Capisic Pond Habitat Restoration and Enhancement Project

Capisic Pond Park in Portland, Maine

Year Three Post Construction Monitoring Report

DECEMBER 2019

Prepared By:

Flycatcher LAND + SCIENCE + PEOPLE

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1.0 PROJECT OVERVIEW

As requested by Woodard & Curran on behalf of the City of Portland (the City), Flycatcher LLC (Flycatcher) has prepared the following 2019 Year 3 Post-Construction Monitoring Report for the Capisic Pond Habitat Restoration and Enhancement Project (the Project) located in Portland, Maine. The Project was approved in 2014 by the U.S. Army Corps of Engineers (USACE) New England District (Permit #NAE-2014-00383), the Maine Department of Environmental Protection ((MDEP) Permit #L-26292-TF-A-N/L-26292-IW-B-N), and by the City of Portland Planning Board (Project ID #2013-268).

The Project site is located within Capisic Pond Park on the north side of Capisic Street. Capisic Pond is a 4.5-acre, manmade freshwater pond and is the largest freshwater waterbody in Portland. Fed primarily by Capisic Brook, the pond flows from north to south. The pond is formed by a dam, dating back to the 1600s, at its south end. The pond and surrounding area are mapped by the Maine Department of Inland Fisheries and Wildlife (MDIFW) as a moderate-value Inland Wading Bird and Wildlife Habitat (IWWH). The trails and open spaces of Capisic Pond Park are frequently used by the public, including hikers, runners, bird watchers, and dog walkers. The overall goal of the Project was to restore a larger open water component to the pond and to increase habitat diversity interspersion along the shoreline.

The construction portion and replanting efforts associated with the Project were completed in the fall of 2016. The first two years of post-construction monitoring were conducted in 2017 and 2018. Monitoring reports were provided to the USACE New England District and the MDEP. The Conclusions section of the 2018 monitoring report noted: “Results from the second-year monitoring effort indicate that the enhancement measures are trending towards achievement of the stated project goals. No significant concerns were noted during site visits conducted in 2018. No plant replacements are recommended.”

Data collected during the 2019 monitoring effort indicate that the plant density and diversity within the restoration components of the Project area is high, except for one small area that was also sparse in 2018 (herbaceous plot 1). Native planted and volunteer plants are well established and thriving in several of the planting areas on the Project. The 2019 monitoring session noted new populations of invasive plant species, primarily common reed (*Phragmites australis*). Remediation recommendations for vegetating herbaceous plot 1 and a smaller section in plot 2 and managing invasive plants are further discussed in Section 5.

2.0 GOALS AND OBJECTIVES

Historically, Capisic Pond was dredged on a regular basis and had a much larger open water component than it had in the late 2000s. The pond is mapped by the MDIFW as a moderate-value Inland Wading Bird and Waterfowl Habitat (IWWH). IWWH’s are ranked based on several criteria, including the habitat diversity and interspersion of habitat types around an open water feature. In recent decades, the pond filled in with silt and sediments, fostering rapid colonization by cattails (*Typha latifolia and T. glauca x)* and a significant loss of open water. Diversity and

interspersion had drastically reduced due to the loss of open water and cattail monoculture. The objectives of the Project were therefore to restore a larger open water area and restore habitat diversity and interspersion of habitat types.

To achieve these goals, the Project established a plan to dredge the pond, remove cattails, and restructure portions of the pond shore to support a wider variety of wetland vegetation and habitats.

The Project involved mechanical excavation, dredging, and removal of more than 16,000 cubic yards of sediments from the pond. A portion of the dredged material was used onsite to create a habitat transition zone within the wetlands and uplands along the shoreline. Following dredging and earthwork, an extensive planting plan was implemented in the transition zones between the open water and the (mostly forested) uplands surrounding the pond. The planting plan was designed to increase ecosystem diversity and to also maintain high aesthetic appeal for users and abutters of the Park. The landscape plan was designed by, and implemented under, the supervision of a Professional Wetland Scientist and a Professional Landscape Architect to help ensure these objectives were met.

As a part of assessing whether the Project is successfully attaining set goals, the MDEP and USACE permits require the applicant to monitor planted vegetation success. As described in the MDEP permit, "the applicant shall monitor the plantings for survival and replace and maintain plantings to achieve an 85% survival after one full growing season." As detailed by the U.S. Army Corps of Engineers, the permittee (City of Portland), must monitor the site and implement remedial measures "for a period of five (5) years commencing with the first growing season after construction is completed as described in the monitoring plan."

A goal of this monitoring report is to provide the findings of the 2019 monitoring effort and provide follow-up recommendations for 2020. Additional monitoring and success criteria are further detailed in Section 4.0. Monitoring requirements were also described in the "Capisic Pond Enhancement Project Monitoring and Management Plan" (Boyle Associates, 2014 –referenced by the USACE permit).

