

**INVASIVE PLANT SPECIES MANAGEMENT PLAN**  
**BIDDEFORD POOL LAND TRUST PROPERTIES**  
**BIDDEFORD POOL, MAINE**



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## Table of Contents

<b>1. Introduction</b> .....	<b>1</b>
Goals and objectives .....	1
Definitions.....	1
Threats posed by invasive species .....	1
Common invasives in Biddeford Pool .....	3
<b>2. Management Techniques</b> .....	<b>4</b>
Physical removal .....	4
Carbohydrate starvation.....	4
Chemical control (systemic poisoning via herbicide application) .....	4
<b>3. Existing conditions</b> .....	<b>5</b>
First Street site.....	5
Ocean Avenue site .....	5
South Point .....	5
Staples Street site .....	5
Yates Park .....	5
<b>4. Progress to date</b> .....	<b>6</b>
Timeline of preceding projects .....	6
Current project .....	6
<b>5. General procedure for invasives management</b> .....	<b>7</b>
State and local permitting .....	7
Phase I – Mechanical preparation .....	7
Phase II – Selective herbicide application.....	8
Phase III – Additional follow-up visits.....	8
<b>6. Recommended next steps</b> .....	<b>8</b>
Permitting .....	9
First Street/South Point .....	9
Ocean Avenue Site.....	9
Staples Street Site .....	9
Yates Park .....	9
<b>7. Future recommendations</b> .....	<b>10</b>
<b>References</b> .....	<b>10</b>
<b>Appendix A. Invasive species maps</b> .....	<b>11</b>
<b>Appendix B. Site photographs</b> .....	<b>15</b>

## 1. Introduction

FB Environmental (FBE) is working with the Biddeford Pool Land Trust (BPLT) to manage non-native, invasive plant species (hereafter “invasives”) at BPLT’s fee-owned properties in Biddeford Pool, Maine (Figure 1). These five properties are known as Yates Park, the Staples Street site, the Ocean Avenue site, First Street site, and the South Point Sanctuary. In 2018, FBE and the Southern Maine Conservation Collaborative (SMCC) conducted field surveys to identify and map invasive species identified at the sites. This plan presents information on existing invasive species observed and documented throughout the sites and sets forth recommended management strategies.

### *Goals and objectives*

The overall purpose of this project is not solely to control invasive species at BPLT properties but to demonstrate to the citizens of Biddeford Pool that management of invasives is a feasible and worthwhile endeavor for the community. It is intended that the project presented herein will garner additional public support regarding the eradication of non-native, invasive plant species. BPLT’s ultimate goal is to expand their invasive removal efforts throughout Biddeford Pool, eventually re-establishing the dominance of native (or non-invasive) plants throughout the entire peninsula.

The specific objectives of this plan are as follows:

- Identify and map existing invasives present at BPLT properties;
- Identify suitable strategies for reducing the overall population and controlling the spread of invasive species on BPLT properties; and
- Identify the steps necessary to successfully control invasives at BPLT properties.

### *Definitions*

A **native** plant is a part of a given ecosystem that has developed over hundreds or thousands of years in a particular 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 also are naturalized invasives are a small, but troublesome, sub-category of naturalized plants (USDA NRCS, 2018).

### *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 affect forest regeneration (following timber harvest, disease, fire, etc.), increase the cost of agriculture, and threaten recreational experiences (e.g., by rendering hiking trails impassable). 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 (MNAP, 2018).



Figure 1. Site map showing project area boundaries.

Each invasive species poses its own species-specific problems and challenges. Oriental bittersweet (*Celastrus orbiculatus*) is a climbing vine that strangles trees; it forms a dense monoculture thicket which can even lead to the toppling of trees. Glossy false buckthorn (*Frangula alnus*) is an understory plant, but it can form dense thickets which crowd out regenerating native trees and shrubs. Garlic mustard (*Alliaria petiolata*) forms a dense ground cover and is allelopathic, meaning that it releases chemicals into the soil making it inhospitable to other species. Japanese knotweed (*Fallopia japonica*), one of the most successfully invasive plants in the world, can sprout from a 5g fragment and completely overtake river and stream floodplains. The seed and berry crops produced by non-native invasives are in most cases less nutritious to wildlife than those produced by native species. Japanese barberry (*Berberis thunbergii*) has been found to harbor higher tick densities than native vegetation (Devine and Bittenbender, 2016).

Invasive species are considered the second greatest threat to worldwide biodiversity after habitat loss (Madren, 2011). Note however these species (or any species for that matter) are not intrinsically evil. The majority of invasive plants in the US 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.

### Common invasives in Biddeford Pool

Based on FBE's field experience in the area, the two most prevalent non-native invasive species in Biddeford Pool are Morrow's honeysuckle (*Lonicera morrowii*) and Oriental bittersweet.

