Morses Pond Erosion Study
Wellesley, MA

FINAL - October 2016

Prepared for:
Wellesley Natural Resources Commission
Wellesley Community Preservation Committee

Prepared by:
Horsley Witten Group, Inc.

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Chapter 1

Introduction

1.1 Background

Morses Pond is a 104-acre, shallow pond in the northwest corner of Wellesley, MA. It is arguably the most important water resource in the Town, providing 40% of Wellesley's drinking water via the adjacent water supply wells and offering the only Town swimming beach. With a 5,300-acre watershed of mostly developed land (including the contributing watersheds to Boulder, Bogle, and Jennings Brooks), it is no surprise that the pond has been impacted by stormwater-related pollutants including sediment and phosphorus. In 2005, the Morses Pond Ad Hoc Committee developed the Morses Pond Comprehensive Management Plan with ENSR International (the "Plan"), which outlined management options to achieve the desired use goals. The priority goal for the pond is to preserve the long-term quantity and quality of drinking water from the nearby wells, with uses such as recreation, flood control, and wildlife protection listed as second and third level priorities. Non-motorized boats and boats with electric motors are allowed on the pond, but boats with gas motors are not permitted. The Town has been implementing water quality improvement recommendations from the Plan over the past ten years, including in-pond measures (e.g., dredging, macrophyte harvesting, etc.) and watershed measures (e.g., demonstration rain garden at Morses Beach and homeowner rain barrels/rain gardens campaigns with the Friends of Morses Pond Association).

1.2 Purpose

This study addresses one of the sediment sources to the pond – shoreline erosion. The purpose of the study was to assess the entire shoreline of Morses Pond to determine: (1) the locations and extent of erosion; (2) appropriate stabilization and restoration measures based on cause(s) of erosion and surrounding land and pond use; (3) a method for prioritizing restoration efforts; and (4) an implementation plan that outlines the necessary next steps and planning-level costs.

1.3 General Characterization of the Study Area

The surrounding land is a combination of private and town-owned land; and the land use is mostly low to medium density residential and park land, with some commercial and transportation land uses along the northern end of the pond and a municipal (Town of Natick) maintenance facility along the western edge. The road network in the residential areas is comprised of narrow, low-volume streets with minimal existing stormwater infrastructure or management. Extensive trails and park lands abut Morses Pond, providing excellent recreational opportunities to the public.

1.4 Field Reconnaissance - Methods

Desktop Analysis

A desktop analysis was performed of the Morses Pond shoreline and surrounding area using all available existing information in order to pre-identify areas prone to erosion as well as to identify plant communities that were likely to be present. Corresponding GIS maps were created for subsequent field assessment efforts. Available spatial data on drainage and site conditions (e.g., soils, land use, land cover, impervious area, topography, slope, and streams) was used to create the maps.

Shoreline Assessment & Plant Community Mapping

On October 5, 2015, condition of the entire Morses Pond shoreline was assessed from the water in a canoe. The pond shoreline condition was documented with a site evaluation form that highlighted the overall shoreline condition, the shoreline slope, vegetative cover, geometry, and potential restoration concepts. Erosion and impacts to the riparian buffer such as encroachment, excess lawn fertilization, or unmanaged access were documented where visible.

An inventory of major plant communities visible from the shoreline was also conducted, using the Swain and Kearsley (2011)[1] classification method. Major plant communities were mapped, and dominant plant species were documented. Particular attention was paid to areas with invasive species. Since invasive species tend to thrive in disturbed, eroded conditions, they were used as indicators for problem areas. During the field assessment, outstanding habitat features, areas for habitat improvements or restoration, and opportunities for educational signage were also noted.

For both the shoreline erosion assessment and plant community inventory, a hand-held data collection device (iPad with GISPro™ capabilities) was used. The site evaluation form was added to the tablet prior to field work so that all sites could be assessed similarly and ranked on an equal scale. Other features that were observed and documented with the tablet include shoreline erosion extent, recommended restoration measures (e.g., outfall stabilization, buffer planting, slope stabilization, etc.), notable landmarks, drainage outfalls, and approximate trail and pond access points. The resulting field forms including photos are included in **Appendix A**.

[1] Swain, P.C. and J.B. Kearsley. 2011. Classification of the Natural Communities of Massachusetts. Version 1.4. Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries and Wildlife. Westborough, MA. URL: http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/natural-communities/classification-of-natural-communities.html#

Document Path: H:\Projects\2015\15120 Morses Pond Erosion Study\GIS\Maps\160930_Morses_Pond_Fig1_15120.mxd

Legend

*GIS Data - MassGIS and the Town of Wellesley

- Parcels
- Town of Wellesley Parcels
- Wellesley Conservation Council Parcels
- Town of Natick Parcels
- Estimated Morses Pond Shoreline
- Streams
- 2-ft Contours

Town of Wellesley Stormwater Infrastructure - Morses Pond Drainage:

- Storm Drains
- Catch Basins
- Manholes
- Stormwater Outfalls

N

0 750

1" = 750 feet

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90 Route 6A • Sandwich, MA • 02563
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General Characterization
Morses Pond Shoreline
Restoration Implementation Plan
Wellesley, MA

Date: 9/30/2016

Figure 1

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Chapter 2

Morses Pond Evaluation - Findings

This chapter summarizes the findings from the field assessment of the Morses Pond shoreline. It is broken down into three sections: Plant Community Mapping, Invasive Species Inventory, and Shoreline Restoration sites.

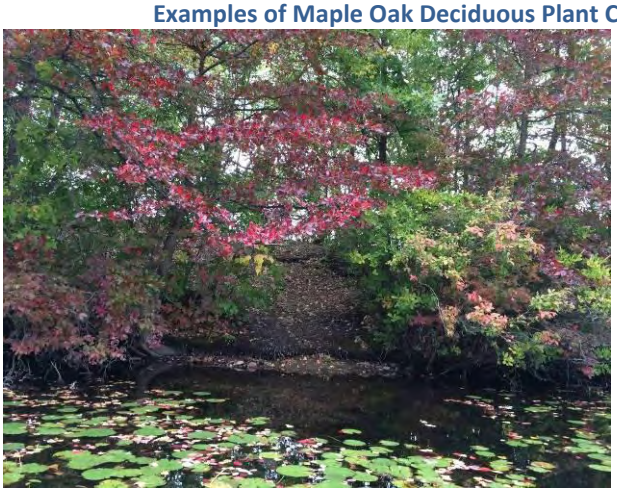
3.1 Plant Community Mapping

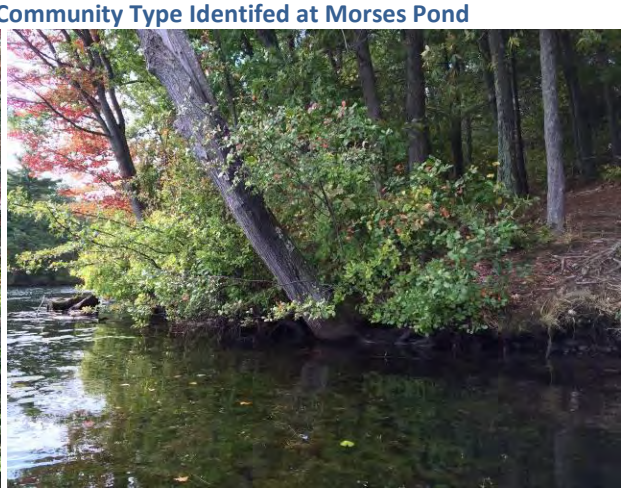
During the field assessment, 14 different Plant Communities were identified along the 3.9 mile shoreline of Morses Pond. The majority (53%) of the shoreline is covered with a naturally vegetated buffer ranging from upland communities like Maple Oak Deciduous (18% of total shoreline) to wetland communities such as Emergent Marsh (16% of shoreline). Landscaped Lawn areas covered 38% of the shoreline (~1.5 miles), with the remainder comprised of beach and other bare areas. The plant communities are mapped on **Figure 2,** and summarized in **Table 1**. All buffer restoration implemented along the shoreline should be designed to match/enhance the surrounding or most likely natural plant communities for that site.

Table 1. Plant Communities Identified along Morses Pond Shoreline

Plant Community Type		Length (miles)	% of Total
Beach		**0.11**	**3%**
Landscaped Lawn		**1.49**	**38%**
Natural Vegetation	Maple Oak Deciduous	0.72	18%
	Maple Oak Deciduous & Locust	0.13	3%
	Maple Oak Deciduous & White Pine Willow Birch	0.09	2%
	Maple Oak Pine	0.06	2%
	Pine Oak Forest	0.29	7%
	White Pine & Oak Forest	0.03	1%
	Maple Swamp	0.08	2%
	Maple Swamp & Shrub Swamp	0.09	2%
	Emergent Marsh	0.61	16%
	Shrub Swamp	0.04	1%
	Subtotal	**2.07**	**53%**
Other - Bare/Sparse Vegetation		**0.12**	**3%**
Other - Road Side Gravel/Bare		**0.03**	**1%**
	Total	**3.9**	**100%**

Examples of Maple Oak Deciduous Plant Community Type Identifed at Morses Pond





3.2 Invasive Species Management

During the field assessment, very few areas of invasive species were noted along the Morses Pond shoreline. The lack of extensive swaths of invasive species is a general indicator of relatively stable, undisturbed natural areas as well as managed landscaped areas. Invasive species were present at only 11 of the 22 sites at the time of the field assessment. Of those, only 2 were listed as high priority sites for management based on extent and aggressiveness of the species. **Table 2** includes the summary of the invasive species identified during this study. See **Appendix B** for the Invasive Species Management Plan developed for this project.

Table 2. Priority and extent of identified invasive species listed by site.

Site	Invasive Species	Extent	Priority
MP-4	Purple Loosestrife	minor	L
MP-5	Purple Loosestrife	minor	L
MP-6	Purple Loosestrife	minor	L
MP-9	Oriental Bittersweet	minor	M
MP-11	Oriental Bittersweet	moderate	H
MP-12	Oriental Bittersweet	minor	M
MP-13	Barberry	minor	L
MP-15	Japanese knotweed	minor	H
MP-16	Oriental Bittersweet	minor	M
MP-21	Oriental Bittersweet	minor	M
MP-22	Euonymous and Barberry	minor	L

Japanese knotweed at site MP-15

3.3 Shoreline Restoration Projects

The field assessment identified a total of 22 erosion/deposition sites that are candidates for restoration to help remove a sediment load to Morses Pond (see **Table 3**). Detailed information on each site is included in the Field Forms in **Appendix A**. The sources of erosion and deposition include the following (also summarized in **Table 4**). Please note that each site could have more than one source, so the percentages do not add up to 100%.

- Water Access Points (foot traffic and boats): 15 sites (68%)
- Unmanaged Road Runoff: 9 sites (41%)
- Stormwater Outfall: 4 sites (18%)
- Unvegetated/Manicured Shoreline: 2 sites (9%)

The restoration concepts identified for each site fall into the following general categories (also summarized in **Table 5**):

- Slope Stabilization (8 Sites)
- Toe Stabilization (3 Sites)
- Managed Access Points (14 Sites)
- Outfall Stabilization (3 Sites)
- Buffer Plantings (10 Sites)
- Upland Stormwater Management (9 Sites)
- Erosion Control (1 Site)

Table 3. Sites Identified for Shoreline Restoration

Site ID	Location
MP-1	Pickerel Point – End
MP-2	Pickerel Road
MP-3	Island Access
MP-4	Pond Access at Natick DPW
MP-5	Natick Maintenance Facility
MP-6	College Road Shore Outfall
MP-7	College Rd Outfall 2/Private Beach
MP-8	Bacon Rd Shore Access
MP-9	Weed Pulling Equipment Area
MP-10	Wellesley Public Beach
MP-11	Foot Access 1, Morses Pond Land
MP-12	Foot Access 2, Morses Pond Land
MP-13	Foot Access 3, Morses Pond Land
MP-14	End of Beach Road
MP-15	End of Lake Road
MP-16	Concrete Outfall near Crosstown Trail - Pond's Northeast Corner
MP-17	Foot Access 1, Crosstown Trail Pine Point
MP-18	Foot Access 2, Crosstown Trail Pickle Point
MP-19	Culvert Behind 4 Grove, Natick
MP-20	Bird Island Access Point
MP-21	Foot Access 3, Crosstown Trail
MP-22	Foot Access 4, Crosstown Trail

Table 4. Sources of Erosion/Deposition at each Site

Cause of Erosion	Assessed Sites																					
	MP-1	MP-2	MP-3	MP-4	MP-5	MP-6	MP-7	MP-8	MP-9	MP-10	MP-11	MP-12	MP-13	MP-14	MP-15	MP-16	MP-17	MP-18	MP-19	MP-20	MP-21	MP-22
Water Access Points	X	X	X	X				X	X	X	X	X	X				X	X		X	X	X
Unmanaged Road Runoff		X			X	X	X		X					X	X	X			X			
Stormwater Outfall						X	X									X			X			
Unvegetated/ Manicured Shoreline							X			X												

Table 5. Types of Restoration Identified for each Site

Restoration Type	Assessed Sites																					
	MP-1	MP-2	MP-3	MP-4	MP-5	MP-6	MP-7	MP-8	MP-9	MP-10	MP-11	MP-12	MP-13	MP-14	MP-15	MP-16	MP-17	MP-18	MP-19	MP-20	MP-21	MP-22
Slope Stabilization			X	X									X		X		X	X		X		X
Toe Stabilization				X			X						X									
Managed Access Points	X	X	X	X				X	X		X	X	X				X	X		X	X	X
Outfall Stabilization							X									X						
Buffer Plantings	X	X		X	X		X		X								X	X	X	X		X
Upland Stormwater Management		X			X	X	X		X					X	X	X			X			
Erosion Control										X												

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Legend

- Parcels

Shoreline Type

- Beach
- Landscaped Lawn
- Emergent Marsh
- Maple Swamp & Shrub Swamp
- Maple Oak Deciduous
- Maple Oak Deciduous & Locust
- Maple Oak Deciduous & White Pine Willow Birch
- Maple Oak Pine
- Maple Swamp
- Bare/Sparse Vegetation
- Pine Oak Forest
- White Pine & Oak Forest
- Shrub Swamp
- Road Side Gravel/Bare
- Other

