Mitchell Field Natural Resources Assessment

Harpswell Neck Road
Harpswell, Maine

Prepared for:
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1.0 INTRODUCTION

The Town of Harpswell (Town) partnered with Stantec Consulting Services Inc. (Stantec) to perform a natural resources assessment of the Mitchell Field property on Harpswell Neck Road (Rt. 123) in Harpswell, Maine (site). The natural resource assessment included an overall characterization of the natural communities as well as identification of regulated resources on the 120-acre property. The identification and evaluation of the natural resources present within the project site included a desktop review of publicly available natural resource data, a reconnaissance-level wetland and stream survey, and identification of Significant or Essential Wildlife Habitats[1] such as vernal pools. The information contained within this report is suitable for preliminary site planning purposes.

Stantec completed a series of meander surveys throughout the site to characterize and evaluate the natural resources present. During these surveys, Stantec collected data on dominant species composition, wildlife use, habitat condition, and evidence of past disturbance. Representative photographs were taken as appropriate. The locations of any Significant or Essential Wildlife Habitat or other significant feature identified, including rare, threatened, or endangered (RTE) plants or natural communities, were documented with the use of an iPad capable of delineating features with an external Trimble R2 GNSS receiver.

Stantec also reviewed *Beginning with Habitat*[2] information and contacted the Maine Department of Inland Fisheries and Wildlife (MDIFW) and the Maine Natural Areas Program (MNAP) regarding known occurrences of rare species and Significant Wildlife Habitat within and in the local vicinity of the property.

The objectives of the assessment were to identify the natural communities and resources present on the site; identify high value or high priority habitats; and develop recommendations for priority conservation areas, invasive species removal, and development options. Figures showing the identified resources are provided in Appendix A. Appendix B includes an Invasive Species Management Plan for the project. Representative photographs are provided in Appendix C.

2.0 NATURAL COMMUNITY DESCRIPTIONS

Mitchell Field is a former Navy fuel depot located on Harpswell Neck Road (Figure 1) that was turned over to the Town in 2000. The property is approximately 120 acres in size and consists of

[1] Significant Wildlife Habitats are defined and regulated under the Maine Natural Resources Protection Act (38 M.R.S.A §480-B(10)). Essential Wildlife Habitats are defined and regulated under the Maine Endangered Species Act (12 M.R.S.A §12804, 12806.

[2] Beginning With Habitat is a collaborative program of federal, state, and local agencies and non-governmental organizations that compiles habitat and natural resource information from multiple source to provide a habitat-based approach to conserving wildlife and plant habitat. Available at: http://www.beginningwithhabitat.org/index.html

roughly equal open field and forested habitats (Photo 1). The property is primarily undeveloped with a few abandoned former Navy buildings located near the waterfront. The existing pier at the site is scheduled to be removed due to safety concerns, but the jetty is proposed to remain (Photo 2). The site is used now for passive recreation, including walking, running, and bird watching, and contains a network of paved and dirt/gravel trails.

Stantec conducted field surveys on May 5, 11, and 17, 2017. The following presents a characterization and assessment of the natural communities present within the site. Natural communities present were classified according to *Natural Landscapes of Maine: A Classification of Vegetated Natural Communities and Ecosystems*.[3] This classification utilizes species composition, topography, and landscape setting to classify the different natural community types present in Maine. Figure 2 shows the location and types of natural communities identified on site.

2.1 NATURAL COMMUNITY CHARACTERIZATION

Two separate natural communities are present within the forested uplands on site: Oak-Northern Hardwood Forest and White Pine Forest. The remaining forested upland is made up of evenly aged stands of white pine (*Pinus strobus*) trees and red maple (*Acer rubrum*) dominated upland areas along wetland-upland boundaries. The dominant wetland natural community is Red Maple Swamp which encompasses the forested wetlands identified on site.

2.1.1 Oak-Northern Hardwood Forest

Oak-Northern Hardwood Forest is a mixed upland forest type primarily located in the western portion of the site. Dominant tree species include red oak (*Quercus rubra*), white pine, and red maple. The understory is dominated by regenerating saplings of the tree species and the invasive shrub Morrow's Honeysuckle (*Lonicera morrowii*). Herbaceous plants include Canada mayflower (*Maianthemum canadense*), bracken fern (*Pteridium aquilinum*), wild sarsaparilla (*Aralia nudicaulis*), and starflower (*Trientalis borealis*).

2.1.2 White Pine Forest

White Pine Forest is a closed canopy forest type located in the southeast corner of the site. Dominant tree species include white pine, red spruce (*Picea rubens*), and red maple. The understory is dominated by the invasive shrubs autumn olive (*Eleagnus umbellata*) and Morrow's honeysuckle. An even-aged white pine stand is situated in the center of the site with similar characteristics, yet dominated by only white pine and no other canopy species (Photo 3).

[3] Gawler, S.C. and A.R. Cutko. 2004. *Natural Landscapes of Maine: A Classification of Vegetated Natural Communities and Ecosystems (DRAFT)*. Maine Natural Areas Program, Department of Conservation, Augusta, Maine.

2.1.3 Red Maple Swamp

Red Maple Swamp is a wetland forest type that makes up the majority of the forested portion of the site (Photos 4 and 5). Dominant tree species include red maple, balsam fir (*Abies balsamea*) and yellow birch (*Betula alleghaniensis*). The red maple trees are generally large and widely spaced with multiple trunks and elevated roots. The shrub layer is sparse with Morrow's honeysuckle present near the wetland boundaries. Dominant herbaceous plants include cinnamon fern (*Osmundastrum cinnamomeum*), sensitive fern (*Onoclea sensibilis*), and wood anemone (*Anemone quinquefolia*).

2.1.4 Open Field

Fields on the property represent the primary former development area associated with the Navy's fuel depot. These fields once contained large fuel storage tanks, which were removed from the site in the late 1990's. The fields are now relatively unmaintained, although occasional burning and mowing has occurred over the years. The fields are dominated by a mix of forbs, and field grasses, with the lower wet areas containing a mix of sedges (*Carex* spp.) and rush (*Juncus* spp.) species.

3.0 FRESHWATER AND COASTAL WETLANDS

Stantec identified freshwater wetlands throughout the forested and field portions of the site, as well as the coastal wetland during a reconnaissance level field survey of the site (Figure 3).

3.1 FRESHWATER WETLANDS

Palustrine forested (PFO)[4] wetlands and palustrine emergent (PEM) wetlands were identified on site. The PFO wetlands are part of the larger Red Maple Swamp natural community with dominant vegetation described in section 2.1.3. Hydrology indicators within the forested wetlands include soil saturation, surface water, and wetland drainage patterns associated with the perennial and intermittent streams which are further described below.

PEM wetlands are associated with excavated drainage features adjacent to the main access road on site. Dominant vegetation within these wetlands includes broad-leaved cattail (*Typha latifolia*), sensitive fern, white meadowsweet (*Spirea alba*), and Morrow's honeysuckle. Surface water and wetland drainage patterns influenced by culverts under the main access road are the primary hydrology indicators.

Additional PEM wetlands are located within the open field portion of the site. The wetland in the southern end of the field is a previously excavated area that has naturalized and is now

[4] Wetland classifications based on: Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Office of Biological Services, U.S. Fish and Wildlife Service. FWS/OBS-79/31.

dominated by herbaceous wetland plants. Dominant plants include broad-leaved cattail, cottongrass bulrush (*Scirpus cyperinus*), and lamp rush (*Juncus effusus*). Hydrology indicators include surface water and saturated soils. The wetland in the northern part of the field is dominated by herbaceous plants including cottongrass bulrush, lamp rush, woodland horsetail (*Equisetum sylvaticum*), and sensitive fern. Scattered shrubs are present throughout the wetland and include white meadowsweet (*Spiraea alba*), speckled alder (*Alnus incana*), and the invasive shrubs autumn olive and Morrow's honeysuckle. Soils were generally compacted and disturbed from former use and grading activities associated with the use and deconstruction of the previous development on site. Hydrology indicators at the time of the delineation included soils saturated to the surface, a water table at or near the surface, surface water, and water-stained leaves.

3.2 COASTAL WETLAND

The coastal wetland creates the western boundary of the site and is delineated as the boundary between the upland shore and Middle Bay (Photos 6 and 7). The wetland boundary was identified by an abrupt change in topography and the highest observable limits of the tide as indicated by wrack lines (rockweed [*Ascophyllum nodosum*] and driftwood debris).

4.0 RARE, THREATENED, AND ENDANGERED SPECIES

Stantec conducted reconnaissance-level RTE habitat surveys during field visits and desktop analysis of the site. No rare plants or animals, or associated habitats were identified on the site. However, it should be noted that Stantec's field surveys were not conducted during the appropriate time period to identify early spring ephemeral or summer flowering rare plants. Stantec also contacted MNAP and MDIFW to review the site for known occurrences of RTE species. MNAP's response indicated there are no known RTE plant species on site. MDIFW indicated that the Northern Brown Snake (*Storeria dekayi dekayi*) has been documented in the northern portion of the site. The Northern Brown Snake, a Maine Species of Special Concern, is a small, secretive snake that is known to occupy natural and semi-developed habitats. A review of Beginning With Habitat data also identified mapped Tidal Waterfowl and Wading Bird Habitat located offshore (Figure 4). MDIFW also noted that 3 endangered Myotis bat species and 5 bat species of special concern could occur within the site during their migration and/or breeding period.