Data collected during this third year of monitoring at the Project are discussed in the following sections.

2.1 Baseline Data and Plot Establishment

To assist in annual monitoring efforts, following plant installation in the fall of 2016, seven permanent woody shrub monitoring sites and four permanent herbaceous monitoring sites were selected in representative locations throughout the wetland enhancement area. Monitoring plot locations are depicted on Figure 1. At each of the 11 monitoring sites, Flycatcher determined the most appropriate plot type and size for baseline data gathering and future plant monitoring based on conditions at the time of selection. Three types of plots were used, including two 50-foot by 20-foot rounded transects; five circular plots; and four square plots (Table 1).

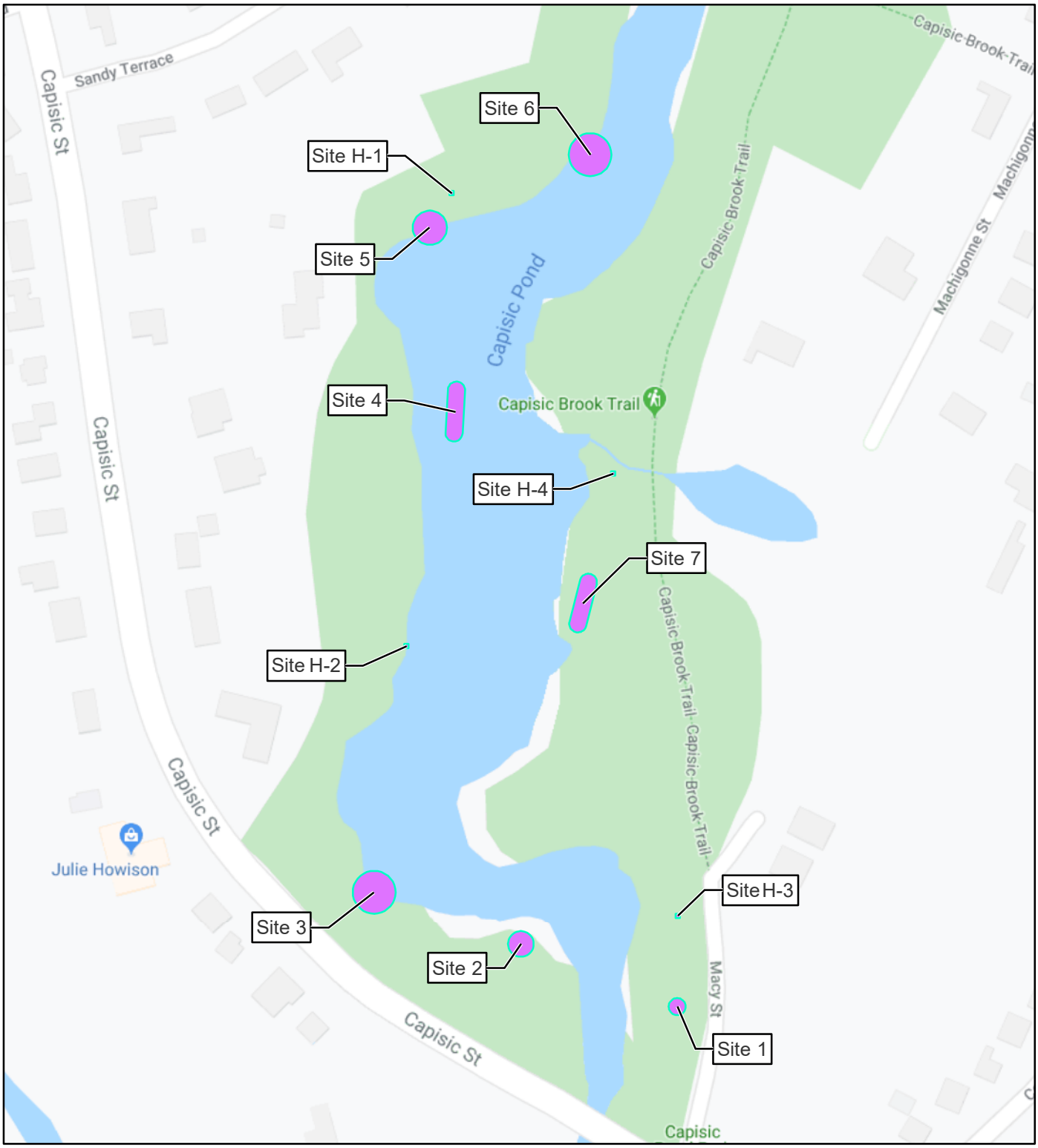
Plant success is measured by the percent survival of the vegetation planted onsite. The baseline vegetation monitoring plots described above were established in late 2016 by Wetland Scientists who visited the enhancement areas along the pond's edge. The survival/mortality rate will be

determined by the annual monitoring of established plots at the site and comparing these results to baseline data. Extrapolation of these plot data across the site provides an estimate of planted plant survival, as well as volunteer plant recruitment and overall site conditions.