N

0 300

1" = 300 feet

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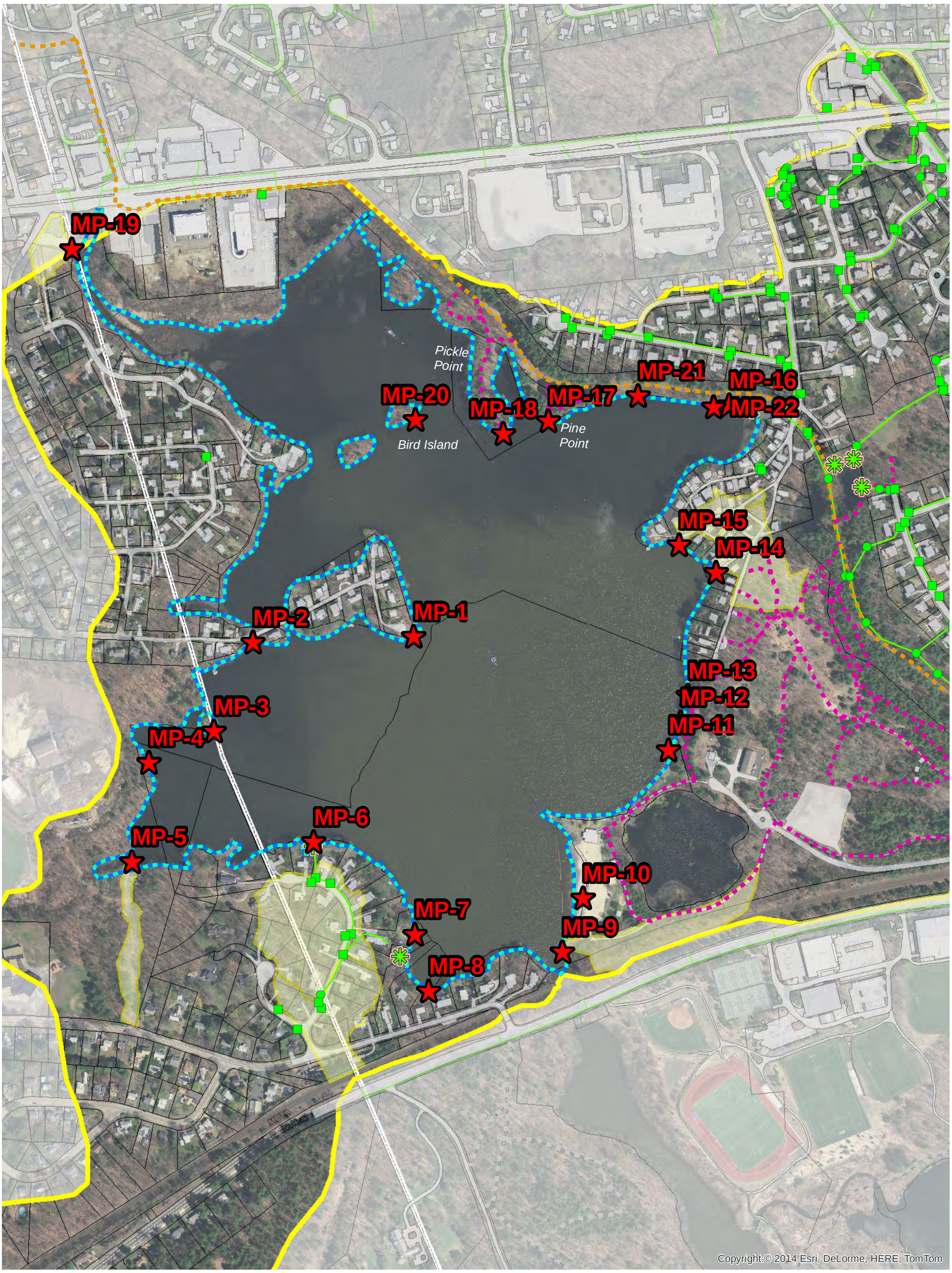
Shoreline Plant Community
Morses Pond Shoreline Restoration
Implementation Plan
Wellesley, MA

Date: 7/22/2016

Figure 2



Legend

- Morse Pond Subbasin
- Drainage Areas to Stormwater Restoration Sites
- Town Boundaries
- Parcels
- Restoration Sites
- Estimated Morses Pond Shoreline
- Morses Pond Trail
- Crosstown Trail

Town of Wellesley Stormwater Infrastructure - Morses Pond Drainage:

- Storm Drains
- Catch Basins
- Manholes
- Stormwater Outfalls

N

0 300

1" = 300 feet

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Restoration Sites
Morses Pond Shoreline Restoration
Implementation Plan
Wellesley, MA

Date: 7/22/2016

Figure 3

Chapter 3

Priority Sites

The structural stormwater BMPs identified in Chapter 2 were ranked to determine the priority projects. The ranking process and the concepts for the top ten projects are included in this chapter. The concepts provide a menu of shoreline restoration strategies that can be used throughout the project area.

3.1 Project Ranking Process

The recommended restoration sites identified within this plan will likely not be implemented simultaneously; therefore, each of the evaluated sites was subject to a ranking procedure in order to help prioritize locations for further evaluation. Since not all recommendations are equal when it comes to implementation, this prioritization allows restoration opportunities to be compared to find the most effective and feasible sites within the study area. The ranking system used a 100-point scoring system, where the relative merit of each proposed restoration site was evaluated by assigning points based on the following nine ranking criteria. The criteria were first determined based on project goals, implementation feasibility constraints, and professional experience. The ranking criteria were presented at the public meeting on the project, and adjusted based on feedback, to better reflect specific Town and public goals as well as the constraints at Morses Pond. The top ten ("High") priority sites are summarized in **Table 6;** in addition, seven other sites were ranked as "medium," while the lowest five sites were ranked as "low" priority. Information used in ranking is included in the field forms (**Appendix A**), and the full ranking spreadsheet is included in **Appendix C**. The nine ranking criteria are as follows:

1. **Erosion/Deposition Severity (45 points) —**This category was allotted the highest number of possible points based on the main goal of this project – addressing sources of sediment to Morses Pond. This category was determined based on field observation and feedback from residents and Town staff.
    - High - Site is actively eroding or building up sediment (deposition) at an increasing rate = 45 points;
    - Medium - Site has active erosion and/or sedimentation occurring = 25 points; and
    - Low - Site has little active erosion and/or sedimentation = 5 points.

2. **Threat to Property/Infrastructure (5 points) —**This category assesses whether the active erosion is threatening adjacent property (structures) or infrastructure. This category was determined based on field observation and feedback from residents and Town staff.
    - High – Active erosion is currently threatening adjacent property/infrastructure = 5 points;

- Medium – Erosion may threaten property/infrastructure in the future if it is not stabilized = 2.5 points; and
- Low – No property or infrastructure is threatened by the erosion at this site = 0 points.

3. **Relative Construction Cost (10 points) —**Relative scores were assigned to each project (high, medium, low) where the lowest relative costs were assigned 10 points, medium costs were assigned 5 points, and the highest costs were assigned 0 points.

4. **Ownership issues (5 points)—**Restoration projects on publicly owned parcels tend to be easier to implement, while privately owned sites may be more challenging and take more time to get off the ground. Each site was given a ranking based on ownership and land use.
   - High – Area is privately-owned = 0 points;
   - Medium - Ownership potentially an issue = 2.5 points; and
   - Low - Publically-owned area = 5 points.

5. **Accessibility for Construction (5 points)—**Sites that are easier to access during construction were ranked higher than more remote, difficult to reach locations.
   - High – Area is easily accessible = 5 points;
   - Medium – Area is moderately accessible = 2.5 points; and
   - Low – Site is difficult to access with necessary construction equipment = 0 points.

6. **Public Education/Demonstration (10 points) —**This category helps compare the proposed concepts based on the potential for effective public education/demonstration projects at each site.
   - High - Site is located in a high visibility area and provides an excellent opportunity for reaching the public = 10 points;
   - Medium - Site provides moderate visibility and located where some portion of the public could benefit = 5 points; and
   - Low - Site provides low visibility and is located in an area few people will visit = 0 points.

7. **Extent of Invasive Species (10 points) —**This category helps compare the proposed concepts based on the presence and extent of identified invasive species at each site.
   - High - Site has extensive and/or aggressive invasive species that need to be managed = 10 points;
   - Medium - Site had moderate coverage of invasive species or little coverage of aggressive invasive species = 5 points;
   - Low - Site had very little coverage of invasive species at the time of field work = 2.5 points; and
   - None - Site had no invasive species at time of field work = 0 points.

8. **Habitat Restoration (5 points) —**This category helps compare the proposed concepts based on how the restoration will affect habitat function at the site.
   - High – Restoration concept will greatly improve habitat function = 5 points;

- Medium – Restoration will add some habitat restoration, but not the focus = 2.5 points; and
- Low – Site concept does not restore habitat function = 0 points.

9. **Recreational Use (5 points) —**Relative scores were assigned to each site based on whether the area was used for recreation.
    - High – Site will improve a highly used public recreational area = 5 points;
    - Medium – Site will improve a moderately used recreational area = 2.5 points; and
    - Low – Site not located in a public recreational area = 0 points.

Table 6. Top Ten Priority Sites in Descending Order

Ranking	Site ID	Name
1	**MP-17**	Foot Access #1 – Crosstown Trail (Pine Point)
2	**MP-13**	Foot Access Point #3 – Morses Pond Land
3	**MP-18**	Foot Access #2 – Crosstown Trail (Pickle Point)
4	**MP-11**	Foot Access #1 – Morses Pond Land
5	**MP-14**	End of Beach Road
6	**MP-16**	Concrete Outfall near Crosstown Trail - Pond's Northeast Corner
7	**MP-10**	Wellesley Public Beach
8	**MP-1**	Pickerel Point – End
9	**MP-15**	End of Lake Road
10	**MP-19**	Culvert Behind 2 Worcester Street (Route 9), Natick

Table 7 provides a detailed description of the type of stabilization practices recommended at each site and includes site photos to illustrate the concepts.

Table 7. Description of Restoration Concepts for Top Ten Priority Sites in Descending Order

Site ID	Description	Site Photo
MP-17	• **Control access** by installing a temporary or permanent barrier (e.g, fencing) to concentrate foot traffic. • **Control runoff** from this trail with water bars that also help create steps for easier access (e.g., stone or log water bars). • **Stabilize slope** with additional loam, coir fabric and native plantings that fit in with the Pine Oak Forest Community.	
MP-13	• Create a formal pond access and fishing platform with a **boardwalk structure**. • Install **buffer plantings**. Use loam, coir fabric, coir logs, and native plantings to help stabilize the bank and protect the existing trees. Choose species that fit in with the surrounding Maple Oak Deciduous Locust Plant Community. • Remove **invasive barberry**.	
MP-18	• **Control runoff** from this trail with simple water bars. • **Stabilize slope** with additional native plantings along the shoreline and sides of the path that fit in with the surrounding Pine Oak Forest Community. • Consider adding a **stable access point** at the water's edge.	
MP-11	• Stabilize access point to the pond with **wooden water bars** (logs or boards). • Narrow access path with either temporary or permanent fencing and additional native plants that fit with the surrounding Maple Oak Deciduous Locust community. • Remove the **invasive bittersweet** growing in this area.	

Site ID	Description	Site Photo
MP-14	• **Reduce stormwater velocity** by pulling back the pavement and installing a stabilized rock and vegetated stormwater practice. • Investigate **stormwater management opportunities** for the road and houses in the 2.5-acre drainage area that contributes stormwater to this location. • **Stabilize paths** that emerge on Russell Rd with water bars and stone to reduce sediment source.	
MP-16	• Install **outlet protection** around this outfall to protect the headwall and pipe as well as prevent future scouring in this location. • Continue to encourage better stormwater management in the contributing watershed to **reduce sediment sources**. • Remove the **invasive bittersweet** from this area.	
MP-10	• **Install snow fencing and straw wattles** or compost sock along high water mark at beach to prevent sand loss during the winter. • Maintain gentle slope by **grading sand** and raking it back prior to beach opening and closure.	
MP-1	• **Control access** by installing a temporary or permanent barrier (e.g, fencing) to concentrate foot traffic. • **Revegetate shoreline and buffer** with additional loam, coir fabric and native plantings outside of the controlled access that fit in with the Pine Oak Forest Community. • **Install stabilized kayak/canoe launch.**	

Site ID	Description	Site Photo
MP-15	• Install **stabilized access point** (steps with stones or wood). • Install **check dam(s)** along slope to create step-pools to help reduce velocity and trap sediment from contributing drainage area. • Investigate **stormwater management opportunities** for the road and houses in the 0.9-acre drainage area that contributes stormwater to this location. • Remove **invasive Japanese knotweed** at this site.	
MP-19	• **Reduce stormwater runoff** from immediately adjacent site by pulling back the pavement and installing a vegetated stormwater practice to manage runoff from the 0.75-acre drainage area (e.g., **bioretention or wet swale**). • Protect the existing pipe and prevent future score by providing **riprap outlet protection**.	