Morrow's honeysuckle is a multi-stemmed, upright, deciduous shrub with telltale shaggy bark and opposite leaves. The plant was imported from Asia in the 1800s for use as an ornamental, as wildlife food and cover, and for soil erosion control. Widely planted through the 20th century, it is now recognized as a highly invasive species found in a variety of landscape settings (Maine Cooperative Extension, 2018).



Morrow's honeysuckle at the Yates Park.



A dense thicket of shrubs entangled by Oriental bittersweet along ocean avenue.

Morrow's honeysuckle forms dense thickets and displaces native vegetation. It invades open woodlands, old fields and other disturbed sites, and spreads rapidly via wildlife-facilitated seed dispersal. While the fruits of Morrow's and other exotic honeysuckles provide some nutrition for birds and mice in winter, their carbohydrate-rich quality makes them inferior to the lipid-rich fruits of many native species that sustain migrating birds (NY Invasive Species Info, 2018).

Oriental bittersweet, as previously mentioned, is a highly-invasive, deciduous, climbing woody vine that can attain lengths of 60 feet. It is easy to distinguish from the far less common American bittersweet (*Celastrus scandens*) in that flowers and fruit are at the leaf axils on Oriental

bittersweet, and are only in terminal panicles on American bittersweet stems. Also, the fall fruit capsule color is yellow for Oriental bittersweet and orange for American bittersweet (TNC, 2018).

As with Morrow's honeysuckle, Oriental bittersweet forms dense thickets and displaces native vegetation. It grows vigorously and is capable of encircling and strangling mature trees and forming dense monocultures. It prefers full sun but can also grow in part shade, which facilitates its colonization of open forests. Its seeds are numerous, readily spread by birds, and can remain viable in the soil for over a decade.

## 2. Management Techniques

### *Physical removal*

This method involves simply pulling or digging a plant from the ground. However, certain species can resprout from very small root fragments remaining in the soil, making this method unsuitable in some cases. The disturbed soil resulting from removal also serves as an ideal spot for invasives to recolonize.

### *Carbohydrate starvation*

In this method, a plant is worn down to the point of death by exhausting the energy reserves stored in its root system. This is done by repeatedly removing the above-ground portion of a plant over a period of time. Repeated cutting, mowing, burning, grazing, and use of herbicides are all types of carbohydrate starvation. Note that this method is not effective for annual and biennial species (Devine and Bittenbender, 2018).

### *Chemical control (systemic poisoning via herbicide application)*

Instead of physically removing a plant or repeatedly cutting aboveground growth, a targeted application of systemic herbicide to a plant will kill it *in situ*. Note that some species require multiple applications and/or a precursor method (e.g., cutting and mowing).

Chemical control measures involve use of the herbicides glyphosate and triclopyr. Glyphosate is a broad-spectrum systemic herbicide, meaning it affects all plants that it contacts, and is translocated throughout the plant. Its mode of action is to inhibit an enzyme involved in the synthesis of several amino acids. Glyphosate does not exhibit herbicidal activity when in the soil. It is bound rapidly and tightly to soil particles, and therefore is not taken up by plant roots and does not affect seed germination. Glyphosate is readily biodegraded by microorganisms, thus it does not persist in soil or water (Connecticut Invasive Plant Working Group, 2018).

Triclopyr is a selective systemic herbicide used to control woody and herbaceous broadleaf plants, and has little or no impact on grasses. It controls target weeds by simulating an overdose of the plant hormone auxin which causes uncontrolled growth and eventually kills affected plants. Triclopyr is not strongly bound by soil particles and does exhibit residual herbicidal activity in soils. It is possible for Triclopyr to leach into groundwater or run off into surface waters (although it has rarely been detected in groundwater monitoring surveys). Triclopyr has low to moderate toxicity to humans and wildlife.

The two most common methods of applying herbicide to invasive plants are foliar application (spraying the leaves) of a dilute solution, or by applying a more concentrated solution directly to a plant's vascular system. An example of the latter is the cut-stump method, in which a plant is cut down and then an herbicide is applied to the freshly cut stump using a hand sprayer.

Some commercially-available herbicides come in ready-to-use formulations, meaning the active ingredient is mixed with a surfactant. Herbicide is mixed with a surfactant for foliar treatments which enables the herbicide to

penetrate through the cuticle of sprayed leaves. Surfactants are not necessary for the cut stump method. Water is used to dilute the herbicide to the desired concentration.

Both triclopyr and glyphosate are considered relatively low-toxicity herbicides and are commonly used across the US for controlling vegetation in ecologically sensitive areas. When used properly, glyphosate and triclopyr pose minimal risk to human health or to the environment.

### 3. Existing conditions

The BPLT properties that comprise this project encompass a total of approximately 8.5 acres (Figure 1). Each of the five areas is discussed further below.

#### **First Street site**

The First Street Site is situated between First Street and Great Pond at the northeastern end of the pond. The project area encompasses approximately 0.3 acres starting roughly from where First Street curves to the east and continues to the southeast for approximately 300 feet. The western end of the study area is dominated by Morrow's honeysuckle and Oriental bittersweet with some Japanese barberry also present. A small patch of common reed (*Phragmites australis*) is present along the shore of Great Pond at the western end of the project area.