Table 1. Woody and Herbaceous Plant Monitoring Plots

Plot ID	Plot Type	Plot Dimensions	Plot Area (square feet)	Vegetation Type
1	Circular	10’ radius (r)	314	Woody
2	Circular	15’ r	707	Woody
3	Circular	25’ r	1,963	Woody
4	Transect	50’ x 10’ x 10’	1,314	Woody
5	Circular	20’ r	1,256	Woody
6	Circular	25’ r	1,963	Woody
7	Transect	50’ x 10’ x 10’	1,314	Woody
H-1	Square	5’ x 5’	25	Herbaceous
H-2	Square	5’ x 5’	25	Herbaceous
H-3	Square	5’ x 5’	25	Herbaceous
H-4	Square	5’ x 5’	25	Herbaceous

Woody and herbaceous species were identified within each of the plots and documented on a plot-specific Monitoring Data Form. The vegetative cover of each herbaceous species identified within the plot was measured by percent areal cover. Invasive and volunteer species were also tallied within the eleven monitoring plots. The baseline monitoring report, including the data forms used to document vegetative species growing within the plots and findings of the baseline survey, was provided in previous submissions and is available upon request.



BASE MAP FROM GOOGLE MAPS

1 " = 167 '
1:2,000

0 200 400 FEET

Legend

MONITORING PLOT

Flycatcher
LAND + SCIENCE + PEOPLE

PROJECT:

CAPISIC POND PARK
PORTLAND, MAINE

TITLE:

WETLAND ENHANCEMENT AREA VEGETATION MONITORING

DRAWN BY:	D. KENWORTHY
CHECKED BY:	R. JORDAN
MONTH:	DECEMBER
YEAR:	2019
PROJ. NO.:	019X
CLIENT:	WOODWARD & CURRAN

FIGURE 1

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3.0 SUMMARY DATA

As summarized in the 2018 monitoring report, after two growing seasons the Project achieved the objective of restoring large areas of open water.

After three growing seasons, the restoration site continues to trend successfully towards meeting the goals of increased habitat diversity and dispersion, and maintenance of aesthetically pleasant views for park users and neighbors. There is minimal erosion and vegetation is on track towards a predominance of native plants. Potential areas of concern include a newly established and robust stand of common reed and relatively sparse vegetation found in two of the eleven monitoring areas. Recommended mitigation for these concerns is included in Section 5.0.

Data is presented in Section 4.0. Photographs showing the changes and vegetative growth within each plot between 2017 to 2019 are included in Appendix B.

4.0 REQUIREMENTS

The primary objectives associated with the Capisic Pond Project are to increase ecosystem diversity and visibility of the open water by reducing the size of the cattail monoculture and increasing the interspersion of a variety of habitat types. Determining success and attainment of these goals will be decided through annual monitoring of vegetation, hydrology, soils, and other site-specific characteristics of the site.

A set of performance standards was identified in the Capisic Pond Enhancement Project Monitoring and Management Plan as guidelines to meet and ensure the long-term viability and continued success of project goals. A description of how the project is successfully meeting standards is provided in the following paragraphs.

4.1 Hydrology

Hydrologic conditions at the site were observed on several occasions throughout 2017, 2018, and 2019. No areas seemed too dry; however, some areas were inundated due to minor slumping along the edge of the pond. Additional willow and dogwood live stakes were installed in these slumped areas in 2018 to provide more stability. Overall, hydrologic conditions observed at the site are successfully supporting species planted and the slumping does not appear to have changed since 2017.

In some areas of the restoration area, the frequent inundation and soil saturation may be prohibiting the establishment of the some of the spruce trees planted over the previous few years. However, other wetland plants have filled in these areas and the existing forested edge is robust and healthy (despite existing populations of invasive plant species outside the restoration areas).

4.2 Diversity

Overall vegetation and habitat diversity throughout the site remains high and in line with project goals. The diversity goal of the project is to increase interspersion and availability of different types of habitat (open water, emergent wetland, shrub wetland, forest) within the park.

Based solely on examination of the plot data (Tables 2 and 3 in Section 4.4), the 2019 data may appear to indicate low diversity. However, the plots only assess the planted species within set footprints in the Project in which single species were clumped by design to create microhabitats of certain species. Review of the overall site data, including 2019 volunteer plant data (Appendix A) and photographs (Appendix B), indicates increased diversity over previous years.

4.3 Areal Cover by Non-Invasive Species

Overall the restoration areas are well vegetated (i.e. >85% aerial coverage overall). The site may require some additional plantings to achieve >85% cover in herb plot 1 and other discrete areas such as a small area in plot 2 and where common reed has established post remedial measures (see Section 5 for recommendations).

