicuous, pale yellow in color, and occur in clusters in the leaf axis. In the fall, fleshy fruits ripen to a dark purple color. Glossy buckthorn bark is gray to brown with white lenticels. It invades moist woodlands and disturbed areas throughout the Northeast and Midwest. Its rapid growth and prolific seed production make these plants an aggressive invader that can form dense thickets which shade and displace native understory plants, shrubs, and tree seedlings. Glossy buckthorn can be found throughout upland habitats in Fort Foster Park.



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MULTIFLORA ROSE (*ROSA MULTIFLORA*)



The U.S. Soil Conservation Service promoted the use of multiflora rose in the early 1900’s for erosion control and wildlife habitat. It grows as a perennial, thorny bush made of hardy stems that can be about 10 to 15 ft. (3-4.5 m) tall. Leaves are sharply toothed, alternate, and arranged in leaflets of five to eleven. The base of each leaf has distinctive fringed stipules. The plant grows clusters of white or pink flowers in June that last through July before forming red rosehips in the fall. In Fort Foster, multiflora rose is most common along road, trails, and early successional areas with ample sunlight.

Multiflora rose (*Rosa multiflora*) and rugosa rose (*Rosa rugosa*) are separate species in the rose family (*Rosaceae*). Other common names for rugosa rose include salt spray rose, dune rose, and beach rose. Planting of rugosa rose along the shore at Fort Foster Park was required under the FEMA grant for shoreline restoration. The Town of Kittery negotiated half of the planting be native sea grass in addition to the rugosa rose. This plan does not address the removal of rugosa rose; the issue will be reevaluated under a different project once the FEMA restoration project is complete.



PURPLE LOOSESTRIFE (*LYTHRUM SALICARIA*)

Purple loosestrife is native throughout Europe, Russia, and Asia. It was introduced to the northeastern U.S. and Canada for ornamental and medicinal reasons and is still sold in many garden stores. It is recognized by cone shaped purple flowers that bloom during the summer and persist until fall. Purple loosestrife can grow up to 10 ft. tall but usually growth maxes out around 4 ft. The stems are four-sided, woody, and have opposite or whorled leaves that are lance shaped. Mature plants can have 30 to 50 stalks rising from the same root system. Purple loosestrife is most likely found outcompeting native grasses and wetland species in low lying areas. Purple loosestrife was found in some wetlands in Fort Foster Park, but the extent of its invasion is somewhat unknown due to difficult access in its dense, wet habitat.



COMMON REED (*PHRAGMITES AUSTRALIS*)

Common reed is a perennial grass that can grow to be 15 ft. in height. This introduced species established itself along the Atlantic coast after arriving through ballast water from European ships in the late 18th century. It grows in wetland conditions and quickly alters the hydrology of the area by shading out native species with its long, thin leaves. Stands of common reed are made up of both live and dead stems from the past years growth that quickly crowd native species. The grass flowers in late summer and are purple to golden in color. As the seeds mature in the early fall, the ends of the stalks take on a furry cone appearance that turn gray as the season passes. Common reed creeps along the banks of rivers and wetlands and spreads very easily through water systems. Fortunately, common reed occurs in two, isolated populations in Fort Foster Park making complete eradication possible.



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INVASIVE MANAGEMENT PLAN

PREVIOUS INVASIVE MANAGEMENT EFFORTS

Volunteer work on the property has reduced the vigor of some invasive populations within Fort Foster. Specifically, the cutting of glossy buckthorn stems has proved very effective and has reduced the plant's presence in many areas of the park. Since FBE's initial survey in August 2018, invasive density has been reduced in several areas, and these reductions are displayed in an updated invasive map (Map 3). Areas that have seen a reduction in invasives due to volunteer hand removal efforts are Area 5, Area 9, and Area 12. Site walks in summer 2019 revealed that black swallowwort population has grown since FBE's initial summer 2018 invasive plant survey. However, we recommend prioritizing black swallowwort control as the species is yet to expand throughout the park, so the population can be effectively suppressed.

INVASIVE CONTROL METHODS

There is no single action, whether it is mechanical, biological, or physical, that can provide optimal control of multiple invasive species in the moderate to high densities located within Fort Foster Park. Any management plan that attempts to address the control of invasive species will have to rely on a multi-faceted approach that will protect the safety of park visitors and secure the long-term commitment of partners and stakeholders. While some populations of invasive species are isolated, such as common reed, purple loosestrife, and black swallowwort, others such as bittersweet, buckthorn, and honeysuckle exist as dense thickets, leaving little room for native plants to occupy these areas. Control methods that combine mechanical, manual, and chemical treatments are timed to be most effective. The repetition that a multi-year commitment provides will allow native plants the opportunity to once again thrive within The Park.

An Integrated Vegetation Management (IVM) approach should be implemented to provide the most effective, long-term control strategy. This includes minimizing impacts to non-target species through a series of techniques that allow native plant communities to increase while suppressing invasive plant species. Techniques to be

implemented include hand cutting, pulling, and mowing as well as selective herbicide treatments such as cut stump and low-volume foliar herbicide applications applied by a licensed commercial applicator. More detail regarding treatment methods is below.

MECHANICAL/MANUAL TREATMENT METHODS

- Pull: Manually pulling entire plant, including roots. Volunteers can be organized annually to uproot seedlings from infested areas.
- Cut-Stem: Cutting stems with hand or power tools can be used alone or in combination with application of systemic herbicide. Herbicide kills the plant and prevents resprouting.
- Mowing: Utilizing brush mowers and large mechanical machines (e.g. hydro ax, brontosaurus brush mower, skid steer).