#### **Ocean Avenue site**

The Ocean Avenue Site consists of approximately 2.8 acres of land that runs from the intersection of Ocean Avenue and LB Orcutt Boulevard to the intersection of Ocean Avenue and Seventh Street. A vegetated area between Ocean Avenue and a coastal wetland is dominated by Morrow's honeysuckle and Oriental bittersweet.

#### **South Point**

South Point consists of 4.4 acres of land which runs from the east side of Great Pond southward to the Ocean. It is contiguous with the First Street site that lies adjacent to the north. A large wetland complex with prevalent winterberry (*Ilex verticillata*) encompasses roughly the southern half of the property. Fortunately the wetland is dominated by native plant species (e.g., the winterberry). The portion to the north of the wetland however, does contain invasives, namely oriental bittersweet and Morrow's honeysuckle.

#### **Staples Street site**

The Staples Street site consists of two parcels at the end of Staples Street. One parcel is fee-owned by BPLT and the other is privately owned and placed under a conservation easement. An area of approximately 0.3 acres that lies between the manicured lawns of residences and the coastal wetland is overrun with Oriental bittersweet and Japanese knotweed.

#### **Yates Park**

BPLT's Yates Park encompasses one half-acre at the northwest end of Yates Street. The park consists of a small manicured area that abuts an estuarine marsh. The edge of the manicured area along the marsh is stabilized in part by large Morrow's honeysuckle shrubs which were apparently planted to serve the purpose.

## 4. Progress to date

### *Timeline of preceding projects*

The current project presented herein is the result of the coalescing of several smaller projects that preceded it, which are summarized in the following timeline:

July 2017 – FBE submitted necessary permit materials to the Maine Department of Environmental Protection (MEDEP) for BPLT to conduct invasive management activities at the Ocean Avenue site, Staples Street site, and Yates Park (see Appendix A, Photos 2, 4, & 6).

August 2017 – BPLT held a volunteer day at the Staples Street site and Yates Park. At Staples Street volunteers removed by hand completely all vegetation present as the site was overwhelmingly dominated by invasives. At Yates Park, volunteers carefully removed by hand bittersweet from the beach rose hedge at the east end of the property. At that time, the (previously planted) Morrow's honeysuckle along the park/ocean interface was left in place as it provided bank stabilization (see Appendix A, Photos 5, 6, & 8). BPLT hired VCS to undertake invasive removal operations at the Ocean Avenue site.

September 2017 – VCS cleared invasive vegetation from the site using machinery (see Appendix A, Photo 3). A follow-up herbicide treatment took place after one full growing season, in the late summer or early fall of 2018.

November 2017 – FBE submitted necessary permitting materials to MEDEP to conduct management of invasives at the First Street site. Correspondence to MEDEP indicated that the project would involve manual and mechanical (i.e., machinery) removal and application of herbicides (e.g., glyphosate, triclopyr) to non-native, invasive plants present at the site. To date, on-the-ground invasive management activities have yet to occur.

### *Current project*

The current project consists of four overall tasks: A) Field mapping of invasives using GPS and associated GPS map creation and data upload into iMapInvasives; B) Project coordination with a company specializing in on-the-ground management of invasives; C) Permit acquisition; and D) creation of an invasive species management plan. To date, field mapping of all sites is complete.

Field mapping involves conducting site visits to document the extent and location (via handheld GPS) of invasive plant species throughout BPLT properties. The GPS data are then used to create maps using GIS software (e.g., ArcGIS, Google Earth). This task was undertaken by SMCC staff in the summer of 2018 (Appendix A). In addition to creating the invasive species maps, SMCC uploaded collected data into iMapInvasives, which is an online, GIS-based data management system used to assist those working to protect natural areas from non-native, invasive species.<sup>1</sup>

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<sup>1</sup> From the iMapInvasives website: *iMapInvasives is designed to share and manage invasive species information for stakeholders within your state or province. This information includes species maps, treatment efforts and effectiveness, and areas where invasive species were searched for but were not found. Since many regulatory and budgetary decisions about invasive species are made at the state level, each state/province can customize the iMapInvasives interface by selecting their tracked species list, data permission levels, and many other details. On a broader scale, iMapInvasives is a growing, collaborative partnership of participating states and provinces, creating a network of professionals and shared resources to help combat the threat of invasive species.*



In February 2018, FBE's Kevin Ryan and Amanda Gavin met with Jeff Taylor of Taylor's Invasive Plant Control (TIPC) to assess the properties and ascertain management recommendations and cost from Mr. Taylor. Management recommendations and estimated cost are presented in section 6 of this document: Recommended Next Steps.