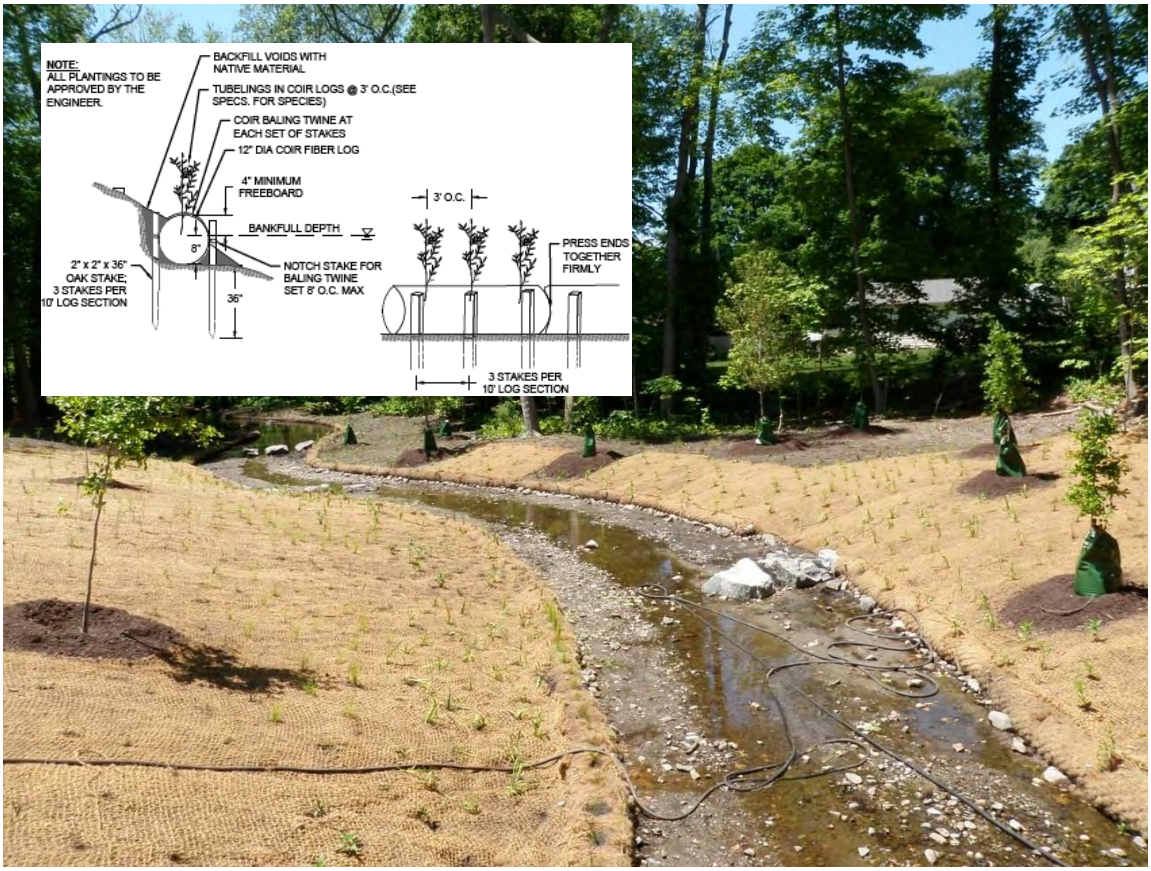
3.2 Representative Concept Designs

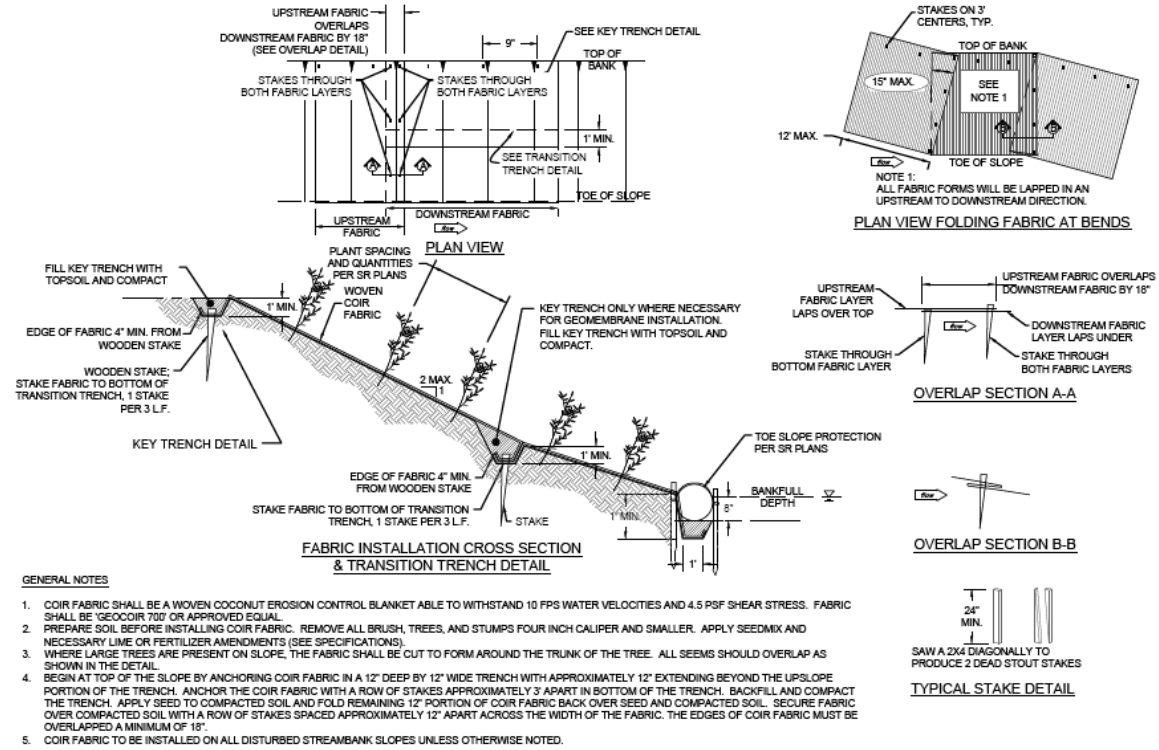
Many of the restoration sites recommend similar types of restoration. This section provides representative design information for each type of restoration proposed.

1. Slope and Toe Stabilization Practices

Slope and toe stabilization includes using coir fiber matting and logs and native plantings to provide natural stabilization to a slope, and water bars to redirect runoff before it can erode a trail's surface. **Table 8** provides a short list of appropriate native species that can be used in buffer restoration and stabilization projects based on the natural vegetation communities around Morses Pond. This list was tailored to focus on a few species that should be readily available at commercial nurseries and easy for homeowners to find; this list should not be considered exhaustive or mandatory.

Coir fiber matting and logs used with native vegetation to stabilize a slope.





GENERAL NOTES

1. COIR FABRIC SHALL BE A WOVEN COCONUT EROSION CONTROL BLANKET ABLE TO WITHSTAND 10 FPS WATER VELOCITIES AND 4.5 PSF SHEAR STRESS. FABRIC SHALL BE 'GEOCOIR 700' OR APPROVED EQUAL.
2. PREPARE SOIL BEFORE INSTALLING COIR FABRIC. REMOVE ALL BRUSH, TREES, AND STUMPS FOUR INCH CALIPER AND SMALLER. APPLY SEEDMIX AND NECESSARY LIME OR FERTILIZER AMENDMENTS (SEE SPECIFICATIONS).
3. WHERE LARGE TREES ARE PRESENT ON SLOPE, THE FABRIC SHALL BE CUT TO FORM AROUND THE TRUNK OF THE TREE. ALL SEEMS SHOULD OVERLAP AS SHOWN IN THE DETAIL.
4. BEGIN AT TOP OF THE SLOPE BY ANCHORING COIR FABRIC IN A 12" DEEP BY 12" WIDE TRENCH WITH APPROXIMATELY 12" EXTENDING BEYOND THE UPSLOPE PORTION OF THE TRENCH. ANCHOR THE COIR FABRIC WITH A ROW OF STAKES APPROXIMATELY 3' APART IN BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" PORTION OF COIR FABRIC BACK OVER SEED AND COMPACTED SOIL. SECURE FABRIC OVER COMPACTED SOIL WITH A ROW OF STAKES SPACED APPROXIMATELY 12" APART ACROSS THE WIDTH OF THE FABRIC. THE EDGES OF COIR FABRIC MUST BE OVERLAPPED A MINIMUM OF 18".
5. COIR FABRIC TO BE INSTALLED ON ALL DISTURBED STREAMBANK SLOPES UNLESS OTHERWISE NOTED.

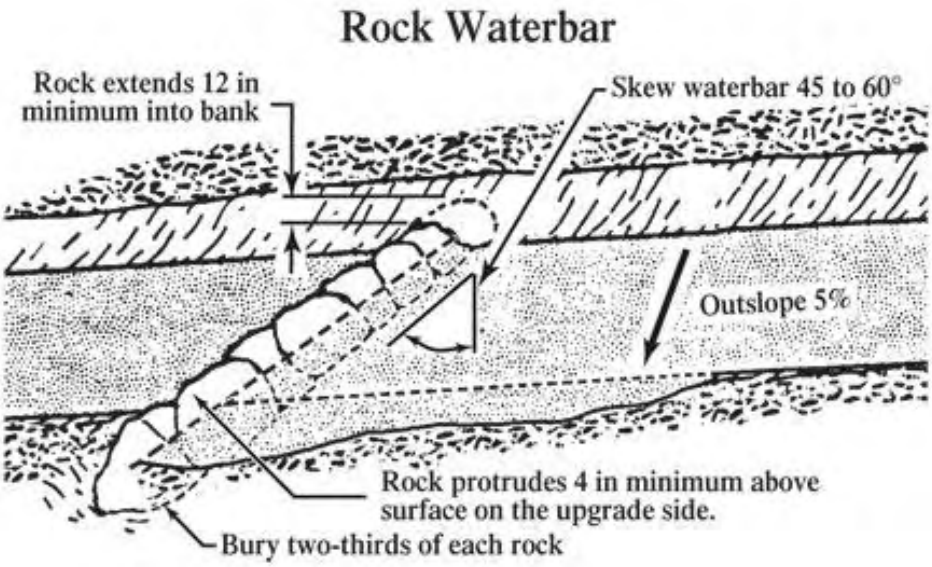
Table 8. Suggested Native Plant List Suitable for the Various Plant Communities along Morses Pond

Suggested Native Plantings	Plant Community Type					
	Maple Oak Deciduous	Maple Oak Deciduous & Pine *	Pine Oak Forest	Maple Swamp	Shrub Swamp	Emergent Marsh
Red maple (*Acer rubrum*)	X	X		X		
River birch (*Betula nigra*)	X	X		X		
Red oak (*Quercus rubra*)	X	X	X			
Eastern redbud (*Cercis canadensis*)	X	X				
Red-osier dogwood (*Swida sericea*)	X	X	X			
American elderberry (*Sambucus canadensis*)	X					
Speckled alder (*Alnus incana*)				X	X	
Sweet pepper bush (*Clethra alnifolia*)	X			X	X	
Highbush blueberry (*Vaccinium corymbosum*)	X			X	X	
Winterberry (*Ilex verticillata*)	X			X	X	
Arrowwood (*Viburnum dentatum*)	X			X	X	
Ostrich fern (*Matteuccia struthiopteris*)				X	X	
Cinnamon fern (*Osmundastrum cinnamomeum*)	X			X	X	
Hay-scented fern (*Dennstaedtia punctilobula*)	X	X	X			
Joe-Pye weed (*Eutrochium purpureum*)				X		X
Cardinal flower (*Lobelia siphilitica*)				X	X	
Blue flag iris (*Iris versicolor*)				X	X	X
Cranberry (*Vaccinium macrocarpon*)				X	X	

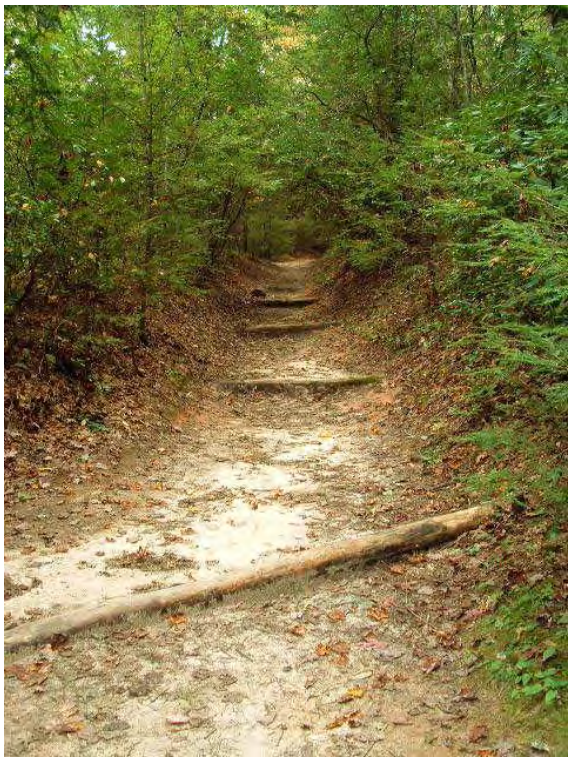
**May also include willow and birch*

Waterbars should be designed based on the following criteria:

- Excavate trench at 30-45 degree angle across the trail surface. Steeper grades with more surface flow should be closer to 45 degrees. Waterbars should divert surface runoff to sheet flow into stabilized terrain or along a rock-lined swale to prevent further erosion.
- Bury logs and stone 2/3 of their diameter on downhill side of trench. Consider using rock to help anchor if you use wood and logs.
- Top of berm should be 8 inches higher than bottom of trench. To make a water bar easier to step over, widen it by increasing the distance between the bottom of the dip or trench and the top of the berm, maintaining the correct height.
- Pitch of waterbar is such that outlet end is at least 3 inches lower than the upper end (~3% slope).



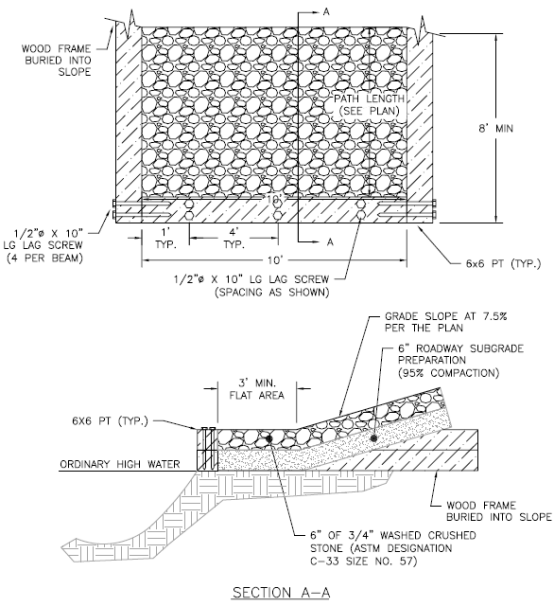
Examples of rock and wooden water bars.



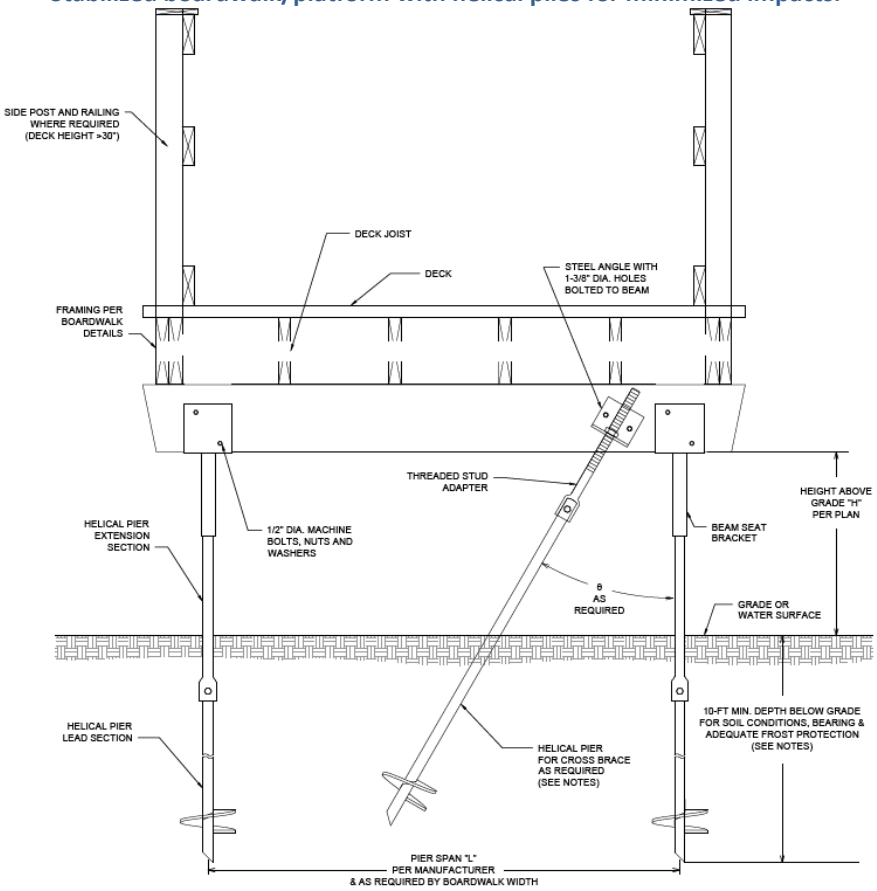
2. Managed Access Points

Managed access points includes installing a stabilized launch at the shoreline and installing a boardwalk/platform overlook for very steep, eroding banks.

Stabilized kayak/canoe launch using wood and stone.



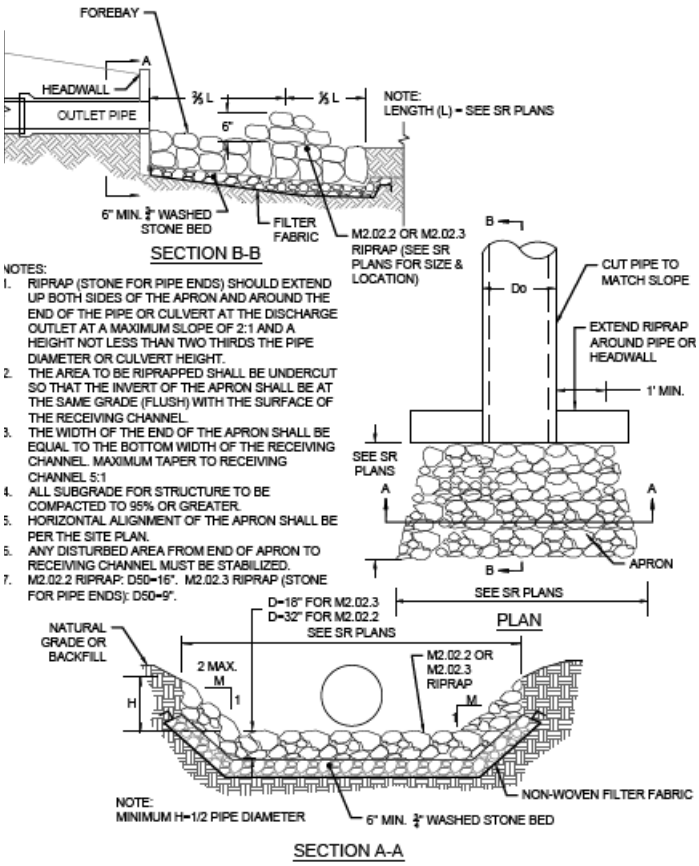
Stabilized boardwalk/platform with helical piles for minimized impacts.