In this plan, we refer to **Mechanical Treatment** as any pulling, cutting, or mowing that will occur with power tools and will require hiring a professional. **Manual cutting** refers to the action of cutting or pulling that could be done safely by a volunteer by hand or with loppers.

BIOLOGICAL CONTROL METHODS

- Insect Pest Introduction: Insects, usually from the native range of an invasive species, that are known pests to the invasive species of concern, are released into the local environmental.

CHEMICAL TREATMENT METHODS

- Low-Volume Foliar Backpack: Licensed pesticide applicators walk established transects over the entire area spraying herbicide on the foliage of invasive plants (Table 2). The herbicide mixture will include an anti-drift agent to keep spray directed on target species and to enhance sensitivity.
- Cut-Surface Treatment: This method involves applying herbicide to freshly cut surfaces of invasives (i.e., cut stumps and branches). Licensed applicators typically use this method to effectively treat target species in wetlands. The method is also used when in close in proximity to native species to avoid overspray.
- Basal Bark Treatment: Basal treatment is herbicide mixed with oil that is applied to the lower 15 inches of a tree trunk or brush stem down to the ground. This method is especially effective to minimize disturbance and control resprouting when treating species such as buckthorn. Licensed applicators use the basal application method to selectively treat individual woody plants.

Table 2. List of commonly used herbicides currently registered in the state of Maine.

Chemical Name	Examples of Brand Names	Target Use	Target Species
Triclopyr	Garlon3A®; Habitat®; Garlon 4®	Cut surface and/or basal bark treatment; foliar spray; Broad-leaf selective.	Bittersweet, buckthorn, barberry, multiflora rose, honeysuckle
Glyphosate	Roundup®	Cut surface and/or basal bark treatment; foliar spray. Non-selective.	Barberry, honeysuckle, buckthorn
Glyphosate (aquatic formulation)	Rodeo®; Aquamaster®; Accord®	Cut surface; application near or in open water. Non-selective.	Honeysuckle, barberry, purple loosestrife, buckthorn, common reed
Imazapyr	Habitat®; Arsenal®	Foliar, cut surface. Non-selective. Habitat® labeled for aquatic applications.	Common reed

IDENTIFYING INVASIVE PLANT MANAGEMENT PRIORITIES

Management priorities are set with the goal of achieving the greatest benefit while minimizing the total, long-term workload and project costs. It is difficult to clearly define, rank, or prioritize where invasive plant control methods should begin, as the ranking is often subjective. Rather than prioritizing areas strictly based on infestation load or probability of eradication, this management plan takes a multifaceted and staggered approach that supports sustainable, community-driven management actions. The approach is neither strictly by area or by species but by feasibility and efficiency. The following descriptions detail objectives outlined in the May 2019 stakeholder meeting.



Flowering black swallowwort at Fort Foster. Photo Credit: FBE.

OBJECTIVE 1: CONTROL SMALL, NOT FULLY ESTABLISHED POPULATIONS

The first priority identified by stakeholders is to control the invasive populations that are yet to be fully established or widespread across the park. This consist of black swallowwort and common reed; an early detection and rapid response approach will hopefully contain and eradicate or minimize the populations before they spread across the park.

FBE observed black swallowwort during the August 2018 visit in small pockets along the seaside trail (See Map 3, Area 8). Subsequent visits in 2019 revealed more black swallowwort than initially noted, as it is now present along the pavilion (Map 3, Area 8) and along the trails in Area 4.

Controlling Fort Foster Park's black swallowwort population is a multi-year effort that will require a variety of tactics. Collecting pods in the late summer prior to dispersal can be an effective method for preventing the previous year's established plants from dispersing thousands of seeds into the Fort Foster Park seedbank (Table 3). This method is relatively cheap and could easily be carried out by a group of volunteers. Volunteers would collect seed pods and place them in plastic bags. It is critical that seed pods are properly disposed of, preferably burned or bagged and disposed of in a municipal landfill.

Chemical treatment will provide an excellent complement to hand removal in controlling the black swallowwort population and should be applied in a two-step process (Table 3). In the spring, triclopyr can be applied during bolting, which typically occurs around June. Flagging of individuals should also occur in the spring, so they are easier to find during follow up chemical application in the fall. In the following September, glyphosate should be applied. Note that rapid regrowth should be expected in following summers until the seedbank is exhausted. Follow-up applications of glyphosate should occur in the fall of the following year. After the second year, managers will need to evaluate the need for future chemical treatment on an annual basis.

Black swallowwort is also present within the New England cottontail habitat (Map 3, Areas 4 and 8). If a licensed, experienced herbicide applicator takes care to target only black swallowwort, the shrubs that provide cottontail habitat and food should be largely unaffected.

Common reed is present in a small patch on the southeastern corner of Area 20 wetland and another small patch along the border of Area 17 and Area 15. Both populations are very small, and we should expect complete eradication. Because both populations are in a wetland, chemical treatment will require a permit from the State of Maine Department of Environmental Protection and the Maine Board of Pesticides Control (See State and Local Permitting section below). The most effective technique to suppress common reed is a combination of manual and chemical treatment that should occur in the early fall in dry conditions. Approximately five to ten stems should be tied or taped together (masking tape works well) approximately three feet from the ground and cut. Cuttings need to be removed from common reed habitat (shoreline and wetlands) but can be safely composted in upland areas, burned, or brought to a landfill. After cutting, aquatic formulated glyphosate can be applied to the cut surface. This protocol needs to be repeated for multiple years (minimum of three) for effective eradication. If permitted, a small, controlled burn in the spring can promote native plant regeneration.

Table 3. Cost and impact analysis for targeting each species in Objective 1.