Several invasive species were observed on site (see Section 4.5); however, the invasive plants do not cover a large percentage of the overall restoration area. Two phragmites patches were noted on the southern and western shore of the pond. Monitors recommend controlling these patches in 2020 so they do not spread and reduce overall plant diversity or wildlife habitat within the Project area. Recommendations are provided in Section 5.

4.4 Woody Vegetation Areal Coverage (i.e. do the shrub enhancement areas have at least 60% cover by noninvasive hydrophytes, of which at least 15% are woody species?)

To account for planted shrub species mortality observed in 2017, 550 live stakes of dogwood and willow species were installed in 2018 throughout the restoration site. Upon inspection in 2019, most of the live stake plantings show new roots and new branch offshoot growth. Overall, the growth and sustained health of the live stakes is promising, as the plantings have continued to increase in aerial cover and density since the spring of 2018. As thickets created by these shrubs continue to mature, they help provide new habitats and shade out invasive species colonization and expansion within the Project area. Many volunteer wetland plants have begun to fill in spaces between planted shrub species (see Appendix A). Following this success, additional willow whip plantings are proposed for 2020 to increase aerial cover within herb plot one and plot 2, and perhaps where common reed control is implemented (see Section 5).

4.4.1 Monitoring Plot Data

The Project site is trending towards successful achievement of the Project Objectives. The following tables provide the monitoring plot data for the 2019 monitoring efforts. A list of volunteer species identified within the monitoring plots is provided in Appendix A.

Table 2. Woody Plant Plot Data

Plot	Monitoring year	Number of Living Woody Plant Species									Total	% Survivorship By Plot
		SAMCAN[a]	ALNINC	AROARB	LARLAR	VIBREC	CEPOCC	RHOVIS	SALIX	CORNUS		
P 1	2016	2	7								9	>100
	2017	2	7								9	
	2018	2	7								9	
	2019	2	9								11	
P 2	2016			16	2						18	78
	2017			16	1						17	
	2018			15	1						16	
	2019			13	1						14	
P 3	2016	8				31					39	51
	2017	0				22			1		23	
	2018	0				0[b]				40	40	
	2019	2				4			1	13	20	
T 4	2016	1				12	19				32	66
	2017	1				3[b]	9[b]				13	
	2018	1				0[b]	0[b]				1[b]	
	2019	1	5			5	10				21	
P 5	2016	10						23		5	38	71
	2017	3						0[c]		0[c]	3	
	2018	3							12	15	30	
	2019	3							2	22	27	
P 6	2016			10					18		28	>100
	2017			10					18		28	
	2018			7					34		41	
	2019	1		9					31		41	
T 7	2016					9				22	31	>100
	2017					5				15	20	
	2018					5			11	15	30	
	2019					17			5	17	39	
											Average Survivorship	**~94**

[a] SAMCAN = Sambucus canadensis; ALNINC = Alnus incana; AROARB = *Aronia arbutifolia*; LARLAR = *Larix laricina*, VIBREC = *Viburnum recognitum*; CEPOCC = *Cephalanthus occidentalis*; RHOVIS = *Rhododendron viscosum*; SALIX = Salix spp.; CORNUS = *C. stolonifera* and *C. sericea*

[b] Transect 4 was densely populated in 2017 with volunteer herbaceous species as shown in Photo 20. This dense growth encompassed the plantings, making it difficult to obtain an accurate count.

[c] Plot 5 was assessed in early 2017 and it appeared that wildlife (presumed Canada geese) had pulled out several of the Rhododendron plants exposing them to desiccation during the winter. A similar impact was noted in Herbaceous Plot H-1 (see Table 3). In 2019, vegetation stabilized in Plot 5 and although still sparse, began to establish in Plot H-1.

Table 3. Herbaceous Plant Plot Data

Plot	Monitoring year	Percent Areal Cover of Herbaceous Plant Species				Notes/Comments
		CARVUL[a]	SCIATR	SCICYP	Total	
H-1	2016	1	1	0	2	This plot was devoid of vegetation in 2017 and 2018. 2019 showed some new vegetation growth. See note [c] in Table 2. Woody plants are recommended to be installed in this area in spring 2020.
	2017	0	0	0	0	
	2018	0	0	0	0	
	2019	0	1	0	1	
H-2	2016	3	0	0	3	Plants are healthy and robust. Volunteer species were noted as dominant in the plot in 2018 and 2019.
	2017	0	100	0	100	
	2018	0	10	0	100 (with volunteer spp)	
	2019	0	15	0	100 (with volunteer spp)	
H-3	2016	7	8	0	15	Plants are interspersed and healthy in 2017, 2018, and 2019.
	2017	50	50	0	100	
	2018	50	50	0	100	
	2019	40	0	50	100 (with volunteer spp)	
H-4	2016	0	0	0	10	Plants are interspersed and healthy in 2017, 2018, and 2019.
	2017	33	33	34	100	
	2018	33	33	34	100	
	2019	50	0	45	100 (with volunteer spp)	