5.0 HIGH VALUE ANIMAL HABITATS

5.1 VERNAL POOLS

Stantec identified 6 vernal pools throughout the site. The vernal pool survey was conducted in the spring of 2017 and in accordance with the Maine Association of Wetland Scientists' 2014

Vernal Pool Survey Protocol.[5] Four of the pools were naturally occurring forested depressions located within the forested wetlands (Photos 8 and 9). Two pools were within man-made excavations in the southeast portion of the site (Photo 10).

The surveys involved searching for amphibian breeding activity, primarily the presence of egg masses, and use by other vernal pool-dependent species. Information was collected on the physical characteristics of the pool such as the likely hydro-period (i.e., how long surface water will remain in the pool) and the presence and/or type of inlet and outlet. Information on the biological and physical characteristics of the pool then was used to determine if the vernal pool met the criteria of a Significant Vernal Pool (SVP) as defined in Chapter 335 of the Maine Natural Resources Protection Act (NRPA). According to this rule, a vernal pool is a natural, temporary to semi-permanent body of water occurring in a shallow depression that typically fills during the spring or fall and may dry during the summer. Vernal pools have no permanently flowing inlet or outlet and no viable populations of predatory fish. In addition, a SVP contains 1 or any combination of the following:

- 40 or more wood frog egg masses;
- 20 or more spotted salamander (*Ambystoma maculatum*) egg masses;
- 10 or more blue spotted salamander (*Ambystoma laterale*) egg masses; and/or
- Presence of fairy shrimp (*Eubranchipus* spp.)

And/or contains:

- Documented use by a state-listed rare, threatened, or endangered species that commonly require a vernal pool to complete a critical portion of their life-history such as Blanding's turtle (*Emydoidea blandingii*), spotted turtle (*Clemmys guttata*), ringed boghaunter dragonfly (*Williamsonia lintneri*), wood turtles (*Clemmys insculpta*), ribbon snakes (*Thamnophis sauritus*), swamp darner dragonflies (*Epiaeschna heros*), and comet darner dragonflies (*Anax longipes*).

None of the pools located on site would be considered an SVP because they were either of man-made origin or did not have the required egg mass counts. One vernal pool, located at the southern end of the field, did have 20 spotted salamander egg masses but would not be considered an SVP by the MDEP because it is a previously excavated area (i.e., man-made). This vernal pool would, however, likely be regulated by the U.S. Army Corps of Engineers (Corps), if a development project on the site triggered the Corps' jurisdiction by impacting wetlands.

5.2 STREAMS

One stream complex was identified on site. This stream complex comprises 1 main, perennial stream channel with 2 perennial tributaries and 1 intermittent tributary. The main stream channel originates off-site to the south and flows north into Middle Bay. The tributaries of the stream

[5] Maine Association of Wetland Scientists Vernal Pool Technical Committee. 2014. Vernal Pool Survey Protocol. April 2014.

originate from drainages under the main access road and are likely fed by ground water coming from under the open field portion of the site. The stream passes through one culvert in the interior of the forest (Photo 11), which runs under one of the gravel walking trails (Photo 12). Near its confluence with Middle Bay, the main stream flows through an approximately 80-foot-long culvert under another of the site's walking trails (Photo 13). Both culverts are undersized and restrict flow and upstream passage of fish and aquatic organisms. Portions of the stream channel within the forested wetland appear to have been excavated and straightened during historic use of the site (Photo 14).

6.0 MARINE RESOURCES

Stantec conducted a desktop review of marine resources at the site (Figure 5). According to information available from the Maine Department of Marine Resources (DMR), there are mapped eelgrass (*Zostera* sp.) beds located offshore of the site. According to information from Maine GIS, there is also mapped shellfish habitat located along the coast of the site. No field surveys were conducted in the marine environment to confirm the presence of the identified resources.

Coastal or off-shore development should avoid disturbance to the eelgrass beds located off shore. Additionally, coastal development presents complicated permitting issues for state and federal regulators. Use of existing infrastructure should be prioritized when considering any coastal development.

7.0 WILDLIFE SPECIES OF CONSERVATION CONCERN

7.1 MDIFW SPECIES OF GREATEST CONSERVATION NEED

The field area is particularly notable for its large size relative to other locally available, similar habitats and is in fact known to support avian and invertebrate species that are otherwise in decline due to restricted habitat availability, i.e., bobolinks (*Dolichonyx oryzivorus*) and eastern meadowlarks (*Sturnella magna*) (Rob Bryant, pers. comm.). Other grassland bird species in decline that have potential to seasonally use this habitat include vesper sparrow (*Pooecetes gramineus*), grasshopper sparrow (*Ammodramus savannarum*), Henslow's sparrow (*Ammodramus henslowii*), and Savannah sparrow (*Passerculus sandwichensis*), as well as a variety of resident and migrating butterflies such as the Monarch (*Danaus plexippus*).

Stantec reviewed publicly available data to determine the wildlife species that could use the habitats available at Mitchell Field, with a specific focus on grassland bird species that are known to utilize, or could utilize, the field portions of the site. We reviewed observations posted

on eBird[6] for Harpswell and the surrounding area, as well as a Christmas Bird Count[7] from Freeport. We then cross-checked the list with MDIFW's list of threatened and endangered species[8] and species of special concern[9], as provided in their Wildlife Action Plan. Table 1 provides a list of the species most likely to be found in, or having the potential to use, the grassland habitat available at the site.

Table 1. List of grassland bird species that are known from the area or could be present on or near Mitchell Field.

Common Name	Scientific Name	Status[1]	Observed in Area, and How?	Breeder, Migrant, Resident, or Visitor?
American Goldfinch	*Spinus tristis*		eBird, CBC[2]	year-round resident
American Kestrel	*Falco sparverius*		eBird	year-round resident
American Pipit	*Anthus rubescens*	SE	eBird	migrant
American Robin	*Turdus migratorius*		eBird, CBC	year-round resident
Baird's Sandpiper	*Calidris bairdii*		eBird	rare visitor
Barn Owl	*Tyto alba*	SSC	not observed	rare visitor
Barn Swallow	*Hirundo rustica*		eBird	breeder
Bobolink	*Dolichonyx oryzivorus*		eBird	breeder
Brown-headed Cowbird	*Molothrus ater*		eBird	breeder
Buff-breasted Sandpiper	*Tryngites subruficollis*		eBird	rare visitor
Clay-colored Sparrow	*Spizella pallida*		eBird	rare visitor
Common Grackle	*Quiscalus quiscula*		eBird, CBC	breeder
Common Redpoll	*Acanthis flammea*		eBird, CBC	wintering
Dickcissel	*Spiza americana*		eBird	rare visitor
Eastern Bluebird	*Sialia sialis*		eBird, CBC	year-round resident
Eastern Kingbird	*Tyrannus tyrannus*	SSC	eBird	breeder
Eastern Meadowlark	*Sturnella magna*	SSC	eBird	breeder
Eastern Phoebe	*Sayornis phoebe*		eBird	breeder
Field Sparrow	*Spizella pusilla*		eBird	breeder
Grasshopper Sparrow	*Ammodramus savannarum*	SE	eBird	breeder
Henslow's Sparrow	*Ammodramus henslowii*		not observed	rare visitor

[6] eBird. 2012. eBird: An online database of bird distribution and abundance [web application]. Ithaca, New York. http://www.ebird.org. Accessed July 6, 2017
[7] National Audubon Society. 2010. The Christmas Bird Count Historical Results. http://www.christmasbirdcount.org. Accesses July 6, 2017
[8] Maine Department of Inland Fisheries and Wildlife. 2013. State List of Endangered and Threatened Species. http://www.maine.gov/ifw/wildlife/endangered/listed_species_me.htm. Accessed July 6, 2017
[9] Maine Department of Inland Fisheries and Wildlife. 2013. Species of Special Concern. http://www.maine.gov/ifw/wildlife/endangered/specialconcern.htm. Accessed July 6, 2017