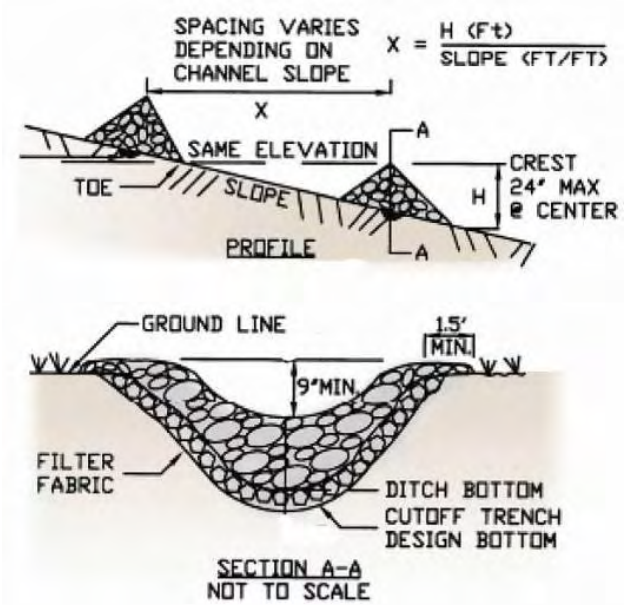
3. Outfall Stabilization

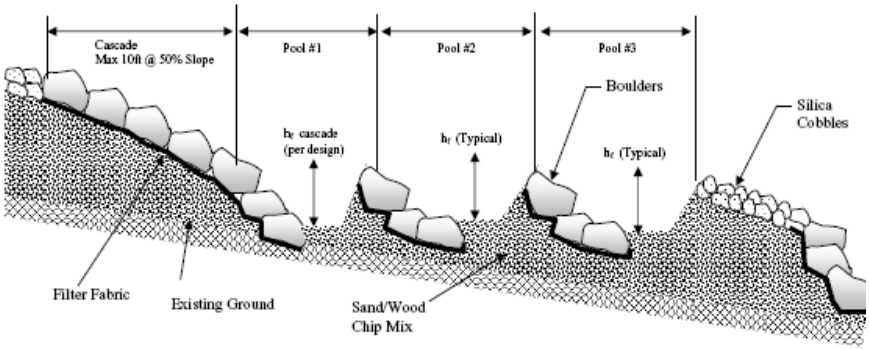
Outfall stabilization includes installing a riprap protection at pipe ends and check dams/step pools for overland flow down steep slopes.

Riprap Outfall Protection Detail

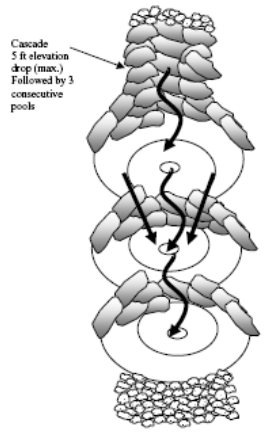


Typical cross-section and profile of rock check dam (NY ESC Manual); and representative design for cascading step pool from Anne Arundel County, MD (next page).





Cascade Profile – Three Pools following Cascade



Cascade Sequence

Check dam installation criteria include:

- Maximum drainage area above the check dam shall not exceed two (2) acres.
- Height not greater than 2 feet. Center shall be maintained 9 inches lower than abutments at natural ground elevation.
- Side slopes shall be 2:1 or flatter.
- Use a well-graded stone matrix 2 to 9 inches in size.
- The overflow of the check dams should be stabilized to resist erosion.
- Check dams should be anchored in the channel by a cutoff trench 1.5 ft wide and 0.5 ft deep and lined with filter fabric to prevent soil migration.
- Space check dams in the channel so that the crest of the downstream dam is at the elevation of the toe of the upstream dam. See Table 3 for general guidance.

Standard Stone Check Dam Spacing
(Maryland Department of the Environment, 1994).

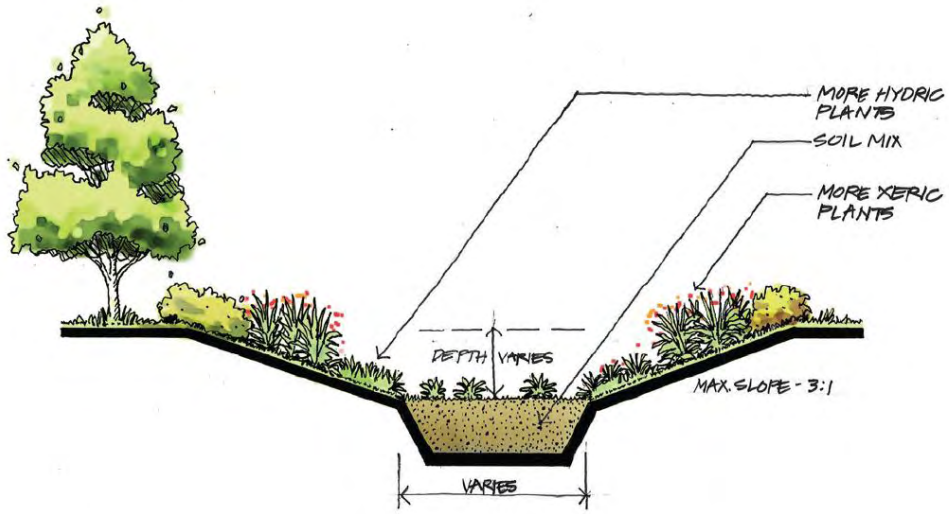
Slope	Spacing (feet)
2% or less	80
2.1% to 4%	40
4.1% to 7%	25
7.1% to 10%	15
over 10%	use lined waterway design

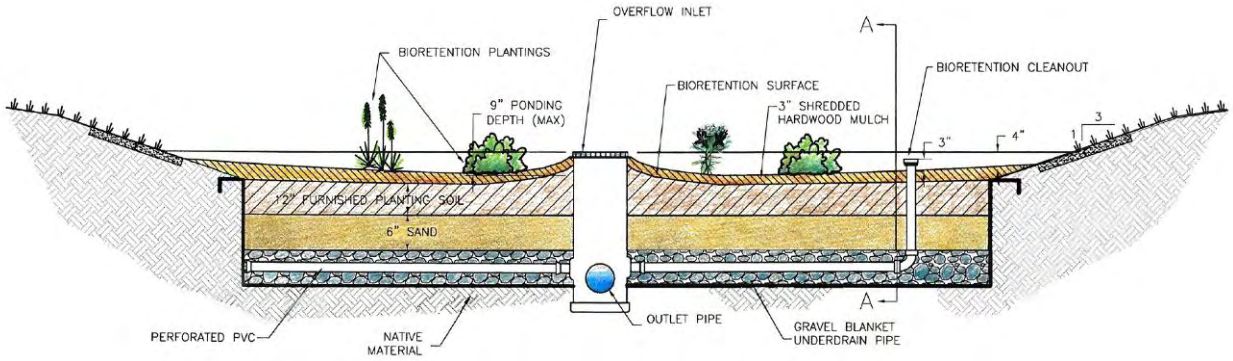
Additional design guidance for step pools can be found from Anne Arundel County, MD at http://www.aacounty.org/DPW/Watershed/StepPoolStormConveyance.cfm.

4. Stormwater Management

Managing stormwater in the contributing drainage areas to Morses Pond should include using low impact practices such as bioretentions and wet swales.

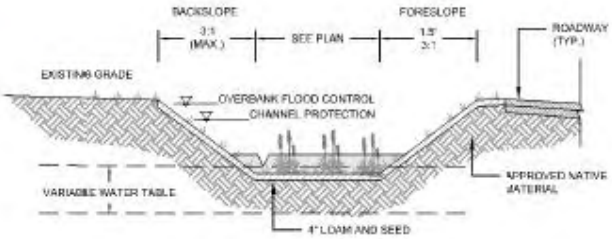
Schematics of a rain garden/with no underdrain (top, from University of Florida Extension Service factsheet) and a bioretention facility (bottom, from Horsley Witten Group).





Photos showing stepped conveyance systems in channel from Anne Arundel County, MD (two photos on left), and a linear bioretention facility along a residential street in Seattle, WA (on right)

Wet swale photo and detail



TYPICAL WET SWALE DETAIL
NOT TO SCALE

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Chapter 4

Next Steps

There are many potential restoration activities presented in this study, and the ranking process provides a road map for how to approach implementation, but opportunities may arise that push one retrofit to the top of the list before others. Regardless of which retrofit, the next steps in implementation have permitting considerations, require coordination with project partners, and need funding sources.

4.1 Permitting Considerations

Permitting requirements will vary depending on the location and size of each project, but based on location of the restoration projects along the shoreline, we can assume that they will need some form of permitting. The permitting process for restoration projects in Massachusetts has recently been updated by the Commonwealth. Based on the proposed restoration concepts and the potential impacts to regulated resource areas, the following permits and/or authorizations may be required if further action is pursued, particularly if many projects are pursued at one time, causing a larger cumulative impact:

- Wetland Protection Act, Order of Conditions (OOC) and potentially a Restoration OOC, if appropriate, from the Wetlands Protection Committee;
- U.S. Army Corps of Engineers Preconstruction Notification General Permit (GP) - for impacts to Waters of the United States;
- Massachusetts Environmental Policy Act (MEPA), Environmental Notification Form (ENF) and possibly Environmental Impact Report (EIR);
- Chapter 91 Waterways Permit;
- 401 Water Quality Certification (WQC) through the Massachusetts Department of Environmental Protection; and
- Possibly a National Pollutant Discharge Elimination System (NPDES) Construction Permit.

We believe the following permits will not be required:

- Filing with the Natural Heritage and Endangered Species Program (NHESP);
- Beneficial Use of Solid Waste;
- Jurisdictional Determination, Chapter 253 Permit with the Massachusetts Office of Dam Safety; and
- Massachusetts Historic Commission, Section 106.

4.2 Project Partners

Project partners can make all the difference in whether a management plan is successfully implemented or not. Potential partners include:

- Natick DPW
- Residential property owners in Wellesley and Natick
- Commercial land owners
- Recreational users of pond and surrounding beaches and trails

Property owners should be brought into the planning process as soon as possible, and hopefully, will become the projects' biggest proponents throughout design and construction. They may also be willing and able to provide funding for some of the projects.

4.3 Grant Funding Opportunities

Various types of funding sources exist for trail restoration, stormwater management, and ecological restoration projects. A summary of potential possibilities include:

- Massachusetts Parkland Acquisitions and Renovations for Communities (PARC) Program: This is a reimbursement grant program that offers a maximum grant of $250,000. These grants are usually for communities with populations of 35,000 and over but small towns and regional attractions can apply. The grant targets expansion of outdoor recreational opportunities in urban areas. Funding must be expended within one or two years, depending on the specific project. Application deadlines are typically in the early summer. http://www.mass.gov/eea/grants-and-tech-assistance/grants-and-loans/dcs/grant-programs/massachusetts-parkland-acquisitions-and.html

- Massachusetts Recreational Trails Program:
  This is a reimbursement grant program that offers two types of separate grant programs – trail grants and education grants. Both require a 20% match by the applicant. Grants may be issued for both motorized and non-motorized uses. The grants offer awards of $2,000 to $50,000 (and up to $100,000 if warranted). The next round of applications is due in February 2017. http://www.mass.gov/eea/agencies/dcr/services-and-assistance/grants-and-technical-assistance/recreational-trails-grants-program.html

- Massachusetts Section 319 Nonpoint Source Competitive Grants Program:
  This grant reimbursement program is authorized under Section 319 of the federal Clean Water Act for implementation projects that address the prevention, control, and abatement of nonpoint source (NPS) pollution. In general, eligible projects must: implement measures that address the prevention, control, and abatement of NPS pollution; target the major source(s) of nonpoint source pollution within a watershed/subwatershed; contain an appropriate method for evaluating the project results; and must address activities that are identified in the Massachusetts NPS Management Plan. Proposals may be submitted by any interested Massachusetts public or private organization. A 40% non-federal match is required by the applicant.

Application deadlines are typically in the early summer. Past awarded grants have ranged from $10,000 to $500,000. http://www.mass.gov/eea/agencies/massdep/water/grants/watersheds-water-quality.html

- Massachusetts Section 604b Grant Program Water Quality Management Planning: This grant program is authorized under the federal Clean Water Act Section 604(b) for water quality assessment and management planning. Eligible entities include: regional planning agencies, councils of governments, conservation districts, counties, cities and towns, and other sub-state public planning agencies and interstate agencies. No local match is required. Application deadlines are typically in the spring. http://www.mass.gov/eea/agencies/massdep/water/grants/watersheds-water-quality.html

- Fields Pond Foundation, private family foundation, attn: Brian Rehrig. For the construction and restoration of trails and other conservation areas. The grant range is $5,000 to $25,000 but the usual range of grants is $2,000 to $10,000. Proposals can be submitted at any time. http://fieldspond.org/guidelines.htm

- Community Preservation Act (CPA). The Town of Wellesley Community Preservation Committee (CPC) can fund projects that meet CPC goals outlined in the CPC Plan. Relevant goals include preserving and enhancing lake and pond frontage, and restoration of those resources that have been degraded or impaired. Restoration of outdoor recreational opportunities (trails) would also apply.

APPENDIX A:

FIELD FORMS

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-1

Name: Pickerel Point - End

Site & Concept Description:
Popular access point to pond at end of Pickerel Point in an aesthetically pleasing location. Evidence of boat launching and fishing. Good parking. Swing and bench adds to use of location. The site would benefit from pathways, steps, etc. to concentrate foot traffic and to reduce erosion. Plant native vegetation buffers along shore outside of water access location(s).

End of Pickerel Point from water.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 75

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Exposed soils due to foot and vehicular traffic

Shoreline Type/Materials: Plain/Beach

Geometry: Point

Eroded Shoreline Length Estimate (ft): 100

Eroded/Deposition Area Estimate (sf): 1000

Slope Estimate: 0-3%

Other Observed Impacts: Unmanaged access, picnic areas, boat launch

SHORELINE VEGETATION

Plant Community: Maple Oak Deciduous

Dominant Species: Maple/oak with unvegetated areas

Vegetation Cover (%): 50

Dominant Invasive Species: None

Secondary Invasive Species: None

Invasives Coverage (sf): 0

Estimated Thickness of Buffer Veg (ft): 0-15

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Buffer planting, access control

Description: Install coir fabric next to shoreline for ground stabilization. Install steps/walkway to concentrate foot access in targeted areas. Plant native plants/shrubs along shore outside of targeted access areas to reestablish shoreline buffer.