## **5. General procedure for invasives management**

Management of invasive species presents a challenge at all the sites. Successful management at the BPLT properties (and throughout the peninsula) will require a long-term, sustained approach. The section below provides a general overview of what steps are necessary to successfully eradicate invasives from an area. The steps presented are modeled after those implemented at Maine Audubon's East Point Sanctuary in Biddeford Pool, where invasives are being successfully controlled.

Successful management consists generally of three phases and involves both mechanical removal and application of herbicides to invasive plants within a given area. Phase I consists of mechanical preparation of the site, Phase II includes selective herbicide application following mechanical treatment, and Phase III consists of long-term management. Note that depending on species and level of infestation, not all projects will require the all phases of treatment (e.g., a lightly-infested area may not first require mechanical treatment).

### ***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 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 the DEP office in Portland. 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' of a wetland, though in some circumstances limited herbicide application within or near wetlands is warranted. Licensed pesticide applicators (e.g., 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 in regard to invasive species removal or pesticide application.

### ***Phase I – Mechanical preparation***

This phase involves the use of machinery to remove plants, which should be carried out in winter or early spring when the ground is frozen in order to minimize soil disturbance. This phase may utilize either or both a rubber-tracked skid steer equipped with a front mounted hydraulic mower and hand-operated chainsaws. The mower is used to selectively remove and mulch dense patches of invasive plants while creating foot access for selective herbicide application (Phase II). Larger target plants are hand-cut using a chainsaw, and their branches are mulched. Large vines (e.g., oriental bittersweet) are cut, with cut stems treated with herbicide to prevent re-sprouting.

In addition to providing accessibility within a project site, mowing and hand-cutting reduces the height of target vegetation and ultimately reduces the amount of herbicide required during Phase II and beyond.

### ***Phase II – Selective herbicide application***

A follow-up treatment is necessary to encourage and maintain the native plant dominance. The selective use of herbicides in this phase will kill the root systems of re-sprouting plants and those potentially missed during Phase I. If herbicide is not applied following mechanical removal, it is very likely that an area will revert back to being dominated by invasives. Phase II should take place after one full growing season following phase I, in the late summer or early fall.

The primary method of herbicide application for this phase is typically low-volume foliar, applied to the leaves and stems of target plants. Licensed technicians walk an organized grid pattern over a project site, selectively directing the herbicide to target vegetation from motorized backpack sprayers. This method of application minimizes any incidental herbicide drip from the leaf surface onto non-target understory vegetation.

### ***Phase III – Additional follow-up visits***

Phase III consists of two additional field visits by a licensed pesticide applicator, one and two years after phase II concludes. The initial clearing of vegetation as part of Phases I and II will open up the canopy and enable both native and non-native species to grow. Therefore, FBE recommends that an additional site visit by a licensed pesticide applicator should take place between August and September the year following the application associated with phase II. The 1 year follow-up site visit will entail spot-treatment of invasives using a combination of foliar herbicide application and additional cutting of vines, if necessary.

The two year follow-up visit should take place in during the summer following the previous. The purpose of this visit is to reassess the site and determine if any further management is needed and, if so, what that would entail. From then on, it is recommended that two to five follow-up visits take place once every two to three years for five to ten years. Management actions similar to those outlined in this document should be re-implemented should non-native vegetation become established at a level deemed unacceptable. This sustained effort is strongly recommended to ensure that invasive management is successful.

## **6. Recommended next steps**

The section below contains recommended next steps for the successful management of invasives at each of the BPLT properties. The recommendations set forth below incorporate stakeholder input provided by BPLT (e.g., the use of herbicides is unwanted by stakeholders at certain areas).

Rather than carry out the overall project in a piecemeal fashion, FBE recommends hiring a dedicated invasive management firm to set up a blanket contract to conduct work at BPLT sites over the next five years. Taylor's Invasive Plant Control is an excellent contractor that FBE recommends highly. Also, legal boundaries of the BPLT properties are not always well-defined. BPLT may wish to consider hiring a land surveyor to mark unclear boundaries so as to avoid conducting invasive species management on property not owned by BPLT.

## **Permitting**

Permit-by-rule forms have been submitted for the Ocean Street Site, Staples Street Site, and Yates Park (in July 2017) and the First Street Site (in November 2017). FBE recommends that all an additional permit-by-rule form be submitted to MEDEP that incorporates all the sites. The form should seek approval to use machinery and herbicides at all sites, even though the use of herbicide is not planned for the Staples Street Site (discussed below). This can be done as a precautionary basis in case the use of herbicide is deemed necessary by residents in the future (a new form will not need to be submitted). Updated permit-by-rule forms can then be submitted on a biannual basis.

## **First Street/South Point**

TIPC and FBE recommend that the western end of the study area dominated Morrow's honeysuckle and Oriental bittersweet undergo mechanical preparation (i.e., the area needs to be cleared). Herbicide application should then take place in the late summer/early fall, after one full growing season. BPLT may wish to reach out to Northeastern Landscaping regarding clearing of the area in the winter or early spring. TIPC can then conduct the herbicide application.