Common Name	Scientific Name	Status[1]	Observed in Area, and How?	Breeder, Migrant, Resident, or Visitor?
Horned Lark	*Eremophila alpestris*	SSC	eBird, CBC	year-round resident
House Wren	*Troglodytes aedon*		eBird	breeder
Indigo Bunting	*Passerina cyanea*		eBird	breeder
Killdeer	*Charadrius vociferus*		eBird	breeder
Le Conte's Sparrow	*Ammodramus leconteii*		not observed	rare visitor
Lapland Longspur	*Calcarius lapponicus*		eBird	wintering
Lesser Yellowlegs	*Tringa flavipes*	SSC	eBird	migrant
Lincoln's Sparrow	*Melospiza lincolnii*		eBird	migrant
Long-eared Owl	*Asio otus*		eBird, CBC	year-round resident
Mourning Dove	*Zenaida macroura*		eBird, CBC	year-round resident
Northern Harrier	*Circus cyaneus*	SSC	eBird, CBC	year-round resident
Pectoral Sandpiper	*Calidris melanotos*		eBird	migrant
Red-winged Blackbird	*Agelaius phoeniceus*		eBird, CBC	breeder
Ring-necked Pheasant	*Phasianus colchicus*		not observed	year-round resident
Saltmarsh Sparrow	*Ammodramus caudacutus*	SSC	eBird	breeder
Savannah Sparrow	*Passerculus sandwichensis*		eBird	breeder
Sedge Wren	*Cistothorus platensis*	SE	not observed	rare visitor
Short-eared Owl	*Asio flammeus*	ST	CBC	migrant
Snowy Owl	*Bubo scandiacus*		eBird, CBC	rare visitor
Song Sparrow	*Melospiza melodia*		eBird, CBC	year-round resident
Sora	*Porzana carolina*		eBird	breeder
Vesper Sparrow	*Pooecetes gramineus*		eBird	breeder and migrant
Upland Sandpiper	*Bartramia longicauda*	ST	not observed	breeder
White-crowned Sparrow	*Zonotrichia leucophrys*		eBird	migrant
Wilson's Phalarope	*Phalaropus tricolor*		eBird	rare visitor
Wilson's Snipe	*Gallinago delicata*		eBird	breeder

[1]SE = state endangered, ST = state threatened, SSC = state species of special concern
[2]CBC = Christmas Bird Count

7.2 USFWS IPAC RESOURCE LIST

Stantec reviewed the USFWS's Information for Planning and Consultation (IPaC) website[10] to identify a list of species and other resources that are known or expected to be on or near the Mitchell Field site. Table 2 provides a list of species that may be impacted by activities at the site; however, determining the likelihood or extent of effects would require additional information on the activities planned and species-specific surveys. The IPaC report also stated that there are no critical habitats at this location.

Table 2. List of species that are known or expected to be on or near the Mitchell Field project site.

Common Name	Scientific Name
Mammals	
Northern Long-eared Bat	*Myotis septentrionalis*
Migratory Birds	
American Bittern	*Botaurus lentiginosus*
American Oystercatcher	*Haematopus palliatus*
Bay-breasted Warbler	*Dendroica castanea*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Blue-winged Warbler	*Vermivora pinus*
Canada Warbler	*Wilsonia canadensis*
Great Cormorant	*Phalacrocorax carbo*
Hudsonian Godwit	*Limosa haemastica*
Least Bittern	*Ixobrychus exilis*
Least Tern	*Sterna antillarum*
Nelson's Sparrow	*Ammodramus nelsoni*
Olive-sided Flycatcher	*Contopus cooperi*
Peregrine Falcon	*Falco peregrinus*
Pied-billed Grebe	*Podilymbus podiceps*
Prairie Warbler	*Dendroica discolor*
Purple Sandpiper	*Calidris maritima*
Saltmarsh Sparrow	*Ammodramus caudacutus*
Short-eared Owl	*Asio flammeus*
Snowy Egret	*Egretta thula*
Upland Sandpiper	*Bartramia longicauda*
Wood Thrush	*Hylocichla mustelina*

[10] Available at: https://ecos.fws.gov/ipac/

8.0 SOILS

Stantec reviewed the Soil Survey Geographic (SSURGO) Database, developed by the U.S. Department of Agriculture and the Natural Resources Conservation Service, to identify the soil types mapped within the site. In total, six soil types were mapped within the site, as shown on Figure 6. Three soil types were dominant on the site, constituting over 91 percent of the mapped soils on the property: cut and fill land (48.1%), Walpole fine sandy loam (26.8%), and Lyman loam (16.7%). Cut and fill land represents land that has been developed and modified and corresponds to the area of former development associated with the Navy fuel storage. Walpole fine sandy loam is a poorly drained soil that corresponds with the forested wetland portions of the site. Lyman loam is a somewhat excessively drained soil and is primarily located in upland forested areas of the site.

Stantec also reviewed the coastal bluff data from the Maine Geologic Survey for the site. Based on this data, the bluffs at the site are mapped as stable. Portions of the site where the shoreline is armored, near the former Navy development, are largely stable and show little signs of erosion. In areas where the bluff is undeveloped, the bluff shows some evidence of erosion but is largely vegetated with a mix of shrubs and trees. Based on our assessment, we don't feel that additional shoreline stabilization is necessary in this area, particularly if no additional development is proposed near the top of the existing bluff. Any additional development that would remove tree or shrub cover from the bluff or near the top of the bluff may, however, cause additional instability and may warrant additional consideration.

9.0 INVASIVE SPECIES

During the spring of 2017, Stantec conducted an extensive invasive species survey of the site. As shown on Figure 7, large numbers of invasive species were found throughout the site. Stantec identified a total of 5 different species on the site: autumn olive, Morrow's honeysuckle, multiflora rose (*Rosa multiflora*), Asiatic bittersweet (*Celastrus orbiculatus*), and Japanese barberry (*Berberis thunbergii*). Some species were more dominant in certain portions of the site; for example, autumn olive was found primarily in the open field (Photo 15), while Asiatic bittersweet and Japanese barberry were primarily limited to the forested areas (Photo 16). Morrow's honeysuckle and multiflora rose were found across both habitat types and at the forest edges (Photo 17). Spotted knapweed (*Centaurea maculosa*) and garlic mustard (*Allaria petiolata*) were also identified on the site by others, with spotted knapweed occurring in the field and garlic mustard more generally found in the forest.

Management of the invasive species is likely to require a long-term management approach. To address specific management strategies for each species, we developed an Invasive Species Management Plan (ISMP), which is provided in Appendix B. The ISMP provides a more detailed description of each species found on the site, their locations, and the recommended control

strategies. The ISMP is provided as a stand-alone document so that it can be provided to a contractor performing invasive species management, if necessary.

In summary, invasive species management will require a long-term and sustained approach, and ultimately depend on the priorities that the Town establishes for the site. The ISMP provides suggested prioritization strategies, based both on species and habitat, but implementation will need to be coordinated with continued planning for Mitchell Field. Management of invasive species likely presents the most significant challenge at this site, as the density and distribution of invasive species will make management a time-consuming, and potentially costly, endeavor. However, control of the populations of invasive species is possible if the resources and budget can be made available.

10.0 LANDSCAPE CONTEXT

The open fields at Mitchell Field are a relatively unique natural community in Harpswell and in the greater mid-coast area. Based on a preliminary desktop assessment of the surrounding landscape, the approximately 40-acres of open field habitat available at the site represents one of the larger, minimally managed field environments within a 10- to 15-mile radius and probably the only habitat of its kind on Harpswell Neck, adjacent Orrs Island, and the surrounding peninsulas of Freeport, Brunswick, Harpswell, Phippsburg, and Georgetown. While open upland field areas exist throughout the region, most all others are regularly mowed and maintained for residential, municipal, or agricultural purposes. For this reason, it may make sense to preserve some or all of this habitat for use by grassland birds, depending on the Town's priorities. Preservation of this habitat may make the site more attractive to the public, as it represents an aesthetic and recreational opportunity that is otherwise uncommon in the region. Further, preservation of this habitat may be a wise ecological choice, as this habitat for both breeding and migrating (stopover) species is regionally rare and likely to become increasingly rarer over time. Consideration for competing and restricted usage of the open field areas (e.g., solar power or more active public activities such as sports fields, gardens, or amphitheater)—particularly those that might induce increased public and economic support of the site's facilities—may be appropriate if properly balanced with a sustained open field program management approach.

The forested portion of the site is a relatively common community type. Forested wetlands and uplands, similar to those found at the site, are generally common throughout the Town and the mid-coast region. Beyond their intrinsic habitat values, the forested wetland areas of the parcel also support important ground and surface water resources that are otherwise limited on the bedrock-based peninsula. Similarly, upland forested areas of the site provide a range of habitat opportunities although, as described, many of the exterior edges are presently threatened by decline and the advancing spread of invasive species. This same forest resource, however, is locally recognized for providing a variety of important active and passive, year-round, recreational opportunities for the resident and seasonal public—another resource likely to become more valued by the public over time. Consideration should be given towards

developing a management plan that includes both a long-term vision and defined goals for sustainably managing the forest area in terms of its ecological (including timber), aesthetic, and recreational values.

11.0 OTHER CONSIDERATIONS

11.1 RECREATION

The Mitchell Field site contains an established network of trails and roads that are used for recreation. The trails range from paved roads encircling the fields to gravel paths through the woods. The trails provide access to a variety of natural communities, including the fields, upland forest, forested wetlands, and streams. Because recreation appears to be a primary desired use of the site, we recommend maintaining these trails and keeping them intact for future use.

The beaches at the site are also used by the public, providing one of the few public access points to the water on the peninsula. Similar to the trails, use of and access to the beach appears to be important to the public; therefore, we recommend maintaining specific access points to the beach for future use.