[a] CARVUL = Carex vulpinoidea; SCIATR = Scirpus atrovirens; SCICYP = Scirpus cyperinus

4.4.2 Tree Plantings

In the Fall of 2016, 62 trees were planted in strategic locations around the pond, as follows:

- 15 Red maple (*Acer rubrum*);
- 14 Serviceberry (*Amelanchier* spp);
- 14 White spruce (*Picea glauca*);
- 8 Larch (*Larix laricina*);
- 6 Black spruce (*Picea mariana*); and
- 5 Balsam fir (*Abies balsamea*).

During surveys conducted in 2017, six dead evergreens were identified, these were replaced in 2018 with six white spruce.

In 2019 investigators found a total of 44 planted tree species are still alive. Out of the six white spruce planted in 2017, five have survived. Other than the larch in the southern part of the site, which seem somewhat stressed potentially due to inundation, all other trees seem healthy and are thriving. No additional tree planting is proposed.

4.5 Invasive Species Control

Invasive species are prevalent in the areas surrounding and upstream from the Capisic Project restoration areas. Invasive species vectors are many, including animals, wind, humans, and Capisic Stream itself. In general, establishment of habitats stabilized by native vegetation is the

preferred method of preventing invasive species infestations from overtaking Capisic Pond. However, some invasive species control strategies and management will likely need to be included as the restoration area continues to mature.

The following invasive species were observed on the Project site in 2019:

- **Common reed (*Phragmites australis*)**
  - Common reed is found in two large patches on the western shore of Capisic Pond.
  - We recommend follow-up action to prevent further spread of this plant.
- **Broadleaved and Hybrid cattail (*Typha latifolia and T. x glauca*)**
  - Cattails are found here and there along the shoreline of the pond, although now only a small percentage of the pre-construction monoculture they once formed within the pond.
  - There are some larger stands on the water's edge within the restoration area, however they are still limited, and no control is recommended at this point.
- **Multiflora rose (*Rosa multiflora*)**
  - Multiflora rose comprised a significant portion of the understory of the Capisic Pond Park area surrounding the pond. While roses are present along much of the restoration area, they do not appear to account for significant coverage within the restoration area itself.
  - No recommendations for controlling roses in the restoration site are recommended at this point.
- **Purple loosestrife (*Lythrum salicaria*);**
  - Purple loosestrife is found in small patches and large individual plants located primarily along the inner edge of the restoration area along the pond. Loosestrife does not constitute a dominant plant (in terms of aerial coverage) in any of the monitoring plots.
  - Continued monitoring for this plant is recommended in successive monitoring seasons; however, there are no mitigation recommendations at this point.
- **Black locust (*Robinia pseudoacacia*)**
  - A few individual plants were observed growing within the restoration area. This plant is common in the park and within surrounding properties.
  - This plant tends to favor uplands, so it is unlikely to become a significant threat to the restoration area. However, it should be monitored and removed if it becomes a dominant feature in the drier reaches of the restoration area.
- **Japanese knotweed (*Fallopia japonica*)**
  - Like locust, this is not a dominant plant in the restoration area (a few small patches were noted). Knotweed is also common around and outside the restoration area.
  - This plant also tends to favor uplands, so it is not expected to become a significant threat to the restoration area.

- Knotweed should be monitored and removed if it becomes a dominant feature in the drier reaches of the restoration area.

- **Honeysuckle *(Lonicera spp.)***
  - A few individual honeysuckle plants were observed on the edges of the restoration area.
  - This plant is also common within the forested edge habitats within and adjacent to the Park.
  - No mitigation recommendations are suggested at this time.

- **Canada thistle *(Cirsium arvense)***
  - A few scattered individual Canada thistle plants were observed within and adjacent to the restoration area.
  - Thus far, this does not appear to be an aggressive colonizer, nor does it pose significant risk to the diversity within the restoration area.
  - No mitigation recommendations are being made at this time.

4.6 Development of Hydric Soil Conditions

In 2018 several soil profiles were investigated within the upper 24 inches of the ground surface. The soils were inspected for presence or indications of formation of hydric soils, defined by the USACE as soils "that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part"[1]. Soils within the restoration area were created from salvaged materials during the pond excavation, primarily consisting of settled silts and clay from historic flood events. The soil textures are a mix of fine silt and clay and the soils show signs of changes as anaerobic conditions facilitate the development of redoximorphic features. In some locations, a dark organic-rich mineral surface layer is beginning to develop within the top six inches of soil surface. Formation of organic-rich topsoil and the presence of new redoximorphic features are good indicators that the site is developing hydric soils due to frequently saturated and seasonally flooded conditions.