Erosion/Deposition Severity: Medium

Threat to Property/Infrastructure? Low

Ownership: Private/Public

Land Use: Residential

Construction Access: Easy

Public Education Opportunity? Good

PRIORITY: High

Date Assessed: 10/5/2015 9:46:08 AM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	

Date Assessed: 10/5/2015 9:46:08 AM

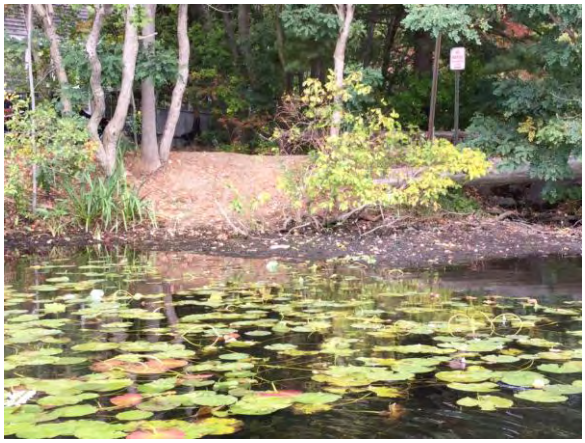
Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-2

Name: Pickerel Point - South Side

Site & Concept Description:
Access point and roadside pulloff on south side of Pickerel Point. Also used for launching boats. Evidence of sediment deposition and road runoff reaching pond from hill. Manage foot access and stormwater flows reaching the pond at this location.



Access point along Pickerel Road.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 50

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Erosion/sediment from road

Shoreline Type/Materials: Forested/roadside

Geometry: Cove

Eroded Shoreline Length Estimate (ft): 20

Eroded/Deposition Area Estimate (sf): 50

Slope Estimate: 5%

Other Observed Impacts: Unmanaged access

SHORELINE VEGETATION

Plant Community: Maple Oak Deciduous

Dominant Species: Maple/oak, black locust,

Vegetation Cover (%): 50

Dominant Invasive Species: None

Secondary Invasive Species: None

Invasives Coverage (sf): 0

Estimated Thickness of Buffer Veg (ft): 0-15

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Buffer planting, stormwater management, access control

Description: Explore options for management of stormwater retention from Pickerel Road prior to its entry to pond. Install sediment controls next to road and/or pond. Plant native plants/shrubs to act as a buffer to help stabilize shoreline and to slow uncontrolled road runoff. Control unmanaged access point.

Erosion/Deposition Severity: Medium

Threat to Property/Infrastructure? Low

Ownership: Private/Public

Land Use: Residential

Construction Access: Easy

Public Education Opportunity? Good

PRIORITY: Medium

Date Assessed: 10/5/2015 10:17:24 AM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	

Date Assessed: 10/5/2015 10:17:24 AM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-3

Name: Island Access - South Side

Site & Concept Description:
Boat and foot access point to island near Wellesley/Natick town line. Evidence of human activity on island (picnic table, compacted ground). If access to island is to be discouraged, stabilize exposed ground with coir fabric and plant native shrub species such as highbush blueberry. If access is to be permitted, install permanent or semi-permanent steps to minimize future soil erosion. In both scenarios, install coir logs to minimize future bank undercutting.

Boat and foot access point to island near Wellesley/Natick town line.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 75

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Launching boats/foot traffic

Shoreline Type/Materials: Forested

Geometry: Point

Eroded Shoreline Length Estimate (ft): 10

Eroded/Deposition Area Estimate (sf): 30

Slope Estimate: 10%

Other Observed Impacts: Unmanaged access, picnic area, boat launch

SHORELINE VEGETATION

Plant Community: Maple Oak Deciduous

Dominant Species: Maple/oak

Vegetation Cover (%): 75

Dominant Invasive Species: None

Secondary Invasive Species: None

Invasives Coverage (sf): 0

Estimated Thickness of Buffer Veg (ft): >25

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Slope stabilization, access control

Description: Island has this one primary access through brush, so management of foot traffic is recommended. Install coir logs to control bank undercutting and plant native shrub plant species. If foot traffic is permitted, install rock or wood steps to reduce future impacts from foot traffic.

Erosion/Deposition Severity: Medium

Threat to Property/Infrastructure? Low

Ownership: Public

Land Use: Recreational

Construction Access: Hard

Public Education Opportunity? Poor

PRIORITY: Low

Date Assessed: 10/5/2015 10:47:14 AM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	

Date Assessed: 10/5/2015 10:47:14 AM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-4

Name: Pond Access on Western Shore - Natick DPW

Site & Concept Description:
Popular pond access point through Natick DPW on western shore of pond. Evidence of common use of the area (exposed roots and compacted soil). Bank undercutting at this location likely exacerbated by long fetch and prevailing wind direction. Manage foot access at this location, stabilize slopes, and restore undercut banks.

Access point along pond's western shore near Natick DPW.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 90

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Foot traffic, wave erosion

Shoreline Type/Materials: Bank

Geometry: Point

Eroded Shoreline Length Estimate (ft): 20

Eroded/Deposition Area Estimate (sf): 400

Slope Estimate: 5-10%

Other Observed Impacts: Unmanaged access

SHORELINE VEGETATION

Plant Community: Pine Oak Forest

Dominant Species: Oak

Vegetation Cover (%): 95

Dominant Invasive Species: Purple Loosestrife

Secondary Invasive Species: None

Invasives Coverage (sf): 1

Estimated Thickness of Buffer Veg (ft): >25

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Slope stabilization, access control, undercut bank improvement, buffer planting

Description: Install coir fabric next to shoreline for soil and slope stabilization. Monitor existing trees for health, as their roots are helpful but exposed. Install coir logs near water level to minimize bank undercutting. Manage foot access from Natick DPW. Plant native plants/shrubs to reestablish shoreline buffer.

Erosion/Deposition Severity: Medium

Threat to Property/Infrastructure? Low

Ownership: Public

Land Use: Municipal

Construction Access: Hard

Public Education Opportunity? Poor

PRIORITY: Low

Date Assessed: 10/5/2015 10:59:19 AM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	

Date Assessed: 10/5/2015 10:59:19 AM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-5

Name: Natick Maintenance Facility

Site & Concept Description:
Pond access point from end of road at Natick Maintenance Facility. Evidence of little active use, potentially due to private property and shallow depths of pond at this location. Evidence of stormwater flows and erosion from end of road reaching pond. Stormwater management and reestablishment of the shoreline buffer are potential restoration scenarios.

Shoreline from end of utility access road.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 60

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Roadway

Shoreline Type/Materials: Bank

Geometry: Cove

Eroded Shoreline Length Estimate (ft): 20

Eroded/Deposition Area Estimate (sf): 500

Slope Estimate: 3%

Other Observed Impacts: Unmanaged foot and road access

SHORELINE VEGETATION

Plant Community: Maple Oak Deciduous

Dominant Species: Oak

Vegetation Cover (%): 70

Dominant Invasive Species: Purple Loosestrife

Secondary Invasive Species: None

Invasives Coverage (sf): 0

Estimated Thickness of Buffer Veg (ft): 0-15

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Buffer planting, stormwater management

Description: Plant shoreline buffer with native natural vegetation to stabilize shoreline and to retain continuity with nearby wetlands. Control stormwater flows and associated sedimentation between road and pond. Stabilize eroded areas and gully, regrade to minimize direct stormflows to pond from grassy areas.

Erosion/Deposition Severity: Medium

Threat to Property/Infrastructure? Low

Ownership: Public

Land Use: Municipal

Construction Access: Easy

Public Education Opportunity? Fair

PRIORITY: Medium

Date Assessed: 10/5/2015 11:18:25 AM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	

Date Assessed: 10/5/2015 11:18:25 AM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-6

Name: College Road Shore Outfall

Site & Concept Description:
A 12" diameter concrete outfall drains into the pond at this location. The culvert was dry at the time of observation. Large deposit of sediment extends into pond from outfall. The outfall watershed is clearly a sediment source to pond during times of flow. Riprap around outfall appears stable. Water spurting from shore into pond about 30' west of outfall. Unknown source, and should be investigated.

Outfall and sediment deposit in pond.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 0

Evidence of Active Erosion? NO

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Large sediment apron at mouth of outfall

Shoreline Type/Materials: Bank

Geometry: Cove

Eroded Shoreline Length Estimate (ft): 0

Eroded/Deposition Area Estimate (sf): 0

Slope Estimate: 3%

Other Observed Impacts: Water source of unknown origin entering pond

SHORELINE VEGETATION

Plant Community: Maple Oak Deciduous

Dominant Species: Maple

Vegetation Cover (%): 60

Dominant Invasive Species: Purple Loosestrife

Secondary Invasive Species: None

Invasives Coverage (sf): 1

Estimated Thickness of Buffer Veg (ft): 0-15

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Sediment control in outfall watershed

Description: Control sediment supply in outfall watershed. Address water entering pond 30 ft west of outfall. Unknown source.

Erosion/Deposition Severity: High

Threat to Property/Infrastructure? Low

Ownership: Private

Land Use: Residential

Construction Access: Moderate

Public Education Opportunity? Good

PRIORITY: Medium

Date Assessed: 10/5/2015 11:34:32 AM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	
 Outfall and sediment deposit in pond.	 Water bubbling from shoreline near outfall, which is dry.

Date Assessed: 10/5/2015 11:34:32 AM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-7

Name: College Road Resident's Beach

Site & Concept Description:
Private beach and shoreline for residence along College Road. Beach sand and rocky point appear vulnerable to erosion from wave action. 8" drain entering pond near this private beach did not appear to be conveying any drainage at the time of observation, nor was a sediment bar noted in the pond at the outfall. Explore replanting native vegetation where possible along the shoreline and reinforce the outfall with riprap. Inquire about lawn treatment due to proximity to pond.

Beach and waterfront.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 50

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Beach at residence

Shoreline Type/Materials: Bank

Geometry: Point

Eroded Shoreline Length Estimate (ft): 60

Eroded/Deposition Area Estimate (sf): 400

Slope Estimate: 2%

Other Observed Impacts: Beach, outfall stabilization, lawn runoff

SHORELINE VEGETATION

Plant Community: Beach

Dominant Species: Oak and Willow

Vegetation Cover (%): 75

Dominant Invasive Species: None

Secondary Invasive Species: None

Invasives Coverage (sf): 0

Estimated Thickness of Buffer Veg (ft): 0-15

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Shoreline/beach stabilization, outfall stabilization, buffer planting, upland stormwater management

Description: Potentially explore reestablishing more native vegetation, refrain from importing more sand to beach, improve rock shoreline stabilization feature, stabilize retaining wall around outfall, implement stormwater management in drainage area.

Erosion/Deposition Severity: Medium

Threat to Property/Infrastructure? Medium

Ownership: Private

Land Use: Residential

Construction Access: Hard

Public Education Opportunity? Poor

PRIORITY: Low

Date Assessed: 10/5/2015 11:51:50 AM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	
 Outfall near residence.	 Section of beach and rocky shoreline feature.

Date Assessed: 10/5/2015 11:51:50 AM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-8

Name: Bacon Road Shore Access

Site & Concept Description:
Foot and small boat access in area of steep shoreline off of Bacon Road. Evidence of moderate use, including pallets and large stones to improve footing for users. Due to steep slopes, potential for erosion is high. Signs of erosion and deposition observed.

Boat access point.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 85

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Foot traffic/steep slopes

Shoreline Type/Materials: Bank

Geometry: Cove

Eroded Shoreline Length Estimate (ft): 10

Eroded/Deposition Area Estimate (sf): 200

Slope Estimate: 8%

Other Observed Impacts: Unmanaged access, steep slopes

SHORELINE VEGETATION

Plant Community: Maple Oak Deciduous

Dominant Species: Oak

Vegetation Cover (%): 75

Dominant Invasive Species: None

Secondary Invasive Species: None

Invasives Coverage (sf): 0

Estimated Thickness of Buffer Veg (ft): 0-15

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Coir fabric, buffer planting, access control

Description: Install coir fabric to stabilize steep slopes/eroding soils, plant native shrubs to reestablish shoreline buffer, control foot and boat access.

Erosion/Deposition Severity: High

Threat to Property/Infrastructure? Low

Ownership: Private

Land Use: Residential

Construction Access: Hard

Public Education Opportunity? Fair

PRIORITY: Medium

Date Assessed: 10/5/2015 12:05:37 PM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	
 Boat access point.	

Date Assessed: 10/5/2015 12:05:37 PM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-9

Name: Weed Pulling Equipment Area - Near Pond Outlet

Site & Concept Description:
Weed pulling equipment storage area near pond outlet and Route 135. Evidence of frequent use of this location for launching and storage. Impacted shoreline, eroded banks, and vulnerability to stormwater flows into pond observed. Shoreline stabilization measures, such as coir log installation and/or buffer planting, would be potentially helpful. If possible, minimize equipment launching and storage. Manage stormwater flows from road.

Weed removal equipment storage area.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 50

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Equipment staging; wave action

Shoreline Type/Materials: Bank

Geometry: Cove

Eroded Shoreline Length Estimate (ft): 100

Eroded/Deposition Area Estimate (sf): 2000

Slope Estimate: 2-5%

Other Observed Impacts: Equipment storage/encroachment, unmanaged runoff, rusting equipment onshore

SHORELINE VEGETATION

Plant Community: Disturbed

Dominant Species: Willow/poplar

Vegetation Cover (%): 25

Dominant Invasive Species: Bittersweet

Secondary Invasive Species: None

Invasives Coverage (sf): 15

Estimated Thickness of Buffer Veg (ft): 0-15

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Coir logs, buffer planting, stormwater management

Description: Install coir logs to stabilize eroded shoreline, plant native shrubs to reestablish shoreline buffer, implement stormwater BMPs to reduce runoff velocity and sediment input from the road.

Erosion/Deposition Severity: Medium

Threat to Property/Infrastructure? Low

Ownership: Public

Land Use: Municipal

Construction Access: Easy

Public Education Opportunity? Good

PRIORITY: Medium

Date Assessed: 10/5/2015 12:23:41 PM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	

Date Assessed: 10/5/2015 12:23:41 PM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-10

Name: Wellesley Public Beach

Site & Concept Description:
Wellesley Town Beach is an asset to the town, and appears to be maintained as such. It is also a contributor of sediment to the pond and is a good location to apply restoration practices, preferentially during the beach offseason. Because of the excellent public access, it is also an excellent candidate for educational programs on erosion and sediment control and how human influences impact water bodies.

Wellesley Town Beach

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 100

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Beach

Shoreline Type/Materials: Beach

Geometry: Cove

Eroded Shoreline Length Estimate (ft): 300

Eroded/Deposition Area Estimate (sf): 6000

Slope Estimate: 4%

Other Observed Impacts: Beach erosion

SHORELINE VEGETATION

Plant Community: Beach

Dominant Species: N/A

Vegetation Cover (%): 0

Dominant Invasive Species: None

Secondary Invasive Species: None

Invasives Coverage (sf): 0

Estimated Thickness of Buffer Veg (ft): 0-15

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Slope stabilization, maintenance of beach during off-season

Description: Erosion control measures, such as straw wattles and silt fence, can be installed on the beach during the off-season months to minimize sand input into the pond. Maintain gentle slope of the beach by grading sand and raking it back prior to beach opening and closure. If applied, confirm that new sand is clean and free of soil and plant material.