11.2 FOREST MANAGEMENT

The forested portion of Mitchell Field does not currently provide high quality, marketable timber resources. Areas of even-aged white pine have been subjected to past damage from white pine weevil and exhibit multiple stemmed growth. Additionally, many trees on the site have been damaged and killed by the growth of Asiatic bittersweet, frequently causing bent and broken limbs and trunks. As already noted, the forest would benefit from a stand-based, forest management plan with the goal of the plan being to create a healthier forest that supports a balanced and Committee-approved approach to enhancing timber, wildlife, recreational, and aesthetic resources. While there is currently relatively little commercial value to the timber on the site, a forest management plan could recommend various silvicultural and harvest methods that enhance the health and productivity of the forest, potentially including patch cuts or selective cutting. A licensed forester should be utilized to prepare or review the plan.

11.3 SEA LEVEL RISE

As part of the natural resource assessment, Stantec estimated potential changes in sea level rise as a result of predicted anthropogenic climate change. Using the highest annual tide (HAT) data and predicted sea level rise or storm surge data from the Maine Geologic Survey, Stantec produced a figure showing the estimated inundation from a sea level rise of 2 feet, 3.3 feet (1 meter), and 6 feet. The figure was developed using a static inundation model that uses LIDAR topographic data as a base digital elevation model, and first adjusts HAT tidal predictions to take into account variability in the water surface elevations along the Maine coastline, and then adds scenarios of 2, 3.3, and 6 feet of either storm surge or sea level rise to that initial starting

elevation. As shown on Figure 8, there is very little predicted inundation from potential sea level rise. The differences in elevations do not appear as though they will significantly affect the ability to use the property.

12.0 RECOMMENDATIONS

Based on several meetings and discussions with Town staff over the course of the development of this report, Stantec has provided the following recommendations to address the desired conservation goals and invasive species management, as requested in the RFP. However, the recommendations provided below should be used with caution. Decisions for management and use of Mitchell Field should be made by the Town, including the Mitchell Field Committee and the general public, and the recommendations provided below are not meant to be requirements for achieving the "best" use of the land. Rather, we have provided options for consideration, recognizing that the ultimate decisions rest with the Town and will depend on the priorities for management of this site.

12.1 INVASIVE SPECIES MANAGEMENT

As stated above and as outlined in the ISMP provided in Appendix A, invasive species represent the largest management challenge at this site. Given the density and extent of invasive species present, the Town should be prepared for a long-term management strategy, if the goals for the site are control of these species.

To address invasive species at the site, we recommend the following actions. These actions are not presented in any order of importance. The order of importance should be dictated based on priorities set by the Town.

- Management of invasive species in the field could be achieved through regular mechanical controls. Annual mowing or burning of the fields would provide control for many of the species found in the field. Manual controls should be coordinated with other management goals for the fields, whether for grassland birds or future development options.

- Asiatic bittersweet is likely causing the most damage at the site, and control of this species, and its effects on the forest community, should be prioritized. Bittersweet has the ability to damage full grown trees, which can have a serious impact on the forest. If possible, control of the vines growing up into the canopy should be considered a priority.

- In general, we would typically recommend invasive species management should be started in the areas of lowest density, with the greatest likelihood for success. However, that may not be the preferred option at this site. Currently, the density of Asiatic bittersweet and other shrub species is threatening the health of the forest. To gain control of the invasive species and to limit the ecological damage, it may make sense to start in the heavily infested areas to reduce impact on the existing forest community. A broad

sweep of large dense areas may help reduce the current impact of the species. Follow up surveys could then target the less dense areas and move toward the denser areas.

- The Town may want to consider allowing a waiver to its existing pesticide use ordinance to allow the use of herbicide in wetlands and within 25 feet of wetlands for invasive species control at this site. Much of the invasive species located in the forested areas are either in or within 25 feet of a wetland. Given the densities and distribution of the species at this site, control through manual methods only may not be possible within a reasonable timeframe and for a reasonable cost. Herbicide use is generally a faster and more cost-effective method for invasive species control. Herbicide application methods can be utilized that greatly reduces the risk of overspray or drift to non-target species or other natural resource (e.g., clip-and-drip, cut-and-paint, foliar spot spraying). As stated in the ordinance, the Conservation Commission may grant a waiver if it finds "That control methods allowed by the ordinance are not adequate to address the threat." It is our opinion that manual controls alone would not be adequate to control the invasive species on this site. We feel that the only way to gain control over these species would be through the controlled use of herbicides.

- Any large-scale areas of invasive species removal that create large areas with little to no vegetation should be replanted or seeded with native vegetation to facilitate colonization by native species. Areas of disturbance are prime for invasive species colonization, so it is important to re-establish native vegetation after removal of dense invasives. In forested areas, species to be planted should be similar to those found in the adjacent forested areas. Large-scale replanting is not expected to be necessary in the fields, as densities were not observed that would result in large areas of exposed soil after treatment.

12.2 FIELD

As outlined above, the open field portions of the site are a relatively uncommon habitat in the region. If the Town wishes to manage these fields, or a portion of them, for habitat for grassland birds, we recommend an annual, late season mowing to control the growth of shrubs and promote grassland habitat. The mowing should be performed after the breeding season for grassland birds, which typically occurs in spring and early summer.

If development of some kind is proposed for the fields and the Town desires to maintain some of the field habitat for birds, we recommend concentrating the development either near the shore, or near the site entrance (toward Rt. 123), so that a larger, unfragmented area of open field remains as intact habitat. Fragmentation of habitat can reduce the habitat value by dividing lands into smaller, more isolated areas that are not as attractive to wildlife species. Concentrating development on the edges of this habitat will maximize available habitat.

12.3 FOREST

The primary recommendation for the forested portion of the site is to develop a forest management plan. As described above, the forested area presently holds relatively little value for marketable timber. The site does not contain a large quantity of higher value saw logs and there is relatively little market for pulp at this time. However, the forest could benefit from active, stand-based management that includes a mix of silvicultural and harvest-related treatments and ultimately support the Towns larger resource management objectives. The creation of patch cuts and the selective cutting to create a mixed-age stand over time would be one means of enhancing the diversity and health of the woodland areas. A management plan should be developed or reviewed by a licensed forester and should be done in consultation with the Town so that invasive species management, or other development or use of the site, is considered during development of the plan. Any harvesting should also be actively coordinated with local educational efforts to help assure public acceptance.

If new development is planned for the site, we recommend avoiding development within the forested portion of the site. Impacts to the forested areas, specifically the wetlands, would be difficult to permit with state and federal regulators, given the available development area located in the fields. Because most of the forested area is wetland, or in close proximity to wetland, state and federal regulators would likely discourage development in the forest. The fields have seen past development and would be better suited to accommodate development, if proposed.

12.4 COASTAL

The shoreline at Mitchell Field is a high-value resource, both aesthetically and ecologically. If any shoreline development is proposed, we recommend the following to preserve natural resources at the site:

- Avoid development in or near the mapped eelgrass beds. Eelgrass is in sharp decline along the Maine coast, and efforts should be made to avoid these resources to the maximum extent possible.
- Utilize existing infrastructure as much as possible. Any development within the coastal wetland (dock, pier, jetty, etc.) will require natural resource permitting with state and federal regulatory agencies. They will look for the Town to avoid and minimize impacts to the maximum extent possible, which would include use of any existing infrastructure, if possible.
- Avoid development near the top of the forested portions of the coastal bluff. While these bluffs are rated as stable by the Maine Geologic Survey, there is evidence of erosion present. We understand there is discussion about potential low impact development in this area (e.g., a campground). The Town should avoid cutting significant amounts of vegetation near the top of the bluff. The root systems of the trees and shrubs in this area

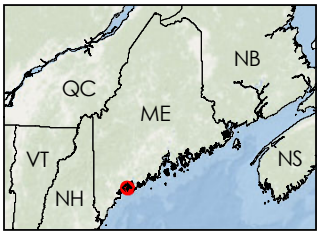
are the primary source of stabilization, and significant removal could potentially de-stabilize the bluff. The bluff is a sensitive area and care should be taken to minimize disturbance in this area, especially given the potential for increased erosion with projected sea level rise. Development should be sited at least 75 feet from the coastal wetland edge

12.5 STREAM RESTORATION

The Mitchell field site contains a perennial stream that roughly bisects the forested portion of the site, as described above. This stream appears to have been altered in the past, showing signs of ditching and channelization. However, it is still functioning as a stream and providing valuable habitat. If wetland or stream restoration is a desired management option for the Town, we recommend replacement of the existing culverts on the main stream with appropriately sized, open-bottom culverts or small bridges to facilitate fish passage and other aquatic organism movement through the system. Both culverts, one of which is located near the shore and one located along the main trail through the forest, are undersized and restrict downstream flow and upstream aquatic passage. The culvert in the forest is perched, preventing upstream fish passage. While not a priority for management of the site, this stream restoration would not only increase the functional value of the stream and the adjacent wetlands, but it would also present a unique educational opportunity (based on proximity to trails) for the public to learn about proper stream crossing techniques. Grant money is available for projects such as these, which could help if funding is limited within the Town.