4.7 Wildlife Usage

Capisic Pond Park is a site frequented by birders. The park is listed on the Maine Birding Trail[2], and the Cornell Lab of Ornithology's eBird site indicates 201 species have been identified within the park[3]. A variety of bird species were observed at the Project site in late 2019, including black ducks, mallards, cormorants, several gull species, Canada geese, raptors, and numerous resident and migratory songbirds. Three small bird nests were observed within shrubs and planted trees within the restoration area in 2019. Turtles are also frequently seen during summer along the pond's edge and on basking rocks within the open water components of the pond. Tracks of fox, skunk and woodchuck were observed within the restoration area in 2019, and muskrat dens can be seen just north in the cattail-dominated upper reaches of Capisic Pond Park.

[1] USDA Soil Conservation Service. 1994. *Changes in hydric soils of the United States*. Federal Register 59(133):35680–35681, July 13, 1994.
[2] http://www.mainebirdingtrail.com/Sites/CapisicPondPark.html
[3] https://ebird.org/hotspot/L251784

4.8 Stabilization

The site is stable. No signs of erosion or sedimentation have been observed within the Project area. Much of the restoration areas of the site are layered with a biodegradable matting that has kept the soils covered since construction. The matting has also slowed revegetation but has kept the site stable and has successfully reduced competition for planted plants by preventing weed growth near planted shrubs and trees. The matting has begun to degrade in several areas, especially where exposed to long term moisture. However, these degraded areas are showing evidence of rapid revegetation.

There has been some slumping of the created banks along portions of the water's edge, most notable on the western side of the pond. There appear to be groundwater discharges in this area, as observed during construction by the Project engineer and wetland scientist. While slumping may continue until the bank is fully vegetated and stabilized, there do not appear to be any soil releases, and the entire bank is simply slowly sinking in discrete areas and otherwise not impacting the site's goals.

5.0 CONCLUSIONS

Plant and Diversity Success: Results from the third-year monitoring effort continue to show that the enhancement measures are trending towards achievement of the stated project goals. Additional replanting is recommended for plot H-1, plot 2, and following treatment of the common reed.

Human and Domestic Canid Intrusions: The park is very popular with local dog walkers, who outnumber most other visitors to the park. To limit wildlife and quality concerns associated with untethered dogs, the City of Portland has installed signs around the restoration area reminding people to avoid these sensitive areas. They have also installed several signs asking owners to keep dogs on a leash and to remove dog waste from the site. The City has also installed bag dispensers and waste receptacles at both ends of the trail in the park.

In previous monitoring years it was noted that despite the signage, people and dogs were tromping through several of the replanted restoration areas. In 2019, due to robust revegetation, monitors noted only a few small manmade footpaths to the water's edge. These trails do not appear to be impacting large areas and seem to be stable in their current states.

Other than continued maintenance of the metal signs installed around the pond's perimeter, no further recommendations are being made for these intrusions at this time.

Concerns & Recommendations: The following concerns were noted in 2019. This list also provides mitigation options that may help keep the Project trending towards successful accomplishment of its goals.

Herbaceous Plot 1: As in past years, herbaceous plot H-1 has remained sparsely vegetated (on the northern end of the restoration area).

Monitors recommend installing approximately 200 willow and dogwood whips and/or live stakes to the area around plot H-1. Willow whips could be harvested onsite prior to bud burst in the

spring of 2020. Alternatively, inexpensive whips and live stakes could be purchased from a nursery. Because plot H-1 is in a designed pond view area for abutting residences, only shrubby species should be chosen and installed.

Herbaceous Plot 2: Only a small area (~ 4 x 3 m) remains without vegetation due to coir fiber matting. It is recommended that approximately 100 willow and dogwood whips are installed here to help shade out and prevent colonization by invasive plants as the coir fabric begins to degrade.

***Common Reed*:** There is one new large stand and one small stand of common reed – both on the western shore of the pond.

Common reed is commonly found in aquatic and wetland sites where it can outcompete native marsh vegetation. Mechanical control (e.g. hand-pulling or excavation) is often impractical due to its extensive rhizome network and requires significantly more diligence in the long-term. The use of herbicides allows for greater control initially, especially for large infestations, than would be manageable with the use of mechanical treatment alone.

Both options are described below – one of these options (or other means of management) will be employed in 2020 and discussed in the 2020 monitoring report.

Mechanical Treatment: Mechanical (non-chemical) treatment of the common reed will require a more stringent labor effort than chemical control but may be the preferred method due to stakeholder concerns and the sensitive nature of being within Capisic Pond Park.

Mechanical control would require removal of the existing, above-ground biomass from the common reed stands. Due to the threat of impacting plantings in the surrounding restoration area, access by digging equipment to the common reed would be impractical. Thus, hand removal of the above-ground biomass would be required.