Herbicide application at the First Street Site can be combined with work conducted at South Point. TICP provided an estimate of \$2,500 to \$3,000 to cover the first herbicide treatment of these properties.

## **Ocean Avenue Site**

As stated previously, phase I (mechanical preparation) and phase II (selective herbicide spraying) have been conducted by VCS at the Ocean Avenue Site. FBE recommends using T IPC to carry out Phase III at the site. This would entail a site visit to selectively apply herbicide to resprouting invasives during the late summer or early fall of 2019 (note that the invasives should *not* be cut in 2019 prior to herbicide application). A visit to assess next steps should then take place in the late summer or early fall of 2020. TICP estimates that herbicide application at the site will range from \$1,500 to \$1,800 per treatment.

## **Staples Street Site**

FBE understands that only mechanical means are to be used at the Staples Street Site. For this method to be effective, sustained, repeated removal efforts will undoubtedly be necessary. FBE recommends that BPLT organize volunteer work days at the site to remove invasive vegetation at least once per year in perpetuity. Invasives will undoubtedly return to dominance at the site if left unchecked for multiple growing seasons.

FBE also understands that an abutting neighbor requested that some Morrow's honeysuckle be left *in situ* to maintain privacy of the residence. A viable option in this instance may be to replace the Morrow's honeysuckle and plant a native shrub in its place. Small bayberry (*Morella carolinensis*) may be a good candidate as it is if it is present in other parts of Biddeford Pool.

## **Yates Park**

As with the Staples Street site, volunteers can be utilized to remove invasive vegetation at Yates park on an annual basis. Large Morrow's honeysuckles have been left in place as they provide bank stabilization. FBE recommends replacing these shrubs with a native species, Virginia Rose (*Rosa virginiana*) being a suitable candidate. The existing honeysuckles should be cut near ground level and their stumps spayed with herbicide to prevent resprouting. This will leave their root structure in place which will provide bank stability while the native shrubs planted in their place become established.

## 7. Future recommendations

The Biddeford Pool Land Trust is taking proactive measures to control non-native vegetation in Biddeford Pool. As both members the land trust and the general public have access to the study area, there exists an excellent outreach and education opportunity. BPLT may wish to contact SMCC to discuss potential outreach and education activities regarding the project. In addition, BPLT could potentially partner with Maine Audubon, which has an ongoing invasive plant management project at the East Point Sanctuary.

Lastly, the current project area encompasses a small but highly visible portion of the Biddeford Pool landscape. While non-native vegetation can be controlled in the current project area, invasive species present outside of this area act as a seed bank for non-native plants to again colonize the project area. FBE concurs with BPLT that the invasive removal efforts should be expanded throughout the peninsula.