Appendix A FIGURES

\\us1241-f01\workgroup\1956\active\195601318\03_data\gis_cad\gis\MXDs\01318_01_LocationMap.mxd Revised: 2017-07-31 By: bkramer



Legend

- Mitchell Field Project Boundary
- Tax Parcels

0 1,000 Feet

1 inch = 1,000 feet (At page size of 8.5"x11")

Stantec

Project Location
Harpswell, ME

195601318
Prepared by EMK on 2017-05-24
Quality Review by KWH on 2017-05-30
Independent Review by BPE on 2017-05-31

Client/Project
Town of Harpswell
Mitchell Field Resource Assessment
Harpswell, ME

Figure No.
1

Title
Location Map

Notes
1. Coordinate System: NAD 1983 UTM Zone 19N
2. Base features provided by Maine Office of GIS.
3. Aerial imagery provided by ArcGIS Online World Imagery Mapping Service (http://server.arcgisonline.com/arcgis/services/World_Imagery/MapServer).

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\\us1241-f01\workgroup\1956\active\195601318\03_data\gis_cad\gis\MXDs\01318_02_Natural Community Map.mxd Revised: 2017-08-03 By: bkramer

Legend

- Mitchell Field Parcel Boundary
- Tax Parcels
- Natural Community Boundary

0 400 Feet
1:4,800 (At page size of 11x17)

Stantec

Project Location
Harpswell, ME

195601316
Prepared by EMK on 2017-05-25
Quality Review by KWH on 2017-05-30
Reviewed by BPE on 2017-05-30

Client/Project
Town of Harpswell
Mitchell Field Resource Assessment
Harpswell, ME

Figure No.
2

Title
Natural Community Map

Notes

1. Coordinate System: NAD 1983 UTM Zone 19N
2. 2013 Low Tide Imagery and tax parcels provided by Maine office of GIS.
3. Natural communities derived from Natural Landscapes of Maine: A Guide to Natural Communities and Ecosystems, Gawler and Cutko, 2010.

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\\us1241-f01\workgroup\1956\active\195601318\03_data\gis_cad\gis\MXDs\01318_03_WetlandRecon.mxd Revised: 2017-07-31 By: bkramer

Legend

- Mitchell Field Project Boundary
- Tax Parcels
- Vernal Pool Center Point
- Intermittent Stream (see note #5)
- Perennial Stream (see note #5)
- Vernal Pool (see note #5)
- Wetland (see note #5)

0 400 Feet
1:4,800 (At page size of 11x17)

Stantec

Project Location
Harpswell, ME

195601318
Prepared by EMK on 2017-05-25
Quality Review by KWH on 2017-05-30
Reviewed by BPE on 2017-05-31

Client/Project
Town of Harpswell
Mitchell Field Resource Assessment
Harpswell, ME

Figure No.
3

Title
Wetland Reconnaissance Map

Notes
1. Coordinate System: NAD 1983 UTM Zone 19N
2. 2013 Low Tide Imagery and tax parcels provided by Maine office of GIS.
3. Vernal pools surveyed in accordance with Maine Association of Wetland Scientists Vernal Pool Technical Committee Vernal Pool Survey Protocol, April 2014.
4. Delineated Wetland were located utilizing a Trimble GeoExplorer Series Receiver. Expected accuracy of GPS data is within 1 meter of actual position.
5. Wetlands, streams and vernal pool boundaries are based in a reconnaissance-level field survey and should be considered approximate.

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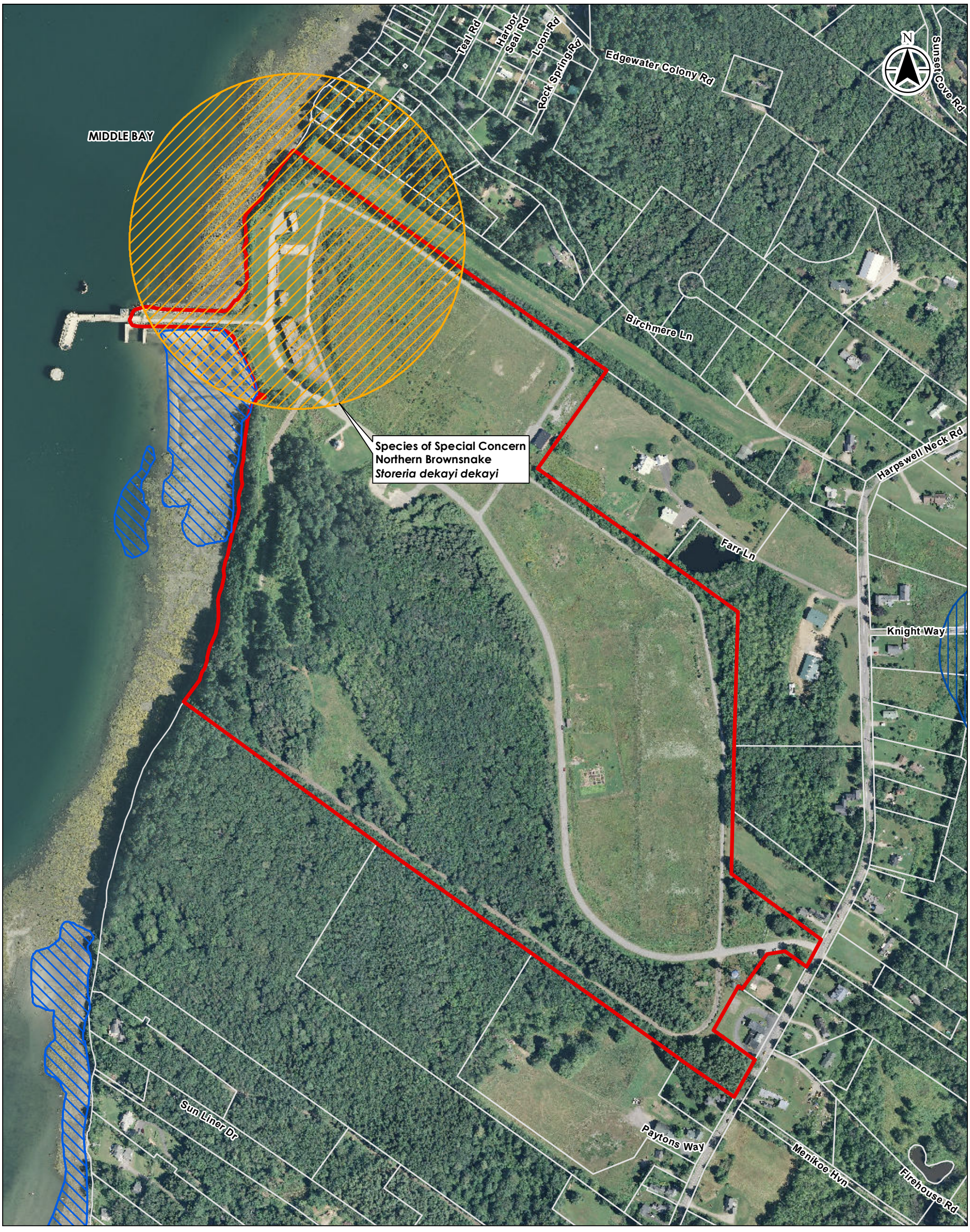
\\us1241-f01\workgroup\1956\active\195601318\03_data\gis_cad\gis\MXDs\01318_04_SignificantWildlifeHabitat.mxd Revised: 2017-07-31 By: bkramer



Legend

- Mitchell Field Project Boundary
- Tax Parcels
- Rare, Threatened or Endangered Wildlife
- Inland Waterfowl/Wading Bird Habitat
- Tidal Waterfowl/Wading Bird Habitat (BWH 2017)

0 400 Feet
1:4,800 (At page size of 11x17)

Stantec

Project Location
Harpswell, ME

195601318
Prepared by EMK on 2017-06-26
Quality Review by KWH on 2017-06-26
Reviewed by TT on 2017-00-00

Client/Project
Town of Harpswell
Mitchell Field Resource Assessment
Harpswell, ME

Figure No.
4

Title
Significant Wildlife Habitat Map

Notes
1. Coordinate System: NAD 1983 UTM Zone 19N
2. 2013 Low Tide Imagery and tax parcels provided by Maine office of GIS.
3. Significant wildlife GIS data layers provided by Beginning with Habitat (BwH) Program. State of Maine agency sources for BwH data include Department of Inland Fisheries and Wildlife, Department of Environmental Protection, and the Department of Conservation.

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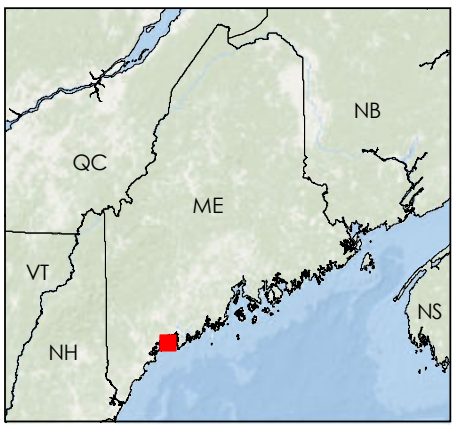
\\us1241-f01\workgroup\195\active\195601318\03_data\gis_cad\gis\MXDs\01318_05_MarineResources.mxd Revised: 2017-07-31 By: bkramer



Legend

- Mitchell Field Project Boundary
- Tax Parcels
- Eelgrass Beds (2013)
- Molluscan Shellfish (2010)
- Former Shellfish Habitat (1995)

0 400 Feet
1:4,800 (At page size of 11x17)

Stantec

Project Location
Harpswell, ME

195601316
Prepared by EMK on 2017-05-25
Quality Review by KWH on 2017-05-30
Reviewed by BPE on 2017-05-30

Client/Project
Town of Harpswell
Mitchell Field Resource Assessment
Harpswell, ME

Figure No.
5

Title
Marine Resources

Notes
1. Coordinate System: NAD 1983 UTM Zone 19N
2. 2013 Low Tide Imagery and tax parcels provided by Maine office of GIS.
3. Marine resource data obtained from Maine Department of Marine Resources (MEDMR), Maine Department of Environmental Protection and Maine Office of GIS.