Following removal of the above-ground materials, the common reed areas would need to be covered with an impenetrable but groundcover/barrier. Ideally, this would be a heavy-duty but biodegradable coir fiber matting like the one installed in the restoration area in 2016. This has held up well in several areas through 2019. We would recommend a double layer of the matting to ensure coverage of the common reed and to prevent the tenacious grass from working through any gaps.

Following installation of matting, willow whips and live stakes would be driven through very small holes in the matting. These would be installed in a very dense configuration, approximately 18” to 24” on center. The goal would be to establish a thick tangle of woody vegetation that would create a shady understory and eventually outcompete common reed as/if it tries to reestablish after the matting begins to degrade.

Inexpensive live stakes should be purchased from a local nursery and installed while dormant in the spring or fall of 2020.

The treatment areas should be monitored on a regular basis (e.g. monthly) through the growing season to ensure no common reed is poking through gaps or from the outer edges of the matting.

Herbicide Treatment: Herbicide application would be the most effective and least-labor intensive method for common reed control. Additionally, a licensed pesticide applicator could treat other plants found sporadically within the restoration area at the same time (e.g. patches of purple loosestrife).

A non-selective (i.e. kills both grasses and broadleaf species) herbicide approved by the Maine Board of Pesticide Control for use in aquatic sites, such as Rodeo™ (active ingredient: glyphosate) or Habitat™ (active ingredient: imazapyr) can be used effectively to control phragmites. The use of any herbicide containing imazapyr should be avoided in areas where non-target kill is a greater concern; although both will kill vegetation indiscriminately, imazapyr will remain active in the soil for a period and continue to kill any exposed vegetation. A glyphosate formulation is typically preferred in sensitive areas where a dense native vegetation community is desired (e.g. Capisic Pond Park).

Application of Rodeo™ (recommended) to the phragmites at Capisic Pond can be performed via a low-volume backpack-foliar spray of a 2% solution, and/or hand-wiping of a 10% solution directly on the stems and leaves. Either of these treatments should be performed between peak bloom (late August) to the time of the first frost (mid-October). The foliar application allows for the efficient treatment of a larger area and should be confined to dense populations of phragmites to limit off-target kill. In areas of low stem density, hand-wiping can be very effective and greatly reduces non-target effects to the surrounding vegetation community. This method is labor intensive but can be highly effective.

Repeat applications 2-3 weeks apart within the same season should be considered to treat any stems that were missed or incompletely killed by previous applications, particularly in areas that received hand-wipe treatments. Additionally, a repeat effort the following growing season is generally recommended to ensure adequate coverage.

APPENDIX A

List of Volunteer Species Found in Monitoring Plots

List of Volunteer Species Found in Monitoring Plots at Capisic Pond Project Site (2019)			
Species	**Plant Type**	**% Areal Cover (herbaceous) or # of stems (woody) in Plot**	
Plot H-1		***% Cover***	***# Stems***
Several herbaceous volunteers noted	Herbaceous	6	
Plot H-2			
Blue vervain *(Verbana hastata)*	Herbaceous	20	
Purple-stemmed beggar-ticks (*Bidens connata*)	Herbaceous	50	
Calico aster *(Symphyotrichum lateriflorum)*	Herbaceous	5	
Plot H-3			
Purple-stemmed beggar-ticks *(Bidens connata)*	Herbaceous	10	
Plot H-4			
Southern arrow-wood *(Vibernum recognitum)*	Woody		15
Red stem dogwood *(Cornus stolenifera)*	Woody		8
Multiflora rose *(Rosa multiflora)*	Woody		20
Plot 1			
Purple-stemmed beggar-ticks (*Bidens connata*)	Herbaceous	15	
Virginia wildrye (*Elymus virginicus*)	Herbaceous	30	
Plot 2			
Red Maple *(Acer rubrum)*	Herbaceous	1	
Virginia wildrye (*Elymus virginicus*)	Herbaceous	20	
Indian grass *(Sorghastrum nutans)*	Herbaceous	5	
Plot 3			
Common winterberry *(Ilex verticillata)*	Woody		5
Lady's thumb *(Polygonum persicaria)*	Herbaceous	5	
Purple-stemmed beggar-ticks (*Bidens connata*)	Herbaceous	25	
Virginia wildrye (*Elymus virginicus*)	Herbaceous	40	
Transect 4			
Grey birch *(Betula populifofia)*	Woody		1
Quaking aspen *(Populous tremuloides)*	Woody		1
Virginia wildrye (*Elymus virginicus*)	Herbaceous	15	
Purple-stemmed beggar-ticks (*Bidens connata*)	Herbaceous	10	
Grass-leaved goldenrod (*Euthamia graminifolia*)	Herbaceous	20	
Blue vervain (*Verbena hastata*)	Herbaceous	15	
Common reed (*Phragmites australis*)	Herbaceous	5	
Calico aster *(Symphyotrichum lateriflorum)*	Herbaceous	25	
Cottongrass bulrush *(Scirpus cyperinus)*	Herbaceous	5	
Plot 5			
Virginia wildrye (*Elymus virginicus*)	Herbaceous	5	
Purple-stemmed beggar-ticks (*Bidens connata*)	Herbaceous	15	
Bird's foot-trefoil *(Lotus corniculatus)*	Herbaceous	5	
Bog muhly *(Muhlenbergia uniflora)*	Herbaceous	15	
Plot 6			
Grey birch *(Betula populifofia)*	Woody		1
Calico aster *(Symphyotrichum lateriflorum)*	Herbaceous	30	
Indian grass *(Sorghastrum nutans)*	Herbaceous	5	
Transect 7			
Red maple *(Acer rubrum)*	Woody		1
Common jewelweed (Impatiens capensis)	Herbaceous	5	