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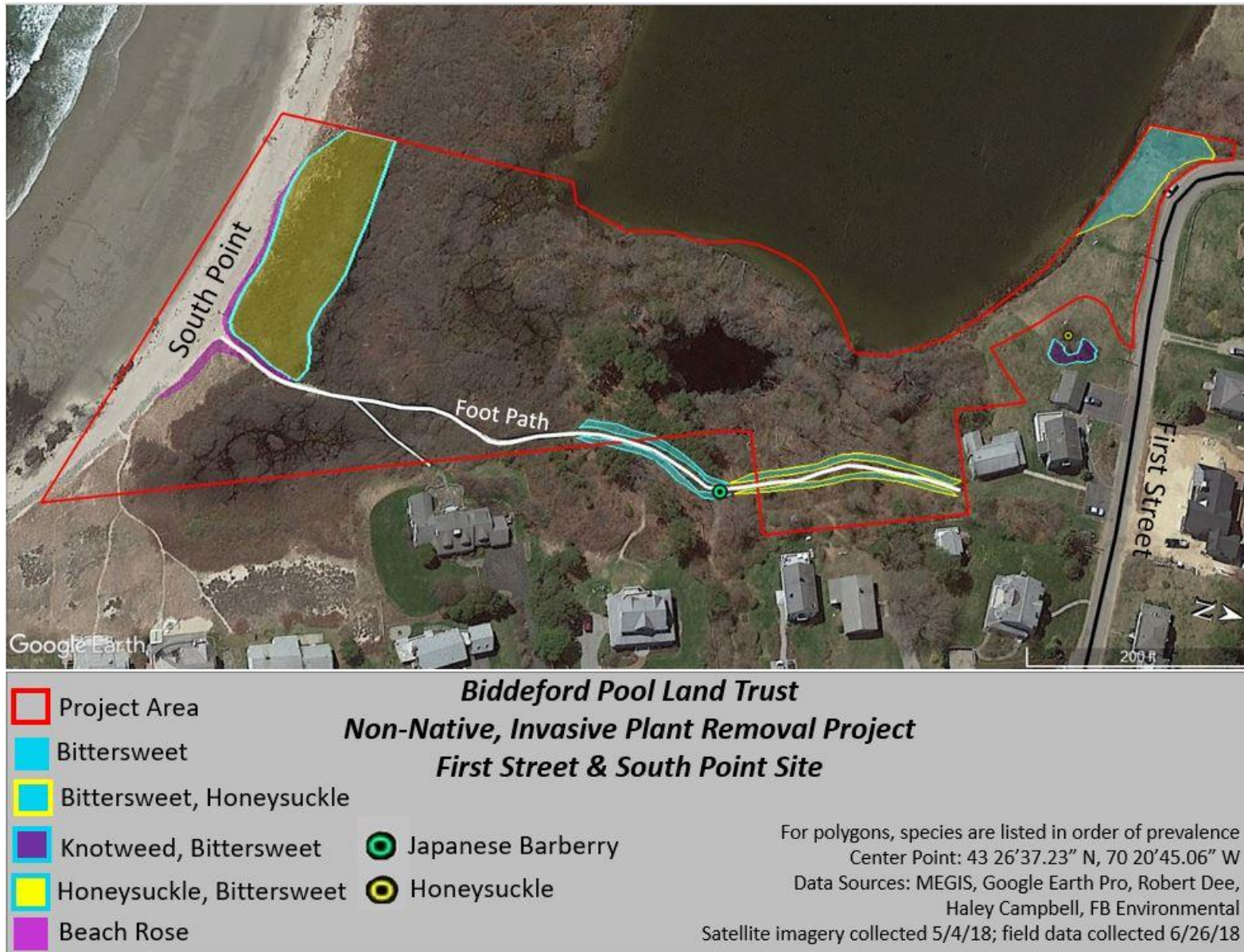
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