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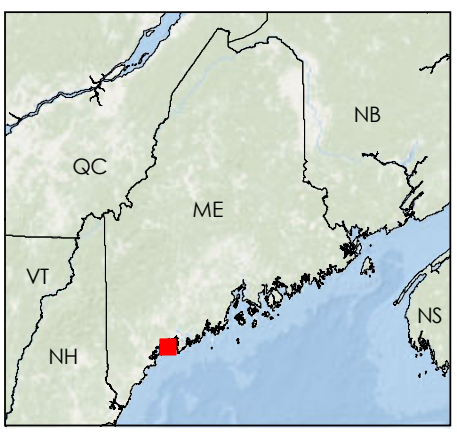
Soil Code	Soil Name	Drainage Class	% of site
Cu	Cut and fill land	Moderately well drained	48.1
DeB	Deerfield loamy sand, 3 to 8 percent slopes	Moderately well drained	3.1
LyB	Lyman loam, 3 to 8 percent slopes, rocky	Somewhat excessively drained	16.7
PkB	Peru fine sandy loam, 0 to 8 percent slopes	Moderately well drained	4.2
RbA	Ridgebury fine sandy loam, 0 to 3 percent slopes	Poorly drained	0.1
W	Water		0.9
Wa	Walpole fine sandy loam	Poorly drained	26.8



Legend

- Mitchell Field Project Boundary
- Tax Parcels
- Soils

0 400 Feet

1:4,800 (At page size of 11x17)

Stantec

Project Location
Harpswell, ME

195601318
Prepared by EMK on 2017-05-25
Quality Review by KWH on 2017-05-30
Reviewed by BPE on 2017-05-31

Client/Project
Town of Harpswell
Mitchell Field Resource Assessment
Harpswell, ME

Figure No.
6

Title
Soils Map

Notes
1. Coordinate System: NAD 1983 UTM Zone 19N
2. 2013 Low Tide Imagery and tax parcels provided by Maine office of GIS.
3. Soil Survey Geographic (SSURGO) Database was developed by the United States Department of Agriculture and the Natural Resources Conservation Service.

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\\us1241-f01\workgroup\1956\active\195601318\03_data\gis_cad\gis\MXDs\01318_07_InvasiveSpecies.mxd Revised: 2017-07-31 By: bkramer

Legend

Invasive Species Occurence and Abundance

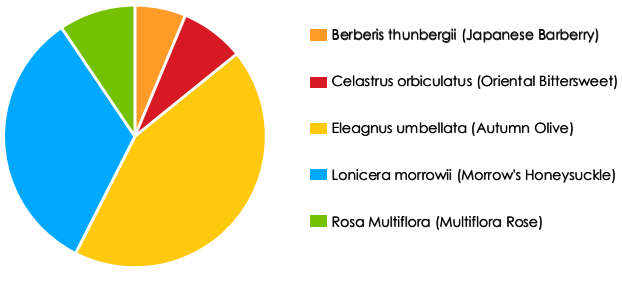
- Single Plant
- <10
- 10 - 100

Area of Invasive Species Occurence and Abundance

- <10
- 10 - 100
- 100 - 999
- >1000

- Mitchell Field Project Boundary
- Tax Parcels

Species Distribution



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Stantec

Project Location
Harpswell, ME

195601318
Prepared by EMK on 2017-05-25
Quality Review by KWH on 2017-05-30
Reviewed by BPE on 2017-05-31

Client/Project
Town of Harpswell
Mitchell Field Resource Assessment
Harpswell, ME

Figure No.
7

Title
Invasive Species Map

Notes
1. Coordinate System: NAD 1983 UTM Zone 19N
2. 2013 Low Tide Imagery and tax parcels provided by Maine office of GIS.
3. Invasive Species located utilizing a GPS enabled iPad field tablet computer with a Garmin Glo Bluetooth GPS/GNSS receiver.

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195601318

Legend - 2015 Highest Annual Tide (HAT)

- HAT w/2 Foot Sea Surge
- HAT w/3.3 Foot Sea Surge
- HAT w/6 Foot Sea Surge
- Mitchell Field Parcel Boundary

Notes

1. Coordinate System: NAD 1983 UTM Zone 19N
2. Aerial imagery provided by ArcGIS Online Bing Maps web mapping service. (http://www.esri.com/software/arcgis/arcgisonline/bing-maps.html).
3. The 2015 Highest Annual Tide (HAT) data was provided by the Maine Geological Survey. The data set includes the maximum predicted astronomical high tide for 2015 with sea level rise or storm surge of 1,2,3.3 and 6 feet along the Maine coastline. The data were developed using a static inundation model that uses LiDAR topographic data as a base digital elevation model, and first adjusts HAT tidal predictions to take into account variability in the water surface elevations along the Maine coastline, and then adds scenarios of 1, 2, 3.3, and 6 feet of either storm surge or sea level rise to that initial starting elevation.

Stantec

30 Park Drive
Topsham, ME USA 04086
Phone (207) 729-1199

Prepared by EPL on 2017-05-17
Quality Review by BPE on 2017-05-30
Independent Review by BPE on 2017-05-30

01318_Sea_Level_Rise.mxd

Client/Project

Town of Harpswell
Mitchell Field Resource Assessment
Harpswell, ME

Figure No.

8

Title

Sea Level Rise

7/31/2017

\\us1241401\workgroup\1956\active\195601318\03_data\gis_cad\gis\MXDs\01318_Sea_Level_Rise.mxd Revised: 2017-07-31 By: bkramer

Appendix B INVASIVE SPECIES MANAGEMENT PLAN

Invasive Species Management Plan for Mitchell Field

Harpswell Neck Road
Harpswell, Maine

Prepared for:
Town of Harpswell
P.O. Box 39
Harpswell, ME 04079

Prepared by:
Stantec Consulting Services Inc.
30 Park Drive
Topsham, ME 04086

August 3, 2017

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1.0 INTRODUCTION

The Town of Harpswell (Town) partnered with Stantec Consulting Services Inc. (Stantec) to perform a natural resources assessment of the Mitchell Field property on Harpswell Neck Road in Harpswell, Maine (site). As part of the natural resources assessment, Stantec conducted field surveys at the site to identify invasive plant species during the spring of 2017. Following the completion of field surveys, Stantec met with the Town to discuss management options for the invasive species identified on the site. This Invasive Species Management Plan (ISMP) provides Stantec's recommended strategy to manage invasive plant species and enhance the ecological value of the natural areas at the site. We understand that the Town is currently in the process of revising the Master Plan for the site; therefore, recommendations provided in this ISMP should be reviewed with the understanding that the recommendations may or may not coincide with the goals and objectives for management of the site. This ISMP includes information on existing invasive species observed and documented on site and recommended control strategies.

1.1 SITE DESCRIPTION

Mitchell Field is a former U.S. Navy fuel depot that was turned over to the Town in 2000. The property is approximately 120 acres and consists of roughly equal areas of open fields and forested area. The property is primarily undeveloped with a few abandoned former Navy buildings located near the waterfront. The site is used now for passive recreation, including walking, running, bird watching, and contains a network of paved and dirt/gravel trails.

1.2 INVASIVE SPECIES BACKGROUND

Invasive plants are non-native species whose introduction to an area causes or is likely to cause environmental or economic harm. Invasive plants often lack natural predators and can successfully colonize and thrive beyond their natural ranges, out-competing native plants. Generally, these species have competitive adaptations, aggressive reproductive strategies, and efficient dispersal methods. The spread of invasive plant species in both wetland and upland areas is a concern for both biological reasons (e.g., threaten global biodiversity, reduce wildlife habitat value) and cultural/economic reasons (e.g., adverse aesthetic effects, reduced recreational opportunities). At the site, the density and distribution of invasive species has the potential to reduce the enjoyment of the available trails, as well as reduce the conservation value of the site.

In January 2017, the Maine Department of Agriculture, Conservation and Forestry adopted rules that prohibit the sale or distribution of 33 terrestrial plant species determined to meet certain invasive plant criteria. The rules define the process by which invasive plants were determined to be invasive and lists whether each species is currently invasive, likely invasive, or potentially

invasive. The species listed in the rule were the focus of the invasive species surveys performed by Stantec.

2.0 GOALS AND OBJECTIVES

The overall goal of this ISMP is to outline a plan to control the spread and reduce the density and distribution of populations of invasive plant species located on the site. Implementation of the ISMP will serve to enhance the functions and values of the uplands and wetlands within the site and improve wildlife habitat. While complete eradication of invasive species is not a stated or realistic goal, this plan is designed to limit the spread and reduce populations of the identified species as much as possible. This ISMP includes the following objectives:

- Identify existing invasive species present on the site;
- Identify appropriate strategies for controlling the spread and reducing the populations of invasive species on the property; and
- Outline recommended priorities for control measures.