Calico aster *(Symphyotrichum lateriflorum)*	Herbaceous	5	
Multiflora rose *(Rosa multiflora)*	Woody		1

APPENDIX B

Site Photographs (2017, 2018, 2019)

Photo 1: Live stake plantings on western bank, facing north (May 2018).

Photo 2: Pussy willow shrubs thriving on northern bank, facing east (May 2018).

Photo 3: Dead evergreens were replaced on western bank (May 2018).

Photo 4: Significant growth in height of pussy willow shrubs (Nov 2018).

Photo 5: Plot H-1 (herbaceous, square plot, year 1). View of riparian planting area, facing northeast (12/1/2017).

Photo 6: Plot H-1 (year 2). Facing southeast. Cattail growth has increased to the north (11/7/2018).

Photo 7: Plot H-1 (year 3). Volunteer vegetation is beginning to spread into plot. View facing northeast (10/23/19).

Photo 8: Plot H-2 (herbaceous plot, year 1). View along edge of pond, facing northeast (12/1/2017).

Photo 9: Plot H-2 (year 2). View of plants along the edge of pond (11/7/2018).

Photo 10: Plot H-2 (year 3). View facing south (10/23/2019).

Photo 11: Plot H-3 (herbaceous, square plot, year 1). View facing south toward Capisic Street (12/1/2017)

Photo 12: Plot H-3 (year 2). View of sedges that have filled and are flourishing in plot (11/7/2018).

Photo 13: Plot H-3 (year 3). View of sedges and a few cattails, looking north (10/23/2019).

Photo 14: Plot H-4 (herbaceous, square plot, year 1). View facing north (12/1/2017).

Photo 15: Plot H-4 (year 2). View of robust vegetation, facing north (11/7/2018).

Photo 16: Plot H-4 (year 3). View facing north (10/23/2019).

Photo 17: Plot 1 (woody, circular plot, year 1). View facing north towards path to pond (12/1/2017)

Photo 18: Plot 1 (year 2). Picture shows extensive shrub and herbaceous growth. View facing north (11/7/2018).

Photo 19: Plot 1 (year 3). View facing north (10/23/2019).

Photo 20: Plot 2 (woody, circular plot, year 1). View facing west (12/1/2017).

Photo 21: Plot 2 (year 2). View facing west (11/7/2018).

Photo 22: Plot 2 (year 3). View facing west (10/23/2019).

Photo 24: Plot 3 (woody, circular plot, year 1). View facing southwest toward Capisic Street (12/11/2017).

Photo 25: Plot 3 (year 2). View of new live stake plantings (11/30/2018).

Photo 26: Plot 3 (year 3). View facing south (10/23/2019).

Photo 27: Transect 4 (woody, transect plot, year 1). View of linear transect 4 facing south (12/1/2017).

Photo 28: Transect 4 (year 2). View of heavy vegetative growth, facing south (11/7/2018).

Photo 29: Transect 4 (year 3). View facing east (10/23/2019).

Photo 30: Plot 5 (woody, circular plot, year 1). View facing southeast (12/1/2017).

Photo 31: Plot 5 (year 2). View showing sparse growth even with new live stake plantings (11/7/2018).

Photo 32: Plot 5 (year 3). View showing new growth meeting sparse area (10/23/19).

Photo 33: Plot 6 (woody, circular plot, year 1). View facing north (12/1/2017).

Photo 34: Plot 6 (year 2). View facing north (11/7/2018).

Photo 35: Plot 6 (year 3). View facing north (10/23/2019).

Photo 36: Transect 7 (woody, transect plot, year 1) - View facing north along transect (12/1/2017).

Photo 37: Transect 7 (year 2). View facing north along transect (11/7/2018).

Photo 38: Transect 7 (year 3). View facing north (10/23/2019).