Rahway River Basin, New Jersey
Coastal Storm Risk Management Feasibility Study

# Appendix A.8:
# Impact and Compensatory Mitigation Assessment

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# 1.0 **Introduction**

The U.S. Army Corps of Engineers (USACE), New York District (District) in partnership with the New Jersey Department of Environmental Protection (NJDEP) has developed feasibility level plans to provide coastal storm risk management for the City of Rahway, Township of Woodbridge, and Borough of Carteret, Union and Middlesex Counties, New Jersey.

The Recommended Plan is comprised of the following:

- A levee 2,520 ft long with a 12 ft top width and 1:3 side slopes with an average height of 10.2ft and floodwall 1,968 ft long.
- Treatment of approximately 112 structures located within the 10-yr floodplain with nonstructural measures in the Town of Woodbridge and Borough of Carteret.

In total, approximately 2.99 acres of wetland habitat and 100 linear ft of tidal channel equaling to 0.05 acres of open water and 0.07 acres of mudflat will be directly impacted by the Recommended Plan. USACE regulations stipulate that the recommended plan must contain sufficient mitigation measures to ensure that the plan selected will have no more than negligible net adverse impacts on fish and wildlife resources, including impacts of the mitigation measures themselves. This is typically accomplished through use of a functional assessment model and incremental cost analysis (ICA).

This document precedes the incremental cost analysis (Appendix A.9) by describing the method utilized to evaluate impacts and describing the potential compensatory mitigation solutions and scales that will be evaluated in the incremental cost analysis. Discussions of the selected compensatory mitigation plan, post construction monitoring, and adaptive management are located in Appendix A.10.

## 1.1 Impact and Mitigation Assessment Method

The District is using the Evaluation of Planned Wetlands (EPW) ecological model to evaluate existing conditions and future with project conditions within the Project Area and compensatory mitigation measures. This model and the method by which it would be employed in analyzing impacts and compensatory mitigation needs, was approved for regional use by the USACE Headquarters Model Certification Team in July 2016.

EPW was developed as a tool to assess various design parameters for planned wetlands and to characterize potential desired or undesired changes in wetland structure and function likely to result from project activities.

EPW provides a technique for comparing the functional capacity of a wetland assessment area and planned wetlands. There are six functional areas that are addressed during the planning process:

- Shoreline bank erosion control
- Sediment stabilization
- Water quality
- Wildlife
- Fish
- Uniqueness/heritage

Each function is assigned a value based on the scores of its elements. Each element is a physical, chemical or biological characteristic of the function that dominates the functions' role in sustaining the wetlands ecological processes. From these Functional Capacity Indexes and Functional

Capacity Units are derived, rating the relative performance of the planned wetland based on comparisons to a similar natural wetland.

## 2.0 **Project Footprint Existing Conditions**

The proposed action is located on the right bank (from a downstream viewpoint) and within the tidal portion of the Rahway River. The channel width of the Rahway River within the project area ranges from approximately 235 to 500 ft. The depth of the river ranges from two feet in the northern portion of the study area to an average depth of 10 ft near the confluence with the Arthur Kill. The substrate is predominantly silty-muck substrate (USACE, 2001).

The project area also contains a small tributary named Casey's Creek which begins in a commercially developed area and flows for approximately 2,700 ft before discharging into the Rahway River. The upper portion of Casey's Creek effectively resembles and serves as a drainage ditch with ephemeral flow created by stormwater discharge although high tide may extend into the area. The channel is overgrown with invasive vegetation such phragmites, Japanese knotweed and tree of heaven. Based on a review of past aerials, the creek width has been significantly reduced, more than likely due to sedimentation, fill activities associated with development, and the overgrowth of vegetation. The characteristics of the creek in its lower portion become more reflective of a natural tidal creek with mudflats as it flows through a high and low marsh wetland complex before discharging into the Rahway River.

The portion of the Rahway River in the project area and Casey's Creek are designated as saline waters of estuaries 3 (SE3). Designated uses for SE3 waters include: 1. Secondary contact recreation; 2. maintenance and migration of fish populations; 3. migration of diadromous fish; 4. maintenance of wildlife; and 5. any other reasonable uses (N.J.A.C. 7:9B, 2016).

Land use within the project area consists of commercial and residential properties, and the Joseph Medwick Park, owned by Middlesex County (Figure 1). The majority of the proposed levee/floodwall length is located along the upper boundary of a 23 acre wetland complex consisting of several wetland habitat types (Figure 2)(Photos 1 through 3). In addition, the District completed a 14 acre tidal marsh wetland mitigation along the eastern end of Joseph Medwick Memorial Park in 2007 to compensate for wetland impacts associated with the Arthur Kill Channel deepening related to the overall New York/New Jersey Harbor deepening project (Figure 1).

**Figure 1: Recommended Plan Project Footprint**

**Figure 2: NJDEP Mapped Wetlands**