Species	Method	Timing	Impact	Cost	Expertise
Black Swallowwort	Pick seed pods	Late summer	Medium Impact	Low Cost	Volunteers
	Chemical treatment	Late spring / Early fall	High Impact	Medium Cost	Certified Applicator
Common Reed	Manual cutting	Early fall	High Impact	Low Cost	Volunteers
	Chemical treatment	Early fall	High Impact	Medium Cost	Certified Aquatic Applicator

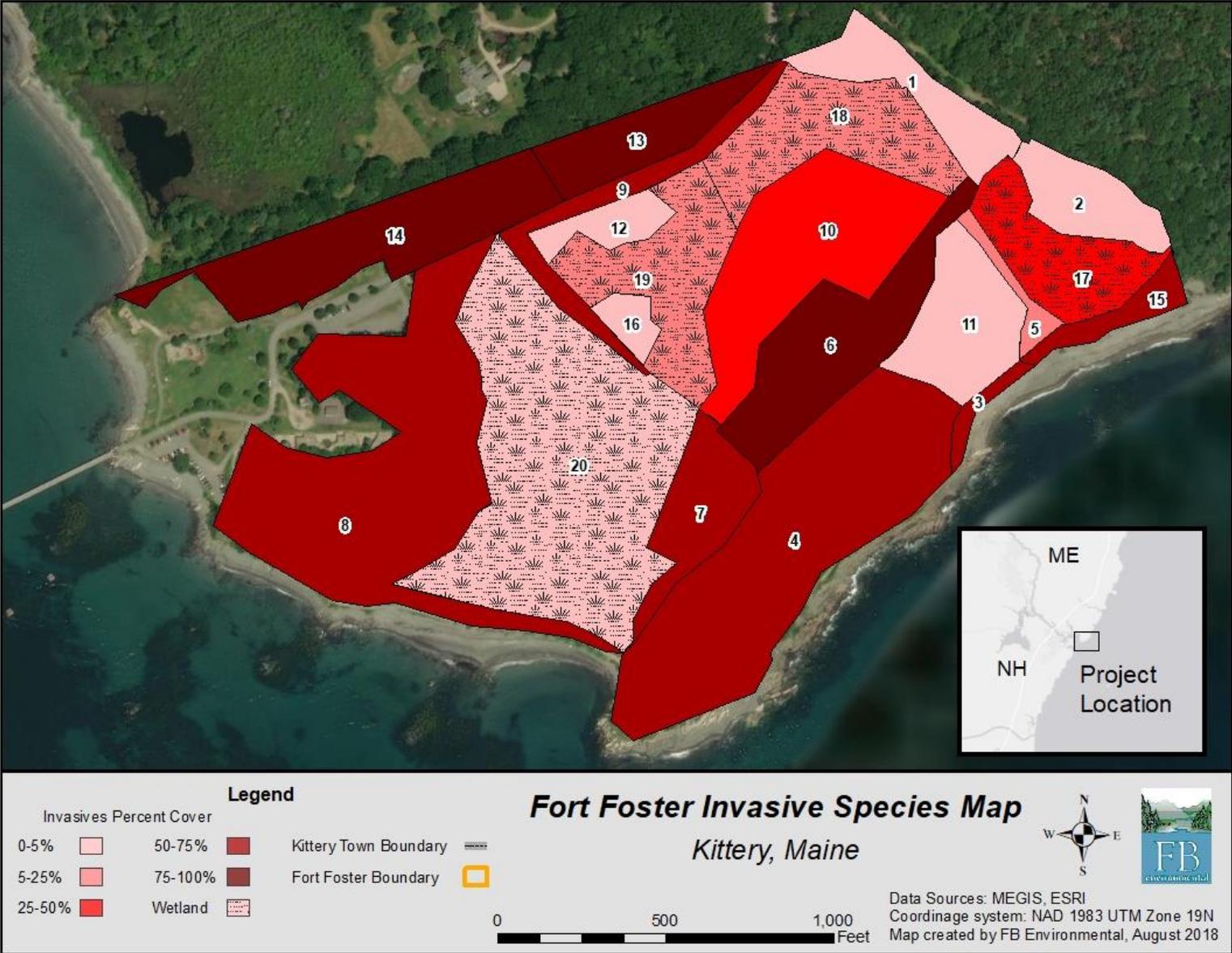
OBJECTIVE 2: AREA BY AREA APPROACH BASED ON COST AND IMPACT

At the May 2019 stakeholder meeting, the group decided the second priority would be to take an area by area approach to combating invasives. This is an effective approach because the organization of the property by area characteristics allows managers to be most effective when coordinating mechanical, chemical, and volunteer-driven removal. For example, if mechanical equipment is rented, it could be rented for one week to tackle all areas within the park that require mechanical equipment, instead of more expensive daily rentals over a longer period. Area by area management plans also allow land managers to create a prioritization scheme that can be rolled out over time based on resources and funding available at the time. Within each area, we provided species-specific management techniques when necessary.

During the May 2019 stakeholder meeting, the group was unable to rank which areas to pursue first because the method of removal for each area was then unknown. In June 2019, Dave Rich and Amanda Gavin conducted a site walk with Jeff Taylor of Taylor’s Invasive Plant Control, where Jeff determined the management techniques necessary and subsequent impact and cost for each mapped Area in the park (see Map 3).



Photo Credit: Gary Mitchell.



Map 3. Fort Foster Invasive Species Map updated from the August 2018 FBE Invasive Plant Survey.