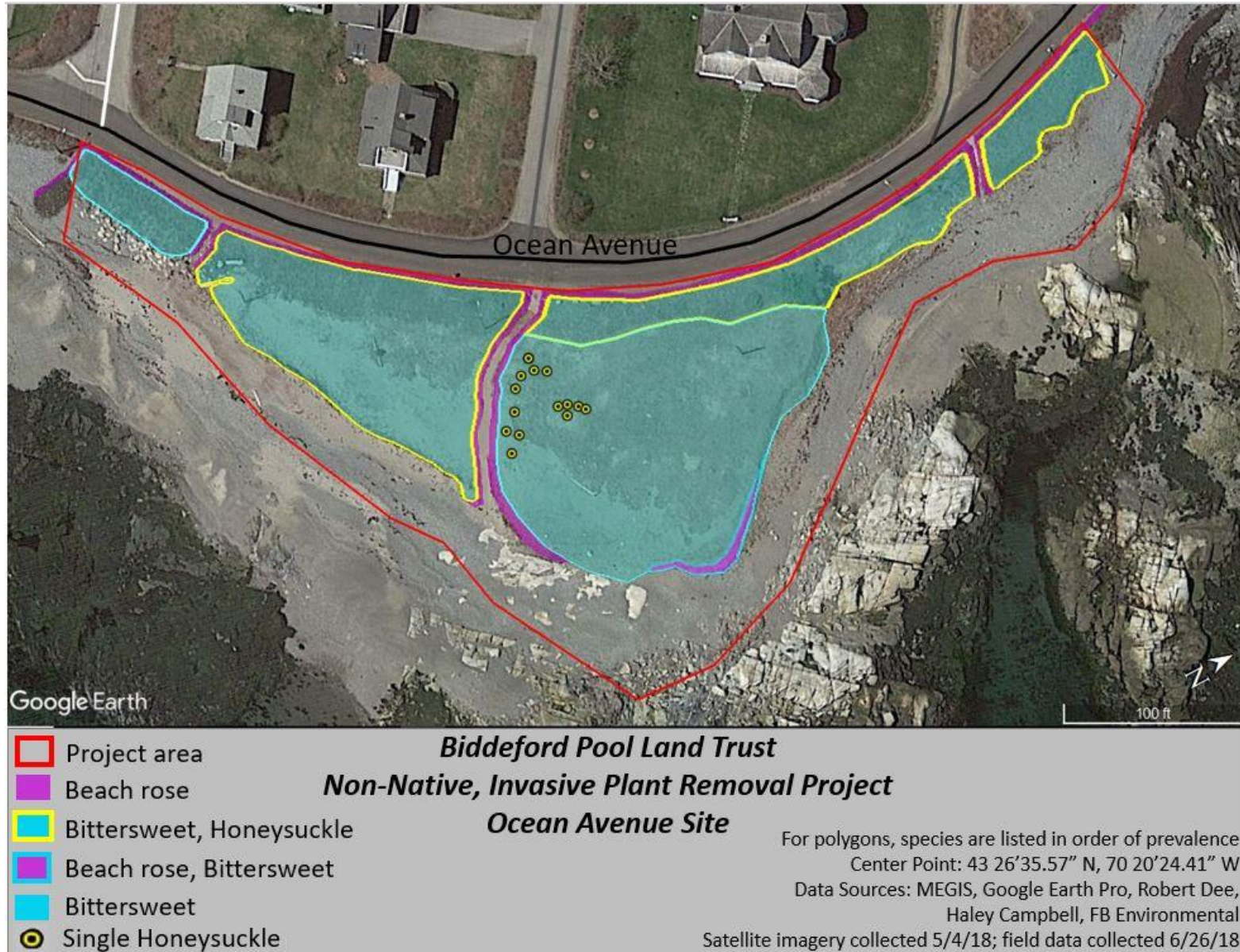
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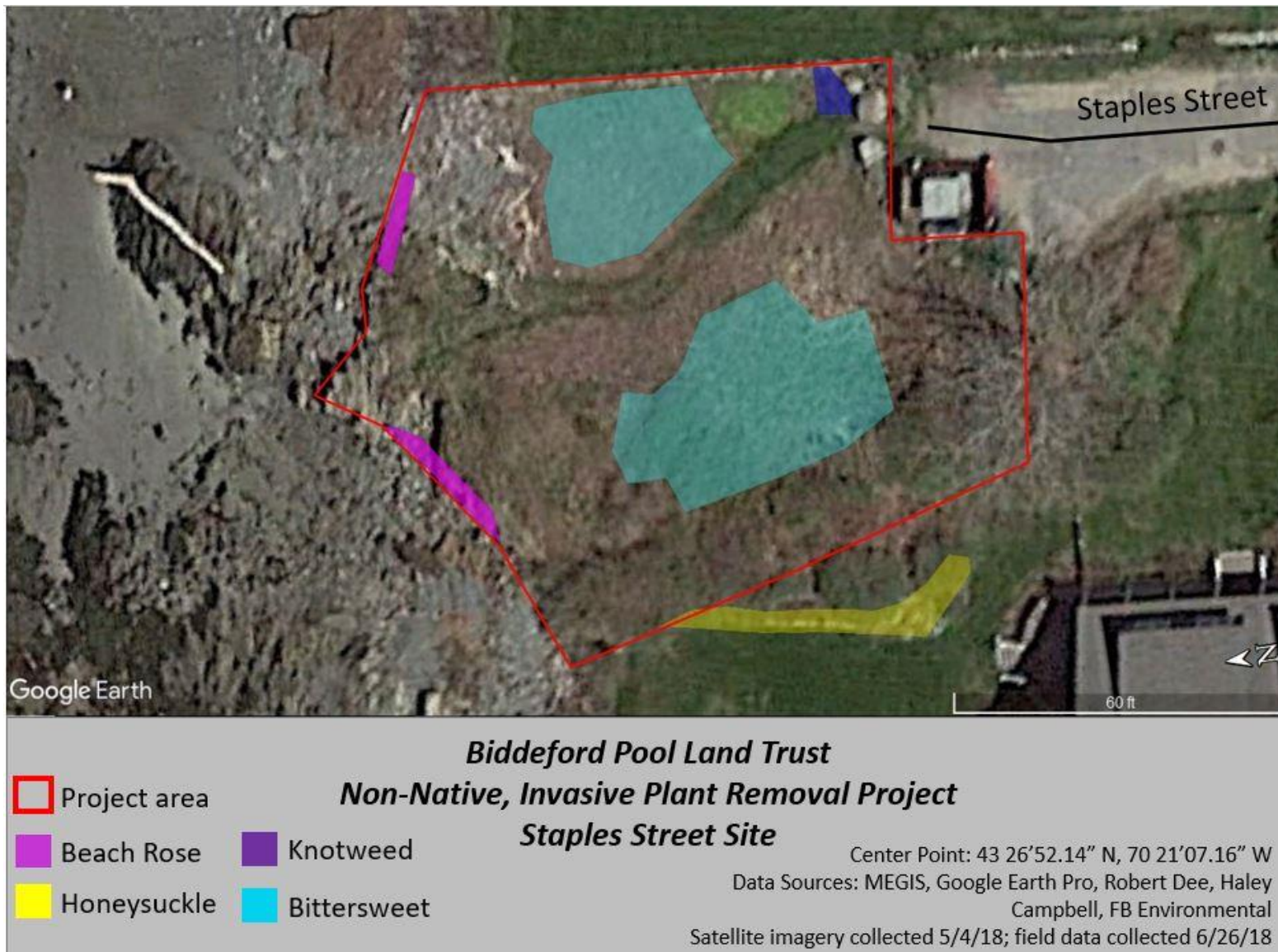
## Appendix A. Invasive species maps