Erosion/Deposition Severity: Medium

Threat to Property/Infrastructure? High

Ownership: Public

Land Use: Recreational

Construction Access: Easy

Public Education Opportunity? Good

PRIORITY: High

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ADDITIONAL PHOTOS/SKETCHES	

Date Assessed: 10/5/2015 1:03:30 PM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-11

Name: Foot Access Point #1 - Morses Pond Land

Site & Concept Description:
Foot access point to pond from walking path on Morses Pond Land. Heavily used, with compacted soils and trampled vegetation observed. Good location to either formalize as an established pond access point or to close off and replant for buffer continuity.

Foot access location.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 50

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Foot traffic

Shoreline Type/Materials: Bank

Geometry: Straight

Eroded Shoreline Length Estimate (ft): 8

Eroded/Deposition Area Estimate (sf): 150

Slope Estimate: 5%

Other Observed Impacts: Unmanaged access

SHORELINE VEGETATION

Plant Community: Pine Oak Forest

Dominant Species: Oak

Vegetation Cover (%): 75

Dominant Invasive Species: Bittersweet

Secondary Invasive Species: None

Invasives Coverage (sf): 50

Estimated Thickness of Buffer Veg (ft): 0-15

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Access control, buffer planting

Description: Control foot traffic, either by discouraging use of the area, or formalize it as an access point with steps, walkway, etc. If foot traffic to be discouraged, plant native plants to reestablish shoreline buffer.

Erosion/Deposition Severity: Medium

Threat to Property/Infrastructure? Low

Ownership: Public

Land Use: Recreational

Construction Access: Easy

Public Education Opportunity? Good

PRIORITY: High

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Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	

Date Assessed: 10/5/2015 1:19:18 PM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-12

Name: Foot Access Point #2 - Morses Pond Land

Site & Concept Description:
Foot access point to pond from walking path on Morses Pond Land. Heavily used, with compacted soils and trampled vegetation observed. Good location to either formalize as an established pond access point or to close off and replant for buffer continuity. Due to good access, potentially beneficial for educational purposes about pond/lake shoreline management.

Foot access location.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 80

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Foot traffic

Shoreline Type/Materials: Bank

Geometry: Straight

Eroded Shoreline Length Estimate (ft): 15

Eroded/Deposition Area Estimate (sf): 250

Slope Estimate: 3%

Other Observed Impacts: Unmanaged access

SHORELINE VEGETATION

Plant Community: Pine Oak Forest

Dominant Species: Black locust

Vegetation Cover (%): 60

Dominant Invasive Species: Bittersweet

Secondary Invasive Species: None

Invasives Coverage (sf): 15

Estimated Thickness of Buffer Veg (ft): 0-15

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Access control, buffer planting

Description: Control foot traffic, either by discouraging use of the area, or formalize it as an access point with steps, walkway, etc. If foot traffic to be discouraged, plant native plants to reestablish shoreline buffer.

Erosion/Deposition Severity: Low

Threat to Property/Infrastructure? Low

Ownership: Public

Land Use: Recreational

Construction Access: Easy

Public Education Opportunity? Good

PRIORITY: Low

Date Assessed: 10/5/2015 1:32:18 PM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	

Date Assessed: 10/5/2015 1:32:18 PM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-13

Name: Foot Access Point #3 - Morses Pond Land

Site & Concept Description:
Steep foot access point to pond from walking path on Morses Pond Land. Due to position on public land and proximity to deep water, this location is popular among fishermen. Heavy foot traffic, steep slopes, and erodible soils have created an area of immediate concern for erosion and sedimentation issues. This location is an excellent candidate for several erosion/sediment control methods. This location could also be valuable to educate the public about erosion, its causes, and methods to address it. Establishing this area as a formal pond access with steps, stairs, shoreline stablization features, etc. should be considered as well.

Steep and eroded pond access location.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 85

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? NO

Cause of Erosion or Deposition: Heavy foot traffic

Shoreline Type/Materials: Steep bank

Geometry: Straight

Eroded Shoreline Length Estimate (ft): 40

Eroded/Deposition Area Estimate (sf): 600

Slope Estimate: 20%

Other Observed Impacts: Unmanaged access

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Access control, shoreline stabilization, slope stabilization

Description: Apply coir fabric to ground, coir logs along shoreline, buffer planting, construction of formalized water access point, fishing platform.

SHORELINE VEGETATION

Plant Community: Maple Oak Deciduous

Dominant Species: Oak

Vegetation Cover (%): 50

Dominant Invasive Species: None

Secondary Invasive Species: Other

Invasives Coverage (sf): 1

Estimated Thickness of Buffer Veg (ft): 0-15

Erosion/Deposition Severity: High

Threat to Property/Infrastructure? Medium

Ownership: Public

Land Use: Recreational

Construction Access: Easy

Public Education Opportunity? Good

PRIORITY: High

ADDITIONAL PHOTOS/SKETCHES

Date Assessed: 10/5/2015 1:42:31 PM **Assessed by:** BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-14

Name: End of Beach Road

Site & Concept Description:
This location, where Beach Road ends steeply at the pond's edge, is vulnerable to impacts from both erosion and sedimentation. No stormwater management system was observed, and evidence of recent stormwater flows directly reaching the pond were noted. Runoff from upgradient path also contributes sediment. Potential restoration opportunities exist for stormwater management. According to a neighboring landowner, access to the pond and nearby beach is popular from Beach Road, so restoration strategies will need to be considerate of the access and use of the area.

End of Beach Road.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 100

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Runoff from Beach Street

Shoreline Type/Materials: Cove

Geometry: Cove

Eroded Shoreline Length Estimate (ft): 30

Eroded/Deposition Area Estimate (sf): 400

Slope Estimate: 8%

Other Observed Impacts: Unmanaged stormwater flows, unmanaged access

SHORELINE VEGETATION

Plant Community: Landscaped Lawn

Dominant Species: N/A

Vegetation Cover (%): 0

Dominant Invasive Species: Other

Secondary Invasive Species: None

Invasives Coverage (sf): 0

Estimated Thickness of Buffer Veg (ft): 0-15

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Erosion and sediment control, stormwater management

Description: Redesign end of Beach Road (and evaluate Russel, Bay, and McLaren Rds) to minimize stormwater runoff from reaching the pond. Work with homeowners to implement rain gardens, rain barrels and other low impact designs for small sites). Plant shoreline buffer and stabilize upgradient path(s) to reduce sediment source.

Erosion/Deposition Severity: High

Threat to Property/Infrastructure? High

Ownership: Unknown

Land Use: Residential

Construction Access: Easy

Public Education Opportunity? Good

PRIORITY: High

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ADDITIONAL PHOTOS/SKETCHES	

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Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-15

Name: End of Lake Road

Site & Concept Description:
This location, where Lake Road ends steeply at the pond's edge, is vulnerable to impacts from both erosion and sedimentation. It is a popular access location for swimming; however, no stormwater management system was observed for road runoff, and evidence of recent stormwater flows directly reaching the pond were noted. Potential restoration opportunities exist for stormwater management and erosion/sediment control.

Drainage swale at end of Lake Road.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 50

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Stormwater runoff

Shoreline Type/Materials: Bank

Geometry: Cove

Eroded Shoreline Length Estimate (ft): 8

Eroded/Deposition Area Estimate (sf): 200

Slope Estimate: 10%

Other Observed Impacts: Unmanaged stormwater flows

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Slope stabilization, stormwater management

Description: Install rip rap and coir fabric to minimize erosion, install drainage system or improve existing system.

SHORELINE VEGETATION

Plant Community: Landscaped Lawn

Dominant Species: Red maple

Vegetation Cover (%): 0

Dominant Invasive Species: Japanese Knotweed

Secondary Invasive Species: None

Invasives Coverage (sf): 50

Estimated Thickness of Buffer Veg (ft): 0-15

Erosion/Deposition Severity: Medium

Threat to Property/Infrastructure? Medium

Ownership: Private

Land Use: Residential

Construction Access: Easy

Public Education Opportunity? Good

PRIORITY: High

Date Assessed: 10/5/2015 2:19:01 PM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	

Date Assessed: 10/5/2015 2:19:01 PM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-16

Name: Concrete Outfall near Crosstown Trail - Pond's Northeast Corner

Site & Concept Description:
At this location, an 18-inch concrete outfall enters the pond from the north. At the time of observation, flows from the outfall were heavy. Flows have created a scour hole on the pond bottom and undermining under the outfall against the bank. Assessing the stability of the outfall and restoring it with rip rap is a potential restoration scenario.

Outfall near Crosstown Trail.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 25

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? NO

Cause of Erosion or Deposition: Outfall

Shoreline Type/Materials: Bank

Geometry: Cove

Eroded Shoreline Length Estimate (ft): 8

Eroded/Deposition Area Estimate (sf): 16

Slope Estimate: 15%

Other Observed Impacts: Scour on pond bottom and bank undermining under the outfall

SHORELINE VEGETATION

Plant Community: Maple Forest

Dominant Species: Red maple

Vegetation Cover (%): 95

Dominant Invasive Species: Bittersweet

Secondary Invasive Species: None

Invasives Coverage (sf): 15

Estimated Thickness of Buffer Veg (ft): >25

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Outfall stabilization

Description: Stabilize area around outfall with riprap. A scour hole has formed below the outfall and undercutting has occurred.

Erosion/Deposition Severity: High

Threat to Property/Infrastructure? High

Ownership: Public

Land Use: Recreational

Construction Access: Moderate

Public Education Opportunity? Fair

PRIORITY: High

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Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	

Date Assessed: 10/5/2015 2:30:02 PM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-17

Name: Foot Access Point #1 - Crosstown Trail "Pine Point"

Site & Concept Description:
Pond access from Crosstown Trail at Pine Point. Due to scenic nature of the location at the end of a peninsula and access via public land, this area appears heavily used through foot traffic. Active erosion gullies, exposed roots, and deposited sediment in pond observed. Similar to locations along the Morses Land walking trail, this location offers the potential for erosion/sedimentation issues to be addressed and for public education to be included.

Pond access point at peninsula (Pine Point) off Crosstown Trail.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 100

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Unmanaged access; steep slopes

Shoreline Type/Materials: Bank

Geometry: Point

Eroded Shoreline Length Estimate (ft): 60

Eroded/Deposition Area Estimate (sf): 400

Slope Estimate: 15%

Other Observed Impacts: Exposed soil and roots

SHORELINE VEGETATION

Plant Community: Pine Oak Forest

Dominant Species: White pine

Vegetation Cover (%): 60

Dominant Invasive Species: None

Secondary Invasive Species: None

Invasives Coverage (sf): 0

Estimated Thickness of Buffer Veg (ft): >25

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Slope stabilization, access control, buffer planting

Description: Apply coir fabric to ground, coir logs along shoreline, plant buffer, construct formalized water access point.

Erosion/Deposition Severity: High

Threat to Property/Infrastructure? Low

Ownership: Public

Land Use: Recreational

Construction Access: Easy

Public Education Opportunity? Good

PRIORITY: High

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ADDITIONAL PHOTOS/SKETCHES	

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Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-18

Name: Foot Access Point #2 - Crosstown Trail "Pickle Point"

Site & Concept Description:
Pond access from Crosstown Trail at Pickle Point Sanctuary (Wellesley Conservation Council Land). Location at end of a peninsula, similar to Foot Access Point #1 from the Crosstown Trail at Pine Point. Due to the scenic nature of the location and the fact that it is accessible to the public, this area appears heavily used through foot traffic. Active erosion gullies, exposed roots, and deposited sediment in pond observed; however, not with the same severity as Foot Access Point #1.

Pond access point at peninsula (Pickle Point) off of Crosstown Trail.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 100

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Unmanaged access; steep slopes

Shoreline Type/Materials: Bank

Geometry: Point

Eroded Shoreline Length Estimate (ft): 20

Eroded/Deposition Area Estimate (sf): 400

Slope Estimate: 15%

Other Observed Impacts: Exposed soil and roots

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Slope stabilization, access control, buffer planting

Description: Apply coir fabric to ground, coir logs along shoreline, plant buffer, construct formalized water access point.

SHORELINE VEGETATION

Plant Community: Pine Oak Forest

Dominant Species: White oak

Vegetation Cover (%): 80

Dominant Invasive Species: None

Secondary Invasive Species: None

Invasives Coverage (sf): 0

Estimated Thickness of Buffer Veg (ft): >25

Erosion/Deposition Severity: High

Threat to Property/Infrastructure? Low

Ownership: Public Access (Land Trust)

Land Use: Recreational

Construction Access: Moderate

Public Education Opportunity? Good

PRIORITY: High

Date Assessed: 10/5/2015 2:53:39 PM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	

Date Assessed: 10/5/2015 2:53:39 PM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-19

Name: Culvert Behind 4 Grove Rd, Natick

Site & Concept Description:
This location is behind 4 Grove Rd in Natick. A 48" diameter culvert conveys flows from Jennings Brook directly upstream of its confluence with Bogle Brook. The parking lot behind 4 Grove Rd extends right up to the edge of the culvert where a large washout has occurred. Outfall stabilization and improved stormwater management practices are appropriate restoration strategies.

48" concrete culvert conveying flows of Jennings Brook. Note erosion next to culvert.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 100

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Gullying next to 48" ID culvert

Shoreline Type/Materials: Riverine

Geometry:

Eroded Shoreline Length Estimate (ft): 10

Eroded/Deposition Area Estimate (sf): 100

Slope Estimate: 2%

Other Observed Impacts:

SHORELINE VEGETATION

Plant Community: Disturbed

Dominant Species: Red maple

Vegetation Cover (%): 50

Dominant Invasive Species: None

Secondary Invasive Species: None

Invasives Coverage (sf): 0

Estimated Thickness of Buffer Veg (ft): 0

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Outfall stabilization, stormwater management for overland flow at this location (not pipe flow)

Description: Repair pavement, backfill with approved materials, install riprap around culvert, manage stormwater runoff from adjacent parking lot/commerical building/and slope to prevent overland erosion at edge of outfall. If possible, pull the parking lot away from the water's edge and plant a vegetated buffer.

Erosion/Deposition Severity: High

Threat to Property/Infrastructure? High

Ownership: Private

Land Use: Commercial

Construction Access: Easy

Public Education Opportunity? Fair

PRIORITY: High

Date Assessed: 10/5/2015 3:23:16 PM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	

Date Assessed: 10/5/2015 3:23:16 PM

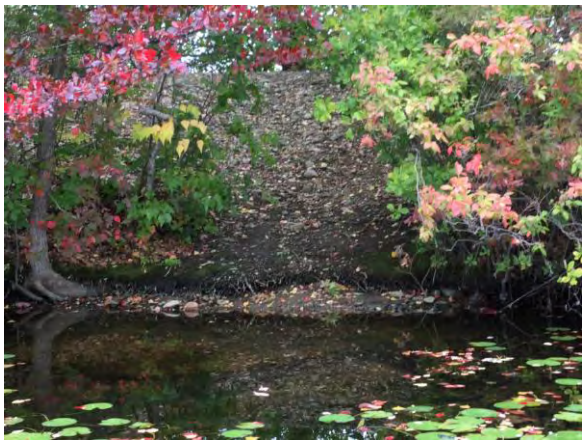
Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-20

Name: Bird Island Access Point

Site & Concept Description:
A narrow, steep path for foot traffic and boat access to easternmost of two islands (Bird Island) due north of Pickerel Point. Slope and bank stabilization methods are appropriate restoration strategies, however due to access issues the impacts via foot traffic are less than areas around pond shoreline.