In this section, the invasive management techniques deemed most suitable for each area are presented and assigned a cost and impact rating. The areas are ranked by invasive plant density from greatest to least. This approach will provide the stakeholder group with the information necessary to decide which areas to tackle first as funds and resources become available. Each area corresponds to a polygon number in Map 3.

AREA 14: Glossy buckthorn, Morrow’s honeysuckle, Japanese barberry, Oriental bittersweet

Area 14 is a the most heavily infested area of Fort Foster Park. FBE recommends starting work on this parcel in the early part of the invasive management process. This is a high-traffic area, so beginning management here will introduce Fort Foster Park users to the invasive plant management project that will be occurring during the following years. If executed properly, this area should show dramatic improvement after one year of treatment, which hopefully will inspire the community to be supportive and involved in Fort Foster Park’s invasives removal project. Given this parcels’ central location to the entrance, parking, and beach, it would be a prime candidate for an informative and educational kiosk regarding the project.

Area 14 is the only area in Fort Foster Park that requires extensive mechanical mowing for invasive plant removal (Table 4). The use of machinery to pull down the extensive bittersweet vines and penetrate through dense honeysuckle shrubs will be necessary to provide access to the area herbicide application. FBE recommends that an expert botanist be on site to direct machine operator(s) to invasive plants that need to be removed. At the very least, invasive plants should be flagged, or spray painted to indicate individuals appropriate for removal. Stems that are five inches or smaller can be hand cut. There are two options for chemical treatment after mechanical removal: 1) Glyphosate can be applied immediately following mechanical treatment, and 2) Triclopyr can be applied as a basal application up to several weeks after mechanical treatment. The type and timing of chemical removal will depend on the resources available during the day of machine removal.

The area should be treated again after one full growing season has passed. This allows time for the sunlight to stimulate the seed bed and for early-successional native plants to regenerate. In following years, we recommend semi-annual monitoring in the spring and fall and maintenance using manual cuttings, basal stem treatments, and low volume, target foliar applications as needed. If this area is selected for a native planting project, fast-growing, early successional species should be used. Potential suitable species include raspberry (*Rubus sp.*), viburnum (*Viburnum sp.*), and winterberry (*Ilex sp.*) species.

Table 4. Cost and impact analysis for targeting each species in Area 14.

Species	Method	Timing	Impact	Cost	Expertise
Buckthorn	Manual cutting	Fall	Medium Impact	Low Cost	Volunteers
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator
Honeysuckle	Mechanical cutting	Fall	High Impact	High Cost	Certified Applicator
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator
Barberry	Mechanical cutting	Fall	High Impact	High Cost	Certified Applicator
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator
Bittersweet	Mechanical cutting	Fall	High Impact	High Cost	Certified Applicator
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator

AREA 6: Glossy buckthorn, Japanese barberry

Area 6 is a heavily infested area, but due to the lack of vines and honeysuckle shrubs, it does not require mechanical treatment. FBE recommends manual cutting followed by targeted herbicide application using the cut-surface or basal bark treatment (Table 5). After waiting one growing season for the seed bank to regenerate, a selective low-volume foliar application should be applied in the spring at leaf-out. Spring treatment can be followed by another cutting and targeted application such as cut-surface or basal bark treatment in the fall.

Table 5. Cost and impact analysis for targeting each species in Area 6.

Species	Method	Timing	Impact	Cost	Expertise
Buckthorn	Manual cutting	Fall	Medium Impact	Low Cost	Volunteers
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator
Barberry	Manual cutting	Fall	Medium Impact	Low Cost	Volunteers
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator

AREA 8: Glossy buckthorn, Morrow’s honeysuckle, Japanese barberry, Oriental bittersweet, Black swallowwort, Multiflora rose

Area 8 encompasses a variety of trails, public use areas, shoreline, and New England cottontail habitat. Because this Area includes both cottontail habitat and black swallowwort, we recommend beginning with the swallowwort management that is outlined in Objective 1. Beyond the methods outlined in Objective 1, extreme caution should be taken with this area. The process of managing and replacing invasives should be very slow and targeted. We recommend removing and replacing only one or two invasive shrub patches per year. When shrubs that may provide New England cottontail habitat are targeted for removal, FBE recommends hand cutting in the fall, followed by a basal bark application (Table 6). Invasive shrubs that leaf out earlier than native species in the spring should be targeted with a low volume foliar application. Given the proximity to parking, picnic areas, and the entrance, this area is also a prime candidate for a revegetation and a community education project. As shrubs are removed, native shrubs that provide cottontail habitat and food can be replaced. Legumes and raspberry species are known to provide quality food sources and thick cover. Also, Area 8 has a steeper slope and more artillery batteries than the other sites, so managing for erosion is critical. Erosion control mulch can be applied to slopes if treatment creates bare spots.

Due to the sensitive nature of cottontail habitat, we don’t recommend mechanical mowing all invasive shrubs present, but some mechanical mowing may be necessary for established bittersweet and multiflora rose. Because this is a sensitive area, we recommend targeted mowing once the ground is frozen to minimize soil disturbance.

Table 6. Cost and impact analysis for targeting each species in Area 8. Note that black swallowwort is included under Objective 1.

Species	Method	Timing	Impact	Cost	Expertise
Buckthorn	Manual cutting	Fall	Medium Impact	Low Cost	Volunteers
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator
Honeysuckle	Manual cutting	Fall	Medium Impact	Low Cost	Volunteers
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator
Barberry	Manual cutting	Fall	Medium Impact	Low Cost	Volunteers
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator
Bittersweet	Mechanical cutting	Fall	High Impact	High Cost	Certified Applicator
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator
Multiflora rose	Mechanical cutting	Fall	High Impact	High Cost	Certified Applicator
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator

AREA 4: Glossy buckthorn, Morrow’s honeysuckle, Japanese barberry, Oriental bittersweet, Black swallowwort, Multiflora rose

Area 4 encompasses a variety of trails, public use areas, shoreline, and cottontail habitat. Because Area 4 includes both cottontail habitat and black swallowwort, FBE recommends beginning with the swallowwort management that is outlined in Objective 1. Given the similarities between Area 4 and Area 8, the same treatment plan (Table 6) can be implemented, with the exception of managing the shoreline of Area 4.