3.0 EXISTING CONDITIONS

During the spring of 2017, Stantec performed invasive species surveys throughout the approximately 120-acre site. The results of these surveys are provided on Figure 1. Note that due to the time of year of the surveys, some species were not readily identifiable and are not included on the figure. General information on additional species was collected by others during previous surveys and is included in this ISMP. The following species were identified in the project area by Stantec during the 2017 surveys:

- **Autumn olive (*Eleagnus umbellata*)** – Autumn olive is a deciduous shrub that grows to a height of 12 feet or more, with dark green leaves with the undersides covered in silvery-white scales, and often with thorns on the branches. Small, round, red and juicy fruits are produced in late summer and are the primary mode of reproduction. Autumn olive prefers full sun but can thrive in full or partial shade. It does not grow well in wet soils or densely forested habitats. Autumn olive was found primarily in the open field portions of the site.
- **Morrow's honeysuckle (*Lonicera morrowii*)** – Morrow's honeysuckle is a deciduous shrub that grows to a height of 10 feet or more. Larger plants have shaggy bark on the lower stem and larger twigs have a hollow pith, distinguishing it from native honeysuckles. Small, round, red and juicy fruits are produced in mid-summer and are the primary mode of reproduction. Morrow's honeysuckle is shade-tolerant and capable of invading intact forest stands. It is tolerant of wet soils, but does not thrive in permanently saturated soils.

Morrow's honeysuckle was found throughout the forested portions of the property, as well as on the forest edges.

- **Rambler rose (*Rosa multiflora*)** – Rambler rose (a.k.a. multiflora rose) is a deciduous shrub that can reach 20 feet tall and wide with arching stalks that can grow up and over small trees and shrubs. Stalks typically have thick, recurved thorns. Reproduction is either by seed or by re-rooting from the tips of twigs in contact with the ground. Rambler rose prefers full sun and dry soil but can tolerate shade and moist soils. It was found throughout the site, but more commonly in the fields and forest edges.

- **Asiatic bittersweet (*Celastrus orbiculatus*)** – Asiatic bittersweet is a perennial, deciduous, woody vine that can climb to the tops of full grown trees, or sprawl along the ground and over low growing vegetation. In the axis of the leaves, Asiatic bittersweet produces a yellow capsule which matures and splits open in the fall to reveal an orange-red fruit. These fruits can persist through the winter. The plant is more productive in full sun, but can tolerate shade and most soil types. At the site, Asiatic bittersweet was found primarily on the forest edges, with relatively little found in the forest interior or in the fields.

- **Japanese barberry (*Berberis thunbergii*)** – Japanese barberry is a perennial, deciduous shrub that grows up to 6 feet tall, with arching stems containing small spines. Plants produce red, oblong fruits along the branches in late summer, which is the primary mode of reproduction. Japanese barberry grows well in full sun or shade and can overtake a forest understory, but is generally not tolerant of wet soils. At the site, Japanese barberry was found throughout the forest and forest edges.

Stantec's survey was conducted May 2017, before some perennial, herbaceous species had sprouted. Using publicly-available information obtained from the Maine iMapInvasives web site[1], we noted that the following species were also documented on the site by others. Stantec was not able to confirm the presence of these species prior to issuance of this plan.

- **Garlic mustard (Alliara petiolata)** – Garlic mustard is a biennial herb that produces a basal rosette in its first year of growth, followed by a flowering spike in its second season with small, white, 4-petaled flowers. Each plant produces hundreds of tiny seeds, and the plant dies after seeds are set. Garlic mustard is shade tolerant and grows well in the forest understory, often overtaking the herbaceous layer out-competing native species. Garlic mustard was documented in the forested portions of the site.

- **Spotted knapweed (Centaurea stoebe)** – Spotted knapweed is a biennial or short-lived perennial. Spotted knapweed forms a basal rosette in its first year, followed by flowering stems that are 8 to 50 inches tall in subsequent years. Flowers are purple to pink and are visible from June to October. Spotted knapweed was documented in the field portions of the property.

[1] Maine Natural Areas Program, Invasive Plants, iMapInvasives
http://www.maine.gov/dacf/mnap/features/invasive_plants/imap.htm

4.0 INVASIVE SPECIES CONTROL STRATEGIES

4.1 TYPES OF CONTROL

There are 4 primary types of invasive species control methods: cultural, mechanical, chemical, and biological. These control methods may be combined to provide a more effective control strategy.

4.1.1 Cultural Control

Cultural controls are important methods to reduce the spread of invasive species to areas not previously colonized. Methods such as immediate seeding and mulching of disturbed soils in order to establish native vegetation are effective at minimizing the opportunities for the establishment of invasive species.

4.1.2 Mechanical Control

Mechanical control measures such as digging, pulling, and cutting may be effective in controlling isolated invasive plants or small stands of plants. These methods are often necessary in sensitive natural resource areas such as wetlands and streams, or where chemical control is not permitted or ecologically appropriate. However, such techniques may be labor-intensive and may be impractical in areas with dense infestations of invasive species.

4.1.3 Chemical Control

Chemical control (i.e., herbicides) is a common method of controlling invasive species. If used selectively and in limited areas, herbicides can be applied in an environmentally sound manner to provide effective control. In addition, herbicide applications often provide the most cost-effective method for controlling dense infestations of invasive species. However, the Town's Outdoor Pesticide Control and Fertilizer Use Ordinance prohibits the use of pesticides within 25 feet of the upland edge of a freshwater wetland, which may limit the ability to perform chemical control on the property.

4.1.4 Biological Control

Biological controls can be effective in controlling some invasive species under certain conditions but are not yet proven for the control of species present within the Project Area. At this time, the use of biological controls is unlikely to be recommended for this Project.

4.2 PRIORITY RECOMMENDATIONS

Stantec understands the Town is in the process of revising the master plan for the site and goals for invasive plant management will be included in that process. Prioritizing control will depend on the Town's goals for management, available resources, and funding for control efforts. The

sections below provide Stantec's recommendations for invasive species management based on our experience and current understanding of the goals for Mitchell Field. Additional options are provided that may be included depending on the Town's priorities.

4.2.1 Species Priority

Of the species present within the site, Asiatic bittersweet presents the largest threat to the natural communities and forested portions of the property. Its ability to climb up, entangle, and overcome large trees presents a significant threat to tree species on the site. We recommend making control of bittersweet, specifically the areas where it is climbing up and over trees, the top priority for invasive species control.

Secondarily, the shrub species on the site (autumn olive, Morrow's honeysuckle, rambler rose, and Japanese barberry) should be considered the next highest priority. These species outcompete native species and take over a forest understory or dominate old field habitat, produce fruits with poor nutritional value for birds and other wildlife, and are avoided by wildlife (e.g. white-tailed deer [*Odocoileus virginianus*]) who browse on shrubs. These characteristics make them a threat to the species diversity and the ecological function of the site. They can outcompete native shrub and shade out herbaceous species resulting in dense monocultures of invasive species. To maintain biodiversity and a healthy wildlife community on the site, control of these species is recommended.

Managing the herbaceous species (garlic mustard and spotted knapweed) would be considered the lowest priority. While these species are definitely invasive and capable of outcompeting native herbaceous plants, they present less of a threat to the ecological communities present at this site than the aforementioned species.

4.2.2 Location Priority

Prioritizing locations to control invasive species may be an effective way to begin a management plan at the site given the distribution of invasive species throughout the site. However, prioritizing locations will depend on the Town's management goals for the site. Generally, we recommend starting a control plan in areas were invasive species density is lowest, and control is manageable. For this site, that could mean focusing on the interior wetland areas and the upper field. In these areas, density and distribution of invasive species is lower, and control may be more successful. However, given the densities of some of the species at the site, we recommend starting with the dense areas where the health and stability of the forested areas are under threat. We recommend performing an initial broad treatment operation to knock down the large, dense populations that are presenting a threat to native species, then in subsequent years treating the remaining populations.

Alternatively, the Town may choose to set priorities for control based on public use of the property. For example, the shoreline is a popular location for visitors to Mitchell Field. If public enjoyment of the site is a priority, it may make sense to prioritize control in the shoreline area, to provide a more positive recreational experience. Further, controlling invasives along the existing

trails may create a more "natural" feeling for users of the property. Prioritization of location should be considered by the Town based on management goals for the property.

4.3 CONTROL OF EXISTING INVASIVE SPECIES

Given the density, distribution, and variety of invasive species present within the property, we recommend that invasive species control be performed by an experienced contractor. Using a contractor with experience performing a variety of control methods will be the most efficient and cost-effective. It will also be important for the Town to identify priorities for invasive species control (see Section 4.2 above). The Town's priorities and the budget available to perform the work will influence the planning and implementation of the control methods.

Successful control of invasive species at this site will take multiple years. Therefore, we assume the recommendations provided below will be carried out over multiple years and may need to be adjusted over the management period. Adaptive management is essential in implementing a successful invasive species control plan. Control efforts should be evaluated annually to assess their efficacy and should be adjusted, if necessary, to achieve effective control of the species or meet the priorities of the Town.