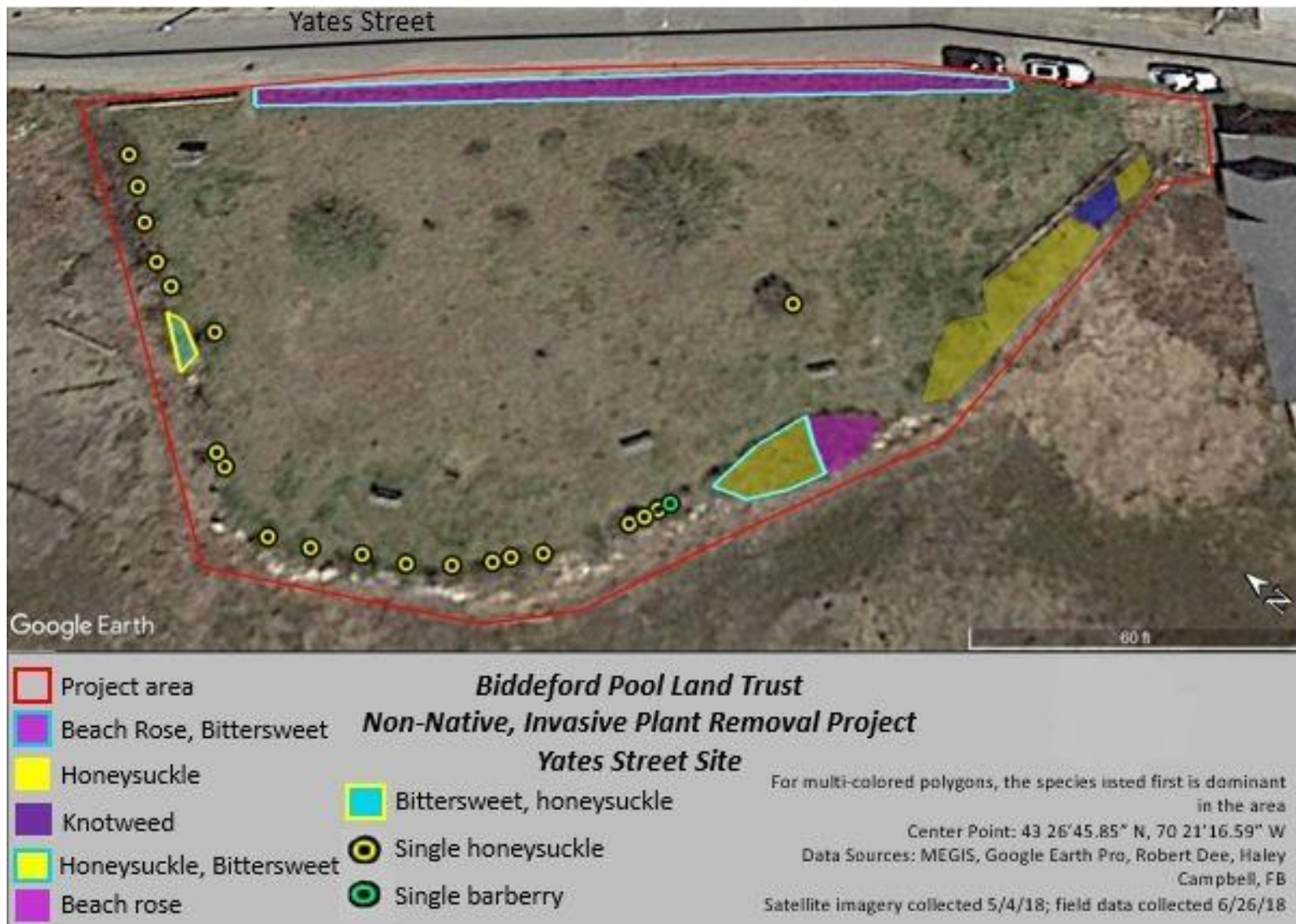
**Map 1.** Invasive species map of the First Street and South Point sites, Biddeford Pool, Maine. Map created by the Southern Maine Conservation Collaborative.



**Map 2.** Invasive species map of the Ocean Street site, Biddeford Pool, Maine. Map created by the Southern Maine Conservation Collaborative.



**Map 3.** Invasive species map of the Staples Street site, Biddeford Pool, Maine. Map created by the Southern Maine Conservation Collaborative.



**Map 4.** Invasive species map of Yates Park, Biddeford Pool, Maine. Map created by the Southern Maine Conservation Collaborative.



## Appendix B. Site photographs



Photo 1. A tangle of oriental bittersweet at the First Street site. Photo taken November 2017.



Photo 2. Morrow's honeysuckle at the Ocean Avenue site in the summer of 2017 prior to mechanical removal.



Photo 3. The Ocean Avenue site in fall 2017 following mechanical removal of invasives (Phase I).



Photo 4. The Staples Street site in the summer of 2017, prior to the volunteer work day.



Photo 5. The Staples Street site following the volunteer work day in the summer of 2017.



Photo 6. Yates Park in the summer of 2017, prior to the volunteer work day.



Photo 7. Yates Park in the summer of 2017 following the volunteer work day.



Photo 8. The large Morrow's honeysuckles still present at Yates Park.