Given the proximity to surface waters in Area 4 the cut surface treatment using glyphosate. Mechanical devices such as Weed Wrenches could be employed to limit disturbance from larger machines, or a small skid steer could be utilized without creating significant impacts. Beach rose (*Rosa rugosa*) is currently being planted in this section as a shoreline buffer by The Federal Emergency Management Agency (FEMA), so revegetation efforts along the shoreline in Area 4 could involve planting *rugosa* rose in spots where honeysuckle is removed.



Morrow’s honeysuckle in fruit on a cobble beach in Area 4. Photo Credit: FBE.

AREAS 18 AND 19: Glossy buckthorn, Purple loosestrife

Areas 18 and 19 are freshwater wetlands found in the interior of Fort Foster Park. These sites have dense vegetation and are very wet, so assessing invasive plant load was difficult. A few purple loosestrifes were found in small densities in Area 18 in Fort Foster Park. Due to the sensitive nature of wetlands and difficulty finding purple loosestrife outside of its flowering time, utilizing a biological control would be preferable (Table 8).

Biological control for purple loosestrife is achieved using the *Galerucella californiensis* beetle. Releases are typically of pupae and adult beetles. The larger the numbers released, the better the chance for establishment. A minimum of 2,000 to 3,000 beetles per area are recommended. Releases in three successive years will improve the chance for establishment (Kenning, 2011).

Given the wet and sensitive nature of these areas, primary exclusion and prevention management techniques should be implemented. By managing the perimeter of the wetland and surrounding areas, dispersal of invasive plants into the wetland is less likely. Additionally, woody invasives could be hand cut by volunteers in the winter, as frozen ground and lack of dense leaves make the wetland more accessible and less susceptible to disturbance. If winter hand cutting is deployed, follow-up treatments should reoccur annually during winter.

Table 7. Cost and impact analysis for targeting each species in Areas 18 and 19.

Species	Method	Timing	Impact	Cost	Expertise
Buckthorn	Manual cutting	Winter	Medium Impact	Low Cost	Volunteers
Purple loosestrife	Biological treatment	Spring	High Impact	Medium Cost	Volunteers

AREA 13: Glossy buckthorn, Morrow’s honeysuckle, Japanese barberry

Area 13 is a narrow area near the entrance of the park with a moderate invasive load. FBE recommends targeting invasive woody shrubs such as buckthorn, honeysuckle, and barberry with hand cutting and basal bark treatment in the fall and following up with a low volume foliar spray after leaf out in the spring (Table 8).

Table 8. Cost and impact analysis for targeting each species in Area 13.

Species	Method	Timing	Impact	Cost	Expertise
Buckthorn	Manual cutting	Fall	Medium Impact	Low Cost	Volunteers
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator
Honeysuckle	Manual cutting	Fall	High Impact	Medium Cost	Volunteers
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator
Barberry	Manual cutting	Fall	Medium Impact	Low Cost	Volunteers
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator

AREA 17: Glossy buckthorn, Common reed

Area 17 is a wetland in the park that likely experiences saltwater intrusion due to proximity to the shore and has a moderate invasive plant load. See description in Objective 1 for targeting the common reed along the southeastern edge of Area 17. First time application of common reed is rarely 100% effective, so three to five years of follow up treatment should be expected. Given the density of glossy buckthorn throughout this wetland, FBE recommends hand cutting or using a small motorized cutting tool in the winter when frozen ground increases accessibility and minimizes disturbance (Table 9). Additionally, we recommend using exclusion and prevention management techniques here. By managing the perimeter of the wetland and surrounding areas, dispersal of invasive plants into the wetland is less likely.

Table 9. Cost and impact analysis for targeting each species in Area 13.

Species	Method	Timing	Impact	Cost	Expertise
Buckthorn	Manual cutting	Winter	Medium Impact	Low Cost	Volunteers

AREAS 3 AND 15: Morrow’s honeysuckle

Given the proximity to surface waters and sensitivity to disturbance, hand cutting of Morrow’s honeysuckle should be implemented in these areas although limited mechanical mowing may be necessary for larger shrubs. Mechanical means such as Weed Wrenches could be employed to limit disturbance from larger machines, or a small skid steer could be utilized without creating significant impacts. After cutting, we recommend cut-stem glyphosate treatment in the fall and a following up with low volume foliar spray after leaf out in the spring. Rugosa rose is currently being planted in this section as a shoreline buffer by FEMA, so removed honeysuckle could be replaced with additional rugosa rose.

Table 10. Cost and impact analysis for targeting each species in Areas 3 and 15.

Species	Method	Timing	Impact	Cost	Expertise
Honeysuckle	Manual/Mechanical cutting	Fall	Medium/High Impact	Low/ High Cost	Volunteers/Certified Applicator
	Chemical treatment	Fall/spring	High Impact	Medium Cost	Certified Applicator

OBJECTIVE 3: PREVENTION

Substantial work has already been done by volunteers to reduce invasive plant load in Areas 1, 2, 5, 7, 9, 10, 11, 12, and 16. FBE recommends semi-annual invasive monitoring in the spring and fall to ensure early detection and rapid response of any new invasive populations. In these areas, volunteers can continue to maintain invasive plant cuttings by hand, but the density of invasive plants does not require chemical treatments.