Narrow, steep path for foot traffic and boat access to Bird Island.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 60

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Unmanaged access

Shoreline Type/Materials: Bank

Geometry: Straight - island

Eroded Shoreline Length Estimate (ft): 8

Eroded/Deposition Area Estimate (sf): 200

Slope Estimate: 10%

Other Observed Impacts: Foot traffic, canoe/kayak launch

SHORELINE VEGETATION

Plant Community: Maple Oak Deciduous

Dominant Species: White oak

Vegetation Cover (%): 85

Dominant Invasive Species: None

Secondary Invasive Species: None

Invasives Coverage (sf): 0

Estimated Thickness of Buffer Veg (ft): >25

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Slope stabilization, access control, buffer planting

Description: Apply coir fabric to ground, coir logs along shoreline, buffer planting, construction of formalized water access point.

Erosion/Deposition Severity: Low

Threat to Property/Infrastructure? Low

Ownership: Public

Land Use: Recreational

Construction Access: Hard

Public Education Opportunity? Poor

PRIORITY: Low

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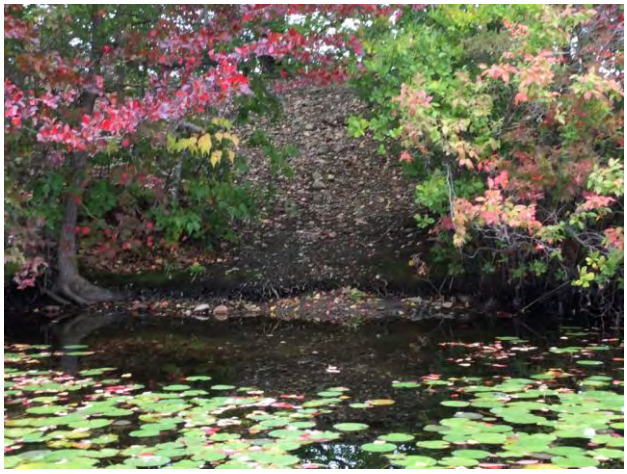	

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Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-21

Name: Foot Access Point #3 - Crosstown Trail

Site & Concept Description:
A narrow, steep path for foot traffic to pond shoreline along Crosstown Trail. Slope and bank stabilization methods are appropriate restoration strategies, especially due to the steep slopes in this area. Heavily used, with compacted soils and trampled vegetation observed.

Narrow, steep path for foot access to pond from Crosstown Trail.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 50

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Unmanaged access; steep footpath

Shoreline Type/Materials: Steep bank

Geometry: Straight

Eroded Shoreline Length Estimate (ft): 6

Eroded/Deposition Area Estimate (sf): 240

Slope Estimate: 20%

Other Observed Impacts: Unmanaged access

SHORELINE VEGETATION

Plant Community: Maple Oak Deciduous

Dominant Species: White oak

Vegetation Cover (%): 100

Dominant Invasive Species: Bittersweet

Secondary Invasive Species: None

Invasives Coverage (sf): 10

Estimated Thickness of Buffer Veg (ft): >25

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Access control

Description: Implement water bars and formal stabilized access point (e.g., formal or informal stairs). Protect adjacent vegetation from trampling.

Erosion/Deposition Severity: Medium

Threat to Property/Infrastructure? Low

Ownership: Public

Land Use: Recreational

Construction Access: Moderate

Public Education Opportunity? Fair

PRIORITY: Medium

Date Assessed: 10/5/2015 4:22:55 PM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	

Date Assessed: 10/5/2015 4:22:55 PM

Assessed by: BM & TN

Morses Pond Erosion/Vegetation Site Assessment

Site ID: MP-22

Name: Foot Access Point #4 - Crosstown Trail

Site & Concept Description:
A narrow, steep path for foot traffic to pond shoreline along Crosstown Trail. Limited boat launching available also. Slope and bank stabilization methods are appropriate restoration strategies, especially due to the steep slopes in this area. Heavily used, with compacted soils and trampled vegetation observed. A short walk to Russell Road parking area.

Narrow, steep path for foot traffic and boat access to pond from Crosstown Trail near Russell Road.

SHORELINE EROSION ASSESSMENT

Exposed Soil (%): 50

Evidence of Active Erosion? YES

Evidence of Past Erosion? YES

Sediment Deposition? YES

Cause of Erosion or Deposition: Foot traffic

Shoreline Type/Materials: Bank

Geometry: Straight

Eroded Shoreline Length Estimate (ft): 20

Eroded/Deposition Area Estimate (sf): 200

Slope Estimate: 10-15%

Other Observed Impacts: Unmanaged access

RESTORATION DESCRIPTION AND FEASIBILITY FACTORS

Restoration Type: Slope stabilization, access control, buffer planting

Description: Apply coir fabric to ground, coir logs along shoreline, and plant buffer of native plantings. Due to proximity of this location to parking areas on Russell Road, interest in a formal pond access point might be high.

SHORELINE VEGETATION

Plant Community: Maple Oak Deciduous

Dominant Species: Red maple

Vegetation Cover (%): 100

Dominant Invasive Species: Euonymous

Secondary Invasive Species: Barberry

Invasives Coverage (sf): 0

Estimated Thickness of Buffer Veg (ft): >25

Erosion/Deposition Severity: Medium

Threat to Property/Infrastructure? Low

Ownership: Public

Land Use: Recreational

Construction Access: Easy

Public Education Opportunity? Fair

PRIORITY: Medium

Date Assessed: 10/5/2015 4:30:44 PM

Assessed by: BM & TN

ADDITIONAL PHOTOS/SKETCHES	

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Assessed by: BM & TN

APPENDIX B:

INVASIVE SPECIES MANAGEMENT PLAN

Morses Pond Erosion Study
Appendix B - Invasive Species Management Plan

I. Introduction

Invasive species are currently few and far between along the Morses Pond shoreline. However, the few that are present could proliferate if not managed effectively, particularly if erosion and disturbance continue along the shoreline. These species, and others common in the area that may appear, pose a threat to the ecological integrity of the area. Under current conditions, these non-native aggressive plant species threaten to degrade the functionality of the shoreline, while displacing the native plant communities that support local wildlife species. An integrated invasive species management plan has been designed to strategically manage (reduce or eliminate) invasive species along Morses Pond.

HW has reviewed available literature on each of the major invasive species identified at this site and has modeled certain elements of the management plan after methods recommended by The Nature Conservancy for land management, as well as other widely accepted guidelines for invasive species management. The management plan presents alternatives for only mechanical control methods for each identified species based on its location in the landscape and the most effective means of managing that particular species.

II. Integrated Pest Management Policy

The Town of Wellesley maintains the position that all pesticides, including herbicides, are toxic to some degree, and that even at low levels, may cause serious adverse health and environmental effects. The "Integrated Pest Management Policy for Land Owned by the Town of Wellesley, Massachusetts," (IPM Policy) developed and adopted by the Wellesley Natural Resources Commission (NRC), mandates the following:

- *The use and application of toxic chemical pesticides, either by the Town of Wellesley employees or by private contractors, is prohibited on all Natural Resources Commission lands, including school fields which shall comply with the School Children and Families Protection Act; except for certain exemptions and emergency waivers…*
- *Preemptive turf, landscape, and grounds cultural, biological and physical maintenance practices shall be undertaken to understand, prevent, and control potential pest problems.*
- *All control products used under the terms of the policy shall be in keeping with, but not limited to, those products on the preferred list of Northeast Organic Farmers' Association as stated in their Standards for Organic Land Care, and/or the Organic Materials Review Institute of Eugene, Oregon.*

In implementing this IPM Policy, the Wellesley Board of Health may grant a temporary, one-time Emergency Waiver permitting the use of pesticides if an emergency public health situation warrants the use of pesticides, which are otherwise not be permitted under this Policy. The standards for issuance of an Emergency Waiver are as follows:

1) *The pest situation poses an immediate threat to human health AND*
2) *Viable alternatives consistent with this IPM policy do not exist.*

Likewise, the Wellesley NRC may grant a temporary, one-time Emergency Waiver permitting the use of pesticides if an emergency environmental health situation warrants the use of pesticides, under the following conditions:

1) *The pest situation poses an immediate threat to environmental health AND*
2) *Viable alternatives consistent with this IPM policy do not exist.*

This project does not recommend the use of herbicides to control the invasive species identified along Morses Pond, and thus, does not need a waiver.

III. Background on Invasive Species and Overview of Management Techniques

Invasive plants are non-native species that have been introduced to areas outside of their native range, where they often thrive and out-compete / overtake endemic plant communities. Non-native plants are characteristically aggressive, have few natural enemies and/or limiting biological factors within their introduced range, and tend to have very effective reproductive abilities. The spread of such plants is a major concern in the United States, as they reduce the functions and values of habitat for native flora and fauna within both wetlands and uplands and are a nuisance to manage once they have become established within an area. Adverse economic and environmental impacts are also often incurred by the establishment of invasive species.

In Massachusetts, the Massachusetts Invasive Plant Advisory Group (MIPAG), a voluntary collaborative representing organizations and professionals concerned with the conservation of the Massachusetts landscape, has been charged by the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) to provide recommendations to the Commonwealth regarding which plants are invasive and what steps should be taken to manage these species. MIPAG identifies invasive plants as follows:

> *Non-native species that have spread into native or minimally managed plant systems in Massachusetts. These plants cause economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems*.

Non-native invasive plants often displace native species over a relatively short period of time, often resulting in monotypic plant communities that lack species diversity. Species diversity is essential to maintaining an ecological balance. As is true with most exotic or non-native species, those found within the Morses Pond area are increasingly common throughout eastern North America, where their spread has lead to a decline in species richness and cover of the local native plant communities.

Most exotic species are adapted to a wide variety of habitats and climactic conditions and are free of known diseases and/or insects or other predators native to the U.S. These plants reproduce either by producing large amounts of seeds that are readily dispersed by birds or small mammals (as with buckthorn or Oriental bittersweet), spread through underground stems or rhizomes (e.g., *Phragmites*), or both (bittersweet). As such, invasive plants quickly establish within a landscape, grow, and spread rapidly. Non-native species aggressively out-compete native plants and can dominate a plant community within a short period of time.

In general, many of the introduced plants were widely cultivated in the past for their ornamental and perceived high wildlife values. Only in more recent years have conservationists and land managers come to realize the importance of preserving native plant communities.

MIPAG was instrumental in developing the Commonwealth's first list of invasive, likely invasive, and potentially invasive plants that have now been prohibited from importation, sale, or trade. As a result, future invasions by non-native species will be more likely due to the spread of naturalized populations, rather than new (accidental) introductions. MIPAG has also developed a list of early detection species for the Commonwealth. MIPAG has also published its strategic recommendations to prevent, control,

and where possible, eradicate invasive plant species in the Commonwealth of Massachusetts. These recommendations complement efforts at both the regional and national levels to establish an early detection and rapid response system for invasive plants. Their recommendations are published in the "Strategic Recommendations for Managing Invasive Plants in Massachusetts." More recently, MIPAG has published both the "Massachusetts Invasive Plant Species: Early Detection Priorities," (March 16, 2011) and the "Guidance for the Effective Management of Invasive Plants, Version 2" (December 2012).

IV. Overview of Management Techniques

Selected management techniques are generally based upon the extent of a given species within the vegetation community at a site and employ a strategy that best controls the invasive species, while minimizing the potential for adverse impacts to other desirable (i.e., native) species. Invasive species are often difficult to completely eliminate from an area, and a practical management goal is to control, not necessarily eradicate, invasive species while simultaneously encouraging or even introducing a native plant community.

Methods for the management of invasive species fall into three basic categories:

- Mechanical (cutting, pulling, grubbing, covering, etc.),
- Chemical (use of herbicides), and
- Biological (using living organisms such as insects or domestic grazing animals).

In general, mechanical controls, such as cutting or pulling, have the least adverse impacts on the adjacent, native communities; however, mechanical methods are often not as effective in the control of certain plant species. Chemical controls (through the use of herbicides) are most effective through modest applications of specific herbicides applied to cut stems. Selective application of herbicides also functions to reduce adverse effects on desirable native species from herbicide use. However, due to the location near a sensitive water body, chemical controls are not proposed for this project. While also not applicable for Morses Pond, biological control, or use of living organisms as a control agent, has also been proven effective on certain species. Upon effective removal or control of invasive species, native plant species are then planted in order to restore a native plant community.

V. Various Management Techniques for Morses Pond Invasives

Several non-native, invasive species are found at this site, and one of the goals of this plan is to control or manage populations of invasive species, while restoring native plant communities.

<u>Herbs</u>

- Japanese knotweed (*Fallopia japonica* formerly *Polygonum cuspidatum*)
- Purple loosestrife (*Lythrum salicaria*)

<u>Vines:</u>

- Oriental bittersweet (*Celastrus orbiculatus*)

<u>Shrubs</u>

- Japanese barberry (*Berberis thunbergii*)
- Winged euonymus (*Euonymus alatus*)

A discussion of the recommended management method for each of these species that is specific to the existing conditions at this site follows. In addition, please refer to the attached Invasive Species Management Techniques Matrix (Table 1) for more information on methods and timing.

A. Japanese Knotweed

Japanese knotweed is an upright, herbaceous, shrub-like perennial native to eastern Asia. Its stems are hollow, smooth, and swollen at the joints. The alternate leaves are broad and oval, triangular, or heart-shaped with a pointed tip and may become six inches long and three to four inches wide. It has greenish white flowers and can spread by seed as well as via rhizomes, runners, and stems (vegetative growth). Damaged stem segments are able to re-grow if the buds at the nodes are viable. Once a population of knotweed becomes established, it spreads primarily by growth along its large rhizomes, which can become up to 30 feet long. Japanese knotweed flowers in August and September, with seeds emerging two weeks following flowering. Japanese knotweed requires high amounts of sunlight and normally does not establish within forest understory.

Manual and Mechanical Control Alternatives for Japanese Knotweed

Manual and mechanical management techniques are most appropriate for smaller stands of knotweed and young plants. These techniques are also most feasible in environmentally sensitive areas where limitations on herbicide application exist.

- Pulling is considered effective for removing and controlling juvenile Japanese knotweed.
- Digging may be used to control growth of very small populations of young plants. This technique is incredibly labor intensive and generally ineffective when applied to large stands and mature plants. If this technique is utilized, the entire plant, including the roots and runners, must be removed. This is generally done with a mechanical excavator.
- Cutting is another viable mechanical control technique for this species. Shoots are cut as close to the ground as possible, reducing the viability of the rhizomes. Cutting may be done at any point during the growing season before senescence. Cutting is most successful when conducted three times or more per growing season. All cut plant parts must be bagged and sealed and disposed of properly in a landfill to prevent spread. Any stem fragments left behind have potential to re-sprout.

Recommended Control of Japanese Knotweed Populations along Morses Pond Shoreline

Knotweed in these areas will be subjected to repeated cutting (a minimum of 2-3 times during the early growing season) in order to deplete the plants' energy stores. All cuttings will be bagged and disposed of off-site. Following the series of repeated cuttings, the area may then be revegetated with native species.