4.3.1 General Best Management Practices for Invasive Species Control

The following best management practices should be followed for any invasive species control carried out on the site:

- Any invasive plant material that is cut, pulled, or otherwise removed from the site should be disposed of in a landfill or incinerator.
- Invasive plant material removed from a site should never be added to compost piles or disposed of in adjacent, un-infested areas.
- During manual removal, care must be taken to avoid creating erosion concerns or exposing large areas of soil.
- Any large areas of exposed soil should be reseeded with a native species seed mix and should be covered with erosion control materials.
- No herbicide applications may be performed within 25 feet of the high-water line of a stream, highest annual tide of a coastal wetland, or the upland edge of a freshwater wetland, as detailed in the Town ordinances, unless a waiver is granted by the Conservation Commission.
- Any herbicide applications must be performed according to product labels and according to applicable laws and regulations put forth by the Maine Board of Pesticides Control (BPC), the Maine Department of Environmental Protection, and the U.S. Environmental Protection Agency.
- Herbicide applications must be performed by Maine licensed applicators with experience applying herbicides to control invasive plant species. At least one individual from any company applying herbicides on the property must also hold a Commercial Master License issued by the BPC.

- Herbicide applicators will utilize appropriate personal protective equipment during applications and will be properly trained in the use of all herbicides prescribed for treatment.
- No herbicide applications will be performed when it is raining, when rain is expected in the next 12 hours, or when wind speeds exceed 15 miles per hour.
- Herbicide applicators will post signs prior to initiation of herbicide application. The signs will display the name of the contractor, contact information, and the products used. Signs will remain in place for at least 48 hours following completion of the application.

4.3.2 Species-Specific Control Recommendations

Because of the variety of species located on the property, and the variety of habitats in which they occur, a range of control options is provided for each species listed below. The appropriate control method should be chosen based on the specific location of each occurrence, as well as the characteristics of the populations (density, size, presence of sensitive resources and/or native plants, etc.). Herbicide applications should be performed according to the specifications provided on the product label.

4.3.2.1 Autumn Olive

- Small shrubs and small populations can be hand pulled, or removed with hand tools (e.g., shovel, mattock, or weed wrench). Care should be taken to remove as much of the root as possible.
- Large shrubs are difficult to remove by hand, and autumn olive resprouts aggressively when cut. Cutting the stump near ground level and applying herbicides to the cut stump is recommended when it occurs outside setbacks from wetlands and streams. In areas where herbicide applications are not permitted, large plants can be cut multiple times throughout the season (at least 3 times) and should be timed so that plants are not able to produce fruit. Several years of repeated cutting will be required to provide control using this method.
- After removing the large shrubs, regular mowing or burning of the fields can control this species over the long term. Mowing and/or burning should be performed in mid-summer so that plants are not able to produce fruit.

4.3.2.2 Morrow's Honeysuckle

- Small shrubs and small populations can be hand pulled, or removed with hand tools (e.g., shovel, mattock, or weed wrench). Care should be taken to remove as much of the root as possible.
- Large shrubs are difficult to remove by hand and Morrow's honeysuckle resprouts aggressively when cut. Cutting the stump near ground level and applying herbicides to the cut stump is recommended when it occurs outside setbacks from wetlands and streams. In areas where herbicide applications are not permitted, large plants can be cut multiple times throughout the season (at least 3 times) and should be timed so that

plants are not able to produce fruit. Several years of repeated cutting will be required to provide control using this method.

- For large populations in forested areas, foliar application of herbicide is effective at controlling populations. However, much of the forested area is wetland, and herbicide applications may not be permitted. Control of these large areas will be costly and time-consuming to be effective without the use of herbicides.

4.3.2.3 Rambler Rose

- Small shrubs can be removed using hand tools (e.g., shovel, mattock, or weed wrench). Care should be taken to remove as much of the root as possible. Hand removal of large plants is difficult due to extensive thorns on the stalks of the plant.
- Large plants and large populations can be treated with foliar application of herbicide. Due to rambler rose's arching branches and ability to grow on top of small trees and shrubs, foliar applications of climbing plants in forested areas can be difficult to perform without drift to non-target species.
- Removal of large shrubs in areas where herbicide application is not permitted will be difficult and time consuming. Large shrubs can be cut multiple times each year, over multiple years to gain control.
- After removal of large shrubs in the fields, regular mowing or burning can control this species over the long term. Mowing and/or burning should be performed in mid-summer so that plants are not able to produce fruit.

4.3.2.4 Asiatic Bittersweet

- The priority should be to remove Asiatic bittersweet from the forested areas to avoid additional damage to the trees. The vines in trees provide greater seed dispersal because seeds are more available for birds, and are dispersed more widely through seed drops from the canopy. Vines should be cut near ground level. Cut vines should be left in the trees to dry out and should not be pulled down, as this can cause more damage to the trees.
- When cutting climbing vines, we highly recommend doing a cut-stump herbicide application to avoid resprouting. Cut vines, if not treated with herbicide, will resprout vigorously and resume climbing trees within a year or less.
- Large populations of bittersweet that are in open areas or low to the ground can be mowed repeatedly over several seasons to get control. However, mowing will need to occur for several years (5 or more) and the area should be replanted with native vegetation.
- Large, monoculture populations can also be treated with a foliar, broadcast application of herbicides.

4.3.2.5 Japanese Barberry

- Most shrubs and small populations can be hand pulled, or removed with hand tools (e.g., shovel, mattock, or weed wrench). Even large shrubs can generally be removed manually using a weed wrench. Care should be taken to remove as much of the root as possible.
- Large populations of Japanese barberry can be treated with a foliar application of herbicides. Japanese barberry is more susceptible to herbicide applications than other invasive species and can often be controlled in less time.

4.3.2.6 Spotted Knapweed

- Small populations can be hand pulled using small hand tools. Care should be taken to remove as much of the root as possible. Pulled plants should be removed from the site and burned or taken away as trash.
- Regular mowing or cutting can also be effective at reducing or eliminating populations. Mowing or cutting should be done multiple times a year to prevent seed production.
- Foliar herbicide applications are also effective on dense populations.

4.3.2.7 Garlic Mustard

- Small populations can be hand pulled using small hand tools. Care should be taken to remove as much of the root as possible. Hand pulling should be done before flowers are budding and before seed production. Pulled plants should be removed from the site.

- Cutting can be effective at controlling garlic mustard, but must be appropriately timed so as not to spread seeds. Manual cutting should be done with the flowers have begun to form, but have not yet opened. Because garlic mustard is a biennial, cutting before flowering and seed set can be effective control.

- Large, dense populations can be treated with a foliar application of herbicides. Garlic mustard is often leafing out before native species and can be treated earlier in the season for effective control, and reducing potential impact to native species.

4.3.3 Adaptive Management

A successful management plan is dependent on regular monitoring to assess the effectiveness of control efforts. The strategies described above are designed to address the identified invasive species based on current knowledge of the site. As population densities change through invasive plant removal, and as priorities for the property change, it may be necessary to adjust the strategies described in this plan. The control strategies described above may need to be adjusted, depending on emerging technologies and research, and on the results of continued management.

Appendix C REPRESENTATIVE PHOTOGRAPHS

Photo 1. Mitchell Field site showing open fields, looking west toward the ocean.
Stantec, May 18, 2017.

Photo 2. Mitchell Field waterfront showing abandoned Navy buildings and existing pier and jetty.
Stantec, May 18, 2017.

Photo 3. Even-age white pine stand along trail through center of forested area.
Stantec, May 5, 2017.

Photo 4. Red Maple Swamp located in forested portion of the site.
Stantec, May 11, 2017.

Photo 5. Red Maple Swamp in forested portion of the site.
Stantec, May 11, 2017.

Photo 6. Coastal wetland along shoreline of Mitchell Field, looking south. Existing jetty and pier are visible in the background. Stantec May 17, 2017.

Photo 7. Coastal wetland and beach area, looking east from end of the jetty.
Stantec, May 17, 2017.

Photo 8. Naturally occurring vernal pool located in forested wetland portion of the site.
Stantec, May 5, 2017.

Photo 9. Naturally occurring vernal pool in forested wetland portion of the site.
Stantec, May 5, 2017.

Photo 10. Man-made vernal pool in former ice skating rink in upper field.
Stantec, May 5, 2017.

Photo 11. Perennial stream running through center of forested portion of the site. Stantec, May 11, 2017.

Photo 12. Perennial stream in center of forested wetland. Note perched culvert carrying stream under a trail. Stantec, May 11, 2017.

Photo 13. Perennial stream running through culvert near the outlet with the ocean. Stantec, May 11, 2017.

Photo 14. Area of historic ditching and channelization of the perennial stream in the forested wetland. Stantec, May 11, 2017.

Photo 15. Autumn olive shrubs in open field. Shrubs in center of photo are all autumn olive. Stantec, May 17, 2017.

Photo 16. Dense Asiatic bittersweet climbing on native and invasive shrubs in forested portion of the site. Stantec, May 11, 2017.

Photo 17. Morrow's honeysuckle at the edge of the white pine stand.
Stantec, May 11, 2017.