DISPOSAL OF INVASIVE PLANT SPECIES

Proper disposal of invasive plant material is critical to the invasive control process, as left-over material can often cause new infestations or re-infest the existing project area. Japanese barberry, glossy buckthorn, Morrow’s honeysuckle, and multiflora rose can be disposed of by stacking brush in piles and chipping or burning. Common reed seed heads are easily dispersed by wind, so it is necessary to dry the seed heads out in the sun before composting or mulching in upland areas. Both black swallowwort pods and Oriental bittersweet need to be taken off the site in bags and disposed of or burned. If controlled by beetles, purple loosestrife does not require disposal.

STATE AND LOCAL PERMITTING

As this project involves removal of invasives within and surrounding protected resources (e.g., all coastal wetlands are classified as wetlands of special significance), a permit approved by Maine Department of Environmental Protection (MEDEP) will be required under Maine’s Natural Resource Protection Act. Section 12 of the Permit by Rule standards allows for “Restoration of Natural Areas” which includes removal of invasive plant species. Prior to the initiation of on-the-ground activities, a completed permit-by-rule form and associated maps and documents must be submitted to MEDEP. Upon receipt of a complete permit-by-rule form with necessary attachments, MEDEP has a 14-day review period after which activities may proceed. If the application is found to be deficient, or MEDEP follows up with questions, the preparer will be notified within the 14-day review period. Granted permits are valid for two years.

State law requires that herbicide application not take place within 25 ft. of a wetland, though in some circumstances limited herbicide application within or near wetlands is warranted. Licensed pesticide applicators (e.g., Vegetation Control Services (VCS), Taylor’s Invasive Plant Control) can acquire a variance from the Maine Board of Pesticides Control to carefully apply herbicide within wetland boundaries, and to use motorized equipment.

In some cases, individual municipalities may have additional regulations in their local code regarding invasive species removal or pesticide application.

The Town of Kittery has taken on the responsibility of acquiring all necessary permits for activities associated with invasives management. A possible exception is that any hired licensed pesticide applicator will need to acquire a permit to apply herbicide within and near wetlands.

MONITORING

Monitoring plays an important role in managing invasive plants, as it provides information on where management actions are meeting objectives, detects actions that are ineffective, and signal early detection warnings for new populations. As mentioned in the introduction, this plan is meant to be living document and will be most effective if it is revised in an iterative fashion to reflect the dynamic nature of invasive species. We recommend that Fort Foster Park institute a semi-annual monitoring plan to track the changes in invasive species populations throughout the management process.

COST

Costs associated with invasive plant management can vary greatly. Access, level of infestation, species present, safety of park visitors, presence of threatened or endangered habitat, and long-term control strategies will all affect cost. During the 2019 site walk with Jeff Taylor of Taylor’s Invasive Plant Control, Jeff provided cost estimates for the invasive management proposed at Fort Foster Park. Often, the most expensive aspect of invasive plant removal is mechanical removal. As discussed during the 2019 site visit with Dave Rich and Jeff Taylor, the Town of Kittery can reduce costs by renting the appropriate machinery and having qualified town staff operate. It is most economical to rent the needed equipment for a longer time period and tackle all the mechanical removal, instead of removing smaller areas at a time using daily rentals.

Hiring a certified professional for chemical treatment, based on current hourly rates, can cost between \$1,000 to \$2,000 per day. The amount of treatment that can occur in one day varies greatly based on the severity of invasives and type of chemical treatment selected. A certified professional can treat between a half acre and six acres per day. For example, hiring a certified professional to apply chemical treatment to Area 14 after the mechanical

removal process would take approximately one to two days. However, for areas with lower invasive density, a certified professional could cover multiple areas within a day.

PROPOSED TIMELINE

The following list and accompanied Gantt chart outlines a proposed timeline for the Fort Foster Invasive Management Plan over the next six years.

Fall -Year 1

Area 14, pg. 15

- Volunteers begin manual cutting of buckthorn.
- Certified applicator uses mechanical removal for honeysuckle, barberry, buckthorn, and bittersweet, and follows up with a chemical treatment.

Area 6, pg. 16

- Volunteers begin manual cutting of buckthorn and barberry.
- Certified applicator follows up manual cutting with targeted herbicide application.

Winter – Year 1

Area 17, pg. 19

- Volunteers begin manual winter cutting of buckthorn.

Spring – Year 1

Black swallowwort (Areas 8 and 4), pg. 12 – 13

- Certified applicator uses chemical treatment on black swallowwort.

Prevention (Areas 1,2,5,7,9,10,11,12), pg. 19

- Monitoring to ensure early detection and rapid response. Hand cutting by volunteers as time permits.

Summer – Year 1

Black swallowwort (Areas 8 and 4), pg. 12 – 13

- Volunteers pick seed pods.

Fall – Year 2

Black swallowwort (Areas 8 and 4), pg. 12 – 13

- Certified applicator uses chemical treatment on black swallowwort.

Common reed (Areas 17 and 5) pg. 12 – 13

- Volunteers begin manual cutting of common reed.
- Certified applicator begins chemical treatment of common reed.

Areas 3 and 15, pg. 19

- Volunteers begin hand cutting of honeysuckle, supplementing with mechanical cutting by a certified applicator as necessary.
- Certified applicator begins chemical treatment of honeysuckle.

Prevention (Areas 1,2,5,7,9,10,11,12), pg. 19

- Monitoring to ensure early detection and rapid response. Hand cutting by volunteers as time permits.