B. Purple Loosestrife

Purple loosestrife is a perennial herb with a strongly developed taproot, which ranges in height from 0.5 to 2.0 m and is easily recognized when in flower by its bright pink inflorescence. This species is native to Eurasia, but now forms large, monotypic stands throughout the temperate regions of the U.S. and Canada, with some of the heaviest concentrations in the glaciated wetlands of the northeast. Purple loosestrife blooms from July through September or October and produces copious seeds, with estimates of more than 2.5 million seeds annually per mature plant. Seeds can remain viable even after 20 months of submergence in water. Purple loosestrife can spread vegetatively by re-sprouting from cut stems and regenerating from pieces of root stock.

Infestations of purple loosestrife appear to follow a pattern of establishment, maintenance at low numbers, and then dramatic population increases when conditions are optimal due to its high seed viability and prolific seed production. Purple loosestrife flourishes in wetland habitats that have been disturbed or degraded. Loosestrife crowds or shades out native species and eventually becomes a virtually monotypic stand.

Several control methods for purple loosestrife have been attempted with varying degrees of success, including mechanical, chemical, and biological methods. It is recommended that any control effort be followed up during the same growing season and for several years afterwards since some plants will be missed, new seedlings may sprout from the extensive seed bank, and a few plants will survive the low-dosage treatment.

Manual and Mechanical Control Alternatives for Purple Loosestrife

Hand-removal is recommended for small populations and isolated stems. In small populations, younger plants (1-2 years old) can be pulled by hand. Plants more than 2 years old should be dug out with special care to include the entire rootstock. Use of tools, such as a "Weed Wrench," on plants once they have developed a woody cane can be an effective way to remove this rootstock. Ideally, the plants should be pulled out before flowering. The entire rootstock must be pulled out since regeneration from root fragments is possible, with care taken to minimize disturbance to the soil and native vegetative cover. Uprooted plants and broken stems must be removed from the area since the broken stems can re-sprout. All plant parts should be carefully bagged, removed from the site, and placed in approved landfills or preferably burned to prevent escape to other non-infested sites. In addition, it is recommended that clothing, boots, and equipment be properly cleaned to ensure that no seeds are transported to other wetland areas. Follow-up treatment of these sites is recommended for 3 years to eliminate re-sprouting from fragments left behind. Where practicable, native plants should be restored to the control area by seeding or planting to encourage re-establishment of native vegetation and deter new loosestrife seedling development.

Cutting of stems has demonstrated to be somewhat effective, but because cutting leaves the root structures intact, it allows the plant to regenerate, so repeated cuttings may be necessary over the course of a growing season. Again, all plant parts should be removed immediately from the site and disposed of properly. Cutting and removing of the flowers may be an effective means of controlling or slowing the spread of this species in areas where this plant is expanding and removal is not feasible. Again, all plant parts that are cut should be bagged and removed from the site to prevent re-sprouting.

Mowing is not recommended for purple loosestrife because it can further spread the species by distributing plant stems that will sprout vegetatively.

Recommended Control Methods for Purple Loosestrife along Morses Pond Shoreline

Since the presence of purple loosestrife is limited at present to individuals or small patches within the wetland plant communities along Morses Pond, only mechanical methods are recommended for this site following the methods outlined above for hand pulling or digging (as necessary). While ideally, the plants should be pulled out before flowering, extending these removal efforts into the early flowering season (late June/July) will increase the chances of eradication of this invasive species when conducted for several years. Care must be taken to carefully bag all plant parts and removed these from the site, and either placed in an approved landfill or burned to prevent further infestation into other sites. It is also recommended that clothing, boots, and equipment be properly cleaned to ensure that no seeds are transported to other wetland areas. Follow-up treatment of sites is recommended for a minimum of 3 years, and where wetland disturbance occurs, it is recommended that removal efforts be followed by seeding with a native wetland plant seed mix, several of which are available commercially.

C. Oriental Bittersweet

Oriental or Asiatic bittersweet is a perennial vine occurring in all regions of Massachusetts in uplands and wetlands that was introduced to the U.S. in the mid 1800s. This vine often reaches 60 feet in height, and stems may reach four to five inches in diameter. The leaves are opposite, round or elliptical, glossy, and finely toothed. Flowers appear in May. Mature fruit have bright yellow valves with one to

three red seeds. This non-native species is wide-spread and produces abundant seeds, which are spread by birds and possibly small mammals and by humans (for instance, through the use of this plant in decorating). The stems of this non-native woody vine wrap around and girdle trees, shrubs, and other woody vines or may cause physical damage from the immense weight of its rapidly growing shoots. Oriental bittersweet may also spread laterally along the ground, forming an impenetrable tangled mass that smothers out all other vegetation.

It is widely recognized that management of Oriental bittersweet is difficult due to its high reproductive rate, long range dispersal, ability to root sucker, and rapid growth rates. Management of this species requires extensive monitoring and often a multi-year commitment. While many mechanical and chemical methods are available, only manual and mechanical methods are proposed. The preferred manual methods are as follows.

Manual and Mechanical Control Alternatives for Oriental Bittersweet

- Cutting over several growing seasons may help to control a population to a certain extent. Small shoots may be mowed or cut weekly for at least a year, although less frequent mowing (2 to 3 times a year) can stimulate re-sprouting from the roots. Larger shoots must be cut every two weeks down to the ground. It is important to cut vines as close to the root collar as possible. Cutting will eventually deplete the stored energy within the root stock, leaving only the seed bank to manage. Cutting can also result in vigorous re-sprouting from below-ground stems (rhizomes).
- Pulling or grubbing of larger plants including all roots and runners using a "Pulaski" or similar digging tool may also reduce a population, although re-sprouting is inevitable if not all the root material is removed. Even if all root material is removed, germination of seeds present in the seed bank will occur for several growing seasons. All plant parts (including fruits) should be sealed in bags and disposed of in a landfill to prevent reestablishment on a given site.

Mechanical control is most practical in small plots, or in areas where chemical control is not an option. Ultimately, manual and mechanical control is a means of restricting growth until the roots and seeds are no longer viable.

Recommended Control Methods for Oriental Bittersweet along Morses Pond Shoreline

<u>Mechanical Methods</u>

- Smaller plants and vines should be pulled or grubbed including all roots and runners using a "Pulaski" or similar digging tool. This should occur during the months of March and April. Some regrowth should be anticipated if not all of the root material is removed. Regrowth may also occur from germination of seeds present in the seed bank. Pulling or grubbing of larger plants including all roots and runners may also reduce a population, although re-sprouting is inevitable if not all parts are removed.
- For larger plants, it is recommended that the stems be cut every two weeks down to the ground and as close to the root collar as possible. Stems should be cut frequently (weekly or bi-weekly) throughout the year (from April through October), as cutting less frequently can stimulate vigorous re-sprouting from below ground stems.
- All plant parts, including fruits, should be bagged and disposed of in a landfill to prevent reestablishment on a given site.

D. Invasive Woody Shrubs

A few invasive shrub species, including barberry and winged euonymus, are discussed individually below. In general, mechanical control methods are anticipated to be sufficient to manage these species.

Winged Euonymus

Winged euonymus is a medium-tall, deciduous shrub native to Northeast Asia, Japan, and Central Asia. It was introduced in the mid-1800s. *Euonymus alatus* is tolerant of a wide range of habitats from full sun to full shade, from open undisturbed areas to forests understory, and can tolerate a variety of soil types and acidity (pH) levels. This species thrives in well-drained soils but does not tolerate water-logged soils as readily. The fruits of winged euonymus are usually dispersed by birds. However, seeds often drop just below the plant, creating a "seed shadow" that suppresses the growth of all other species in the immediate vicinity. Due to the excessive amount of seeds produced, it is difficult to control this species.

Manual and Mechanical Control Alternatives for Winged Euonymus

- Seedlings up to two feet tall may be pulled from the ground, particularly when the ground is moist. Larger plants and their root systems may be dug out through the use of a weed wrench or spading fork.
- Larger shrubs may be cut, but the stump must be ground out or the re-growth cut repeatedly.
- An alternative mechanical method is to trim off all of the flowers as to prevent the spread of the seeds, although this is extremely labor intensive and often not practical.

Recommended Control Methods for Winged Euonymus along Morses Pond Shoreline

The extent of winged euonymus is limited to a few individuals. Hand removal of smaller individuals of this species when the ground is moist, and digging of mature shrubs are effective methods of managing this species. Therefore, only mechanical methods are proposed for the control of this species.

VI. Selected References

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Table 1. Invasive Species Management Techniques Matrix: Approximate Timetable and Recommended Methods for Management of Invasive Species at Morses Pond

SPECIES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HERBS												
Japanese knotweed *(Fallopia japonica)* - flush cut repeatedly throughout growing season+				c	c	c	c	c	c			
Purple Loosestrife *(Lythrum salicaria)* - hand pulling/digging in spring; repeat in summer				p	p		p	p				
VINES												
Oriental bittersweet (*Celastrus orbiculatus*) - pull smaller vines/dig uproot as necessary+			p, d	p, d								
Oriental bittersweet (*Celastrus orbiculatus*) - cut at 2-week intervals+				c	c	c	c	c	c	c		
SHRUBS												
Japanese barberry (*Berberis thunbergii*) - dig/uproot entire plants (spring); cut in fall			d	d				c	c	c		
Winged Euonymus (*Euonymus alatus*) - pulling seedlings in spring			p	p	p	p						
Winged Euonymus (*Euonymus alatus*) - cut larger shrubs; grind stumps or cut sprouts								c, g	c, g			

KEY

c = cut
p = pull
m = mow
d = dig/grub/uproot
g = grind stumps
+ = long-term treatment technique min. 2-3 years

APPENDIX C:

RESTORATION CONCEPT RANKING RESULTS

APPENDIX D - Morses Pond Ranking Spreadsheet

Ranking Criteria:

Site #	Project	Extent of Erosion/Deposition	Threat to Property/ Infrastructure	Relative Cost	Ownership Issues	Accessibility or Construction	Public ed	Invasive Species	Habitat Restoration	Recreational Use
MP-1	Pickerel Point – End	M	L	L	M	H	H	None	H	H
MP-2	Pickerel Road	M	L	M	M	H	H	None	M	H
MP-3	Island Access	M	L	L	L	L	L	None	L	M
MP-4	Pond Access at Natick DPW	M	L	L	M	L	L	L	L	M
MP-5	Natick Maintenance Facility	M	L	M	M	H	M	L	M	L
MP-6	College Road Shore Outfall	H	L	H	M	M	M	L	L	L
MP-7	College Rd Outfall 2/Private Beach	M	M	M	M	L	L	None	M	L
MP-8	Bacon Rd Shore Access	H	L	L	H	L	L	None	L	L
MP-9	Weed Pulling Equipment Area	M	L	M	L	H	L	M	M	L
MP-10	Wellesley Public Beach	M	H	L	L	H	H	None	L	H
MP-11	Foot Access Pt 1, Morses Pond Land	M	L	L	L	H	H	H	M	H
MP-12	Foot Access Pt 2, Morses Pond Land	L	L	M	L	H	H	M	H	H
MP-13	Foot Access Point #3 – Morses Pond Land	H	M	H	L	H	H	L	L	H
MP-14	End of Beach Road	H	H	H	M	H	H	None	L	H
MP-15	End of Lake Road	M	M	M	H	H	H	H	L	H
MP-16	Concrete Outfall near Crosstown Trail - Pond's Northeast Corner	H	H	M	L	M	M	M	L	L
MP-17	Foot Access #1 – Crosstown Trail Pine Point	H	L	M	L	H	H	None	H	H
MP-18	Foot Access #2 – Crosstown Trail Pickle Point	H	L	M	L	M	H	None	M	H
MP-19	Culvert Behind 4 Grove, Natick	H	H	H	H	H	M	None	L	M
MP-20	Bird Island Access Point	L	L	L	L	L	L	None	M	M
MP-21	Foot Access 3, Crosstown Trail	M	L	L	L	M	M	M	M	H
MP-22	Foot Access 4, Crosstown Trail	M	L	M	L	H	M	L	M	H

*** H = High, M = Medium, and L = Low**

Ranking Results:

Site #	Project	Erosion/Deposition - Severity **(45)**	Threat to Property/ Infrastructure **(5)**	Relative Cost **(10)**	Ownership **(5)**	Accessibility for Construction **(5)**	Public Education/ Demonstration **(10)**	Extent of Invasive Species **(10)**	Habitat Restoration **(5)**	Recreational Use **(5)**	**SCORE**
MP-1	Pickerel Point – End	25	0	10	2.5	5	10	0	5	5	**62.5**
MP-2	Pickerel Road	25	0	5	2.5	5	10	0	2.5	5	**55.0**
MP-3	Island Access	25	0	10	5	0	0	0	0	2.5	**42.5**
MP-4	Pond Access at Natick DPW	25	0	10	2.5	0	0	2.5	0	2.5	**42.5**
MP-5	Natick Maintenance Facility	25	0	5	2.5	5	5	2.5	2.5	0	**47.5**
MP-6	College Road Shore Outfall	45	0	0	2.5	2.5	5	2.5	0	0	**57.5**
MP-7	College Rd Outfall 2/Private Beach	25	2.5	5	2.5	0	0	0	2.5	0	**37.5**
MP-8	Bacon Rd Shore Access	45	0	10	0	0	0	0	0	0	**55.0**
MP-9	Weed Pulling Equipment Area	25	0	5	5	5	0	5	2.5	0	**47.5**
MP-10	Wellesley Public Beach	25	5	10	5	5	10	0	0	5	**65.0**
MP-11	Foot Access Pt 1, Morses Pond Land	25	0	10	5	5	10	10	2.5	5	**72.5**
MP-12	Foot Access Pt 2, Morses Pond Land	5	0	5	5	5	10	5	5	5	**45.0**
MP-13	Foot Access Point #3 – Morses Pond Land	45	2.5	0	5	5	10	2.5	0	5	**75.0**
MP-14	End of Beach Road	45	5	0	2.5	5	10	0	0	5	**72.5**
MP-15	End of Lake Road	25	2.5	5	0	5	10	10	0	5	**62.5**
MP-16	Concrete Outfall near Crosstown Trail - Pond's Northeast Corner	45	5	5	5	2.5	5	5	0	0	**72.5**
MP-17	Foot Access #1 – Crosstown Trail Pine Point	45	0	5	5	5	10	0	5	5	**80.0**
MP-18	Foot Access #2 – Crosstown Trail Pickle Point	45	0	5	5	2.5	10	0	2.5	5	**75.0**
MP-19	Culvert Behind 4 Grove, Natick	45	5	0	0	5	5	0	0	2.5	**62.5**
MP-20	Bird Island Access Point	5	0	10	5	0	0	0	2.5	2.5	**25.0**
MP-21	Foot Access 3, Crosstown Trail	25	0	10	5	2.5	5	5	2.5	5	**60.0**
MP-22	Foot Access 4, Crosstown Trail	25	0	5	5	5	5	2.5	2.5	5	**55.0**

Priority Ranking (in descending order)

Site #	Score
MP-17	**80.0**
MP-13	**75.0**
MP-18	**75.0**
MP-11	**72.5**
MP-14	**72.5**
MP-16	**72.5**
MP-10	**65.0**
MP-1	**62.5**
MP-15	**62.5**
MP-19	**62.5**
MP-21	60.0
MP-6	57.5
MP-2	55.0
MP-8	55.0
MP-22	55.0
MP-5	47.5
MP-9	47.5
MP-12	45.0
MP-3	42.5
MP-4	42.5
MP-7	37.5
MP-20	25.0