Winter – Year 2

Areas 18 and 19, pg. 18

- Volunteers begin manual winter cutting of buckthorn.

Area 17, pg. 19

- Volunteers follow up with more manual cutting of buckthorn.

Spring -Year 2

Area 14, pg. 15

- Certified applicator does follow up chemical treatment on honeysuckle, barberry, bittersweet, and buckthorn.

Area 6, pg. 16

- Certified applicator does follow up chemical treatment on buckthorn and barberry.

Areas 3 and 15, pg. 19

- Certified applicator does follow up chemical treatment on honeysuckle.

Prevention (Areas 1,2,5,7,9,10,11,12), pg. 19

- Monitoring to ensure early detection and rapid response. Hand cutting by volunteers as time permits.

Summer -Year 2

Black swallowwort (Areas 8 and 4), pg. 12 – 13

- Volunteers pick seed pods.

Fall -Year 3

Black swallowwort (Areas 8 and 4), pg. 12 – 13

- Certified applicator does follow up chemical treatment on black swallowwort.

Common reed (Areas 17 and 5) pg. 12 – 13

- Volunteers manually cut common reed regrowth.
- Certified applicator does follow up chemical treatment of common reed.

Area 14, pg. 15

- Volunteers follow up with manual cutting of buckthorn.
- Certified applicator follows up with mechanical removal and chemical treatment for honeysuckle, barberry, buckthorn, and bittersweet.

Area 6, pg. 16

- Volunteers follow up with manual cutting of buckthorn and barberry.
- Certified applicator follows up manual cutting with targeted herbicide application.

Area 8, pg. 16

- Volunteers begin manual cutting of buckthorn, honeysuckle, and barberry.
- Certified applicator uses mechanical removal for bittersweet and multiflora rose.
- Certified applicator uses chemical treatment on all invasives cut this season.

Area 13, pg. 18

- Volunteers begin manual cutting of buckthorn, barberry, and honeysuckle.

Prevention (Areas 1,2,5,7,9,10,11,12), pg. 19

- Monitoring to ensure early detection and rapid response. Hand cutting by volunteers as time permits.

Winter -Year 3

Areas 18 and 19, pg. 18

- Volunteers follow up with manual winter cutting of buckthorn.

Area 17, pg. 19

- Volunteers follow up with manual winter cutting of buckthorn.

Spring -Year 3

Area 14, pg. 15

- Certified applicator does follow up chemical treatment on honeysuckle, barberry, bittersweet, and buckthorn.

Area 6, pg. 16

- Certified applicator does follow up chemical treatment on buckthorn and barberry.

Area 8, pg. 16

- Volunteers follow up with manual cutting of buckthorn, barberry, and honeysuckle.
- Certified applicator uses chemical treatment on all invasives cut this season.

Areas 18 and 19, pg. 17

- Volunteers release *Galerucella californiensis* beetle for Purple loosestrife control.

Area 13, pg. 18

- Certified applicator does follow up treatment on buckthorn, honeysuckle, and barberry.

Prevention (Areas 1,2,5,7,9,10,11,12), pg. 19

- Monitoring to ensure early detection and rapid response. Hand cutting by volunteers as time permits.

Summer – Year 3

Black swallowwort (Areas 8 and 4), pg. 12 – 13

- Volunteers pick seed pods.

Fall – Year 4

Black swallowwort (Areas 8 and 4), pg. 12 – 13

- Certified applicator does follow up chemical treatment on black swallowwort.

Common reed (Areas 17 and 5) pg. 12 – 13

- Volunteers manually cut common reed regrowth.
- Certified applicator does follow up chemical treatment of common reed.

Area 14, pg. 15

- Volunteers follow up with manual cutting of all invasives.
- Certified applicator follows up with chemical treatment as needed.

Area 6, pg. 16

- Volunteers follow up on manual cutting of buckthorn and barberry.
- Certified applicator follows up with chemical treatment as needed.

Area 8, pg. 16

- Volunteers follow up with manual cutting of buckthorn, barberry, and honeysuckle.
- Certified applicator uses mechanical removal for bittersweet and multiflora rose.
- Certified applicator uses chemical treatment on all invasives cut this season.

Area 4, pg. 17

- Volunteers begin manual cutting of buckthorn, honeysuckle, and barberry.
- Certified applicator uses mechanical removal for bittersweet and multiflora rose.
- Certified applicator uses chemical treatment on all invasives cut this season.

Area 13, pg. 18

- Volunteers follow up with manual cutting of buckthorn, honeysuckle, and barberry.

Areas 3 and 15, pg. 19

- Volunteers follow up with hand cutting of honeysuckle, supplementing with mechanical cutting by a certified applicator as necessary.
- Certified applicator uses chemical treatment for honeysuckle.

Prevention (Areas 1,2,5,7,9,10,11,12), pg. 19

- Monitoring to ensure early detection and rapid response. Hand cutting by volunteers as time permits.

Winter – Year 4

Areas 18 and 19, pg. 18

- Volunteers follow up with manual winter cutting of buckthorn.

Area 17, pg. 19

- Volunteers follow up with manual winter cutting of buckthorn.

Spring – Year 4

Area 14, pg. 15

- Certified applicator follows up with chemical treatment as needed.

Area 6, pg. 16

- Certified applicator does follow up chemical treatment on buckthorn and barberry.

Area 8, pg. 16

- Volunteers follow up with manual cutting of buckthorn, barberry, and honeysuckle.
- Certified applicator uses chemical treatment on all invasives cut this season.

Area 4, pg. 17

- Volunteers follow up with manual cutting of buckthorn, honeysuckle, and barberry.
- Certified applicator uses chemical treatment on all invasives cut this season.

Areas 18 and 19, pg. 17

- Volunteers release *Galerucella californiensis* beetle for Purple loosestrife control.

Area 13, pg. 18

- Certified applicator does follow up treatment on buckthorn, honeysuckle, and barberry.

Areas 3 and 15, pg. 19

- Volunteers follow up with hand cutting of honeysuckle.
- Certified applicator follow's up with chemical treatment of honeysuckle, as needed.

Prevention (Areas 1,2,5,7,9,10,11,12), pg. 19

- Monitoring to ensure early detection and rapid response. Hand cutting by volunteers as time permits.

Summer – Year 4

Black swallowwort (Areas 8 and 4), pg. 12 – 13

- Volunteers pick seed pods.

Fall – Year 5

Black swallowwort (Areas 8 and 4), pg. 12 – 13

- Certified applicator does follow up chemical treatment on black swallowwort.

Common reed (Areas 17 and 5) pg. 12 – 13

- Volunteers manually cut common reed regrowth.
- Certified applicator does follow up chemical treatment of common reed.

Area 14, pg. 15

- Volunteers follow up with manual cutting of all invasives.
- Certified applicator follows up with chemical treatment as needed.

Area 6, pg. 16

- Volunteers follow up on manual cutting of buckthorn and barberry.
- Certified applicator follows up with chemical treatment as needed.

Area 8, pg. 16

- Volunteers follow up with manual cutting of buckthorn, barberry, and honeysuckle.
- Certified applicator uses chemical treatment on all invasives cut this season.

Area 4, pg. 17

- Volunteers follow up with manual cutting of buckthorn, honeysuckle, and barberry.
- Certified applicator uses mechanical removal for bittersweet and multiflora rose.
- Certified applicator uses chemical treatment on all invasives cut this season.

Area 13, pg. 18

- Volunteers follow up with manual cutting of buckthorn, honeysuckle, and barberry.

Areas 3 and 15, pg. 19

- Volunteers follow up with hand cutting of honeysuckle.

- Certified applicator follow's up with chemical treatment of honeysuckle, as needed.

Prevention (Areas 1,2,5,7,9,10,11,12), pg. 19

- Monitoring to ensure early detection and rapid response. Hand cutting by volunteers as time permits.

Winter – Year 5

Areas 18 and 19, pg. 18

- Volunteers follow up with manual winter cutting of buckthorn.

Spring – Year 5

Area 8, pg. 16

- Volunteers follow up with manual cutting of buckthorn, barberry, and honeysuckle.
- Certified applicator uses chemical treatment on all invasives cut this season.

Area 4, pg. 17

- Volunteers follow up with manual cutting of buckthorn, honeysuckle, and barberry.
- Certified applicator uses chemical treatment on all invasives cut this season.

Areas 18 and 19, pg. 17

- Volunteers release *Galerucella californiensis* beetle for Purple loosestrife control.

Area 13, pg. 18

- Certified applicator does follow up treatment on buckthorn, honeysuckle, and barberry.

Prevention (Areas 1,2,5,7,9,10,11,12), pg. 19

- Monitoring to ensure early detection and rapid response. Hand cutting by volunteers as time permits.

Summer - Year 5

Black swallowwort (Areas 8 and 4), pg. 12 – 13

- Volunteers pick seed pods.

Fall - Year 6

Black swallowwort (Areas 8 and 4), pg. 12 – 13

- Certified applicator does follow up chemical treatment on black swallowwort.

Common reed (Areas 17 and 5) pg. 12 – 13

- Volunteers manually cut common reed regrowth.
- Certified applicator does follow up chemical treatment of common reed.

Area 8, pg. 16

- Volunteers follow up with manual cutting of buckthorn, barberry, and honeysuckle.
- Certified applicator uses chemical treatment on all invasives cut this season.

Area 4, pg. 17

- Volunteers follow up with manual cutting of buckthorn, honeysuckle, and barberry.
- Certified applicator uses mechanical removal for bittersweet and multiflora rose.
- Certified applicator uses chemical treatment on all invasives cut this season.

Prevention (Areas 1,2,5,7,9,10,11,12), pg. 19

- Monitoring to ensure early detection and rapid response. Hand cutting by volunteers as time permits.

Table 12. A Gantt chart outlines a possible timeline for Fort Foster Invasive Management Plan over the next six years. Each season is given a color, and the darker colors indicate more intensive management, and the lighter colors indicate less intensive, follow-up management practices. F = fall, W = winter, Sp = spring, and Su = summer. The management activities that correspond to each objective are outlined in the management section above.

Year		1				2				3				4				5				6	
Season		F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F	W	Sp	Su	F	
Objective 1	Black swallowwort			Sp	Su	F			Su	F			Su	F			Su	F			Su	F	
	Common reed					F				F				F				F				F	
Objective 2	Area 14	F						Sp		F		Sp		F		Sp		F		Sp		F	
	Area 6	F						Sp		F		Sp		F		Sp		F		Sp		F	
	Area 8									F		Sp		F		Sp		F		Sp		F	
	Area 4									F		Sp		F		Sp		F		Sp		F	
	Areas 18 and 19						W				W	Sp			W	Sp			W	Sp			
	Area 13									F		Sp		F		Sp		F		Sp		F	
	Area 17		W				W				W				W								
	Areas 3 and 15					F		Sp			Sp			F		Sp		F		Sp		F	
Objective 3	Areas 1, 2, 5, 7, 9, 10, 11, 12, and 16			Sp		F		Sp		F		Sp		F		Sp		F		Sp		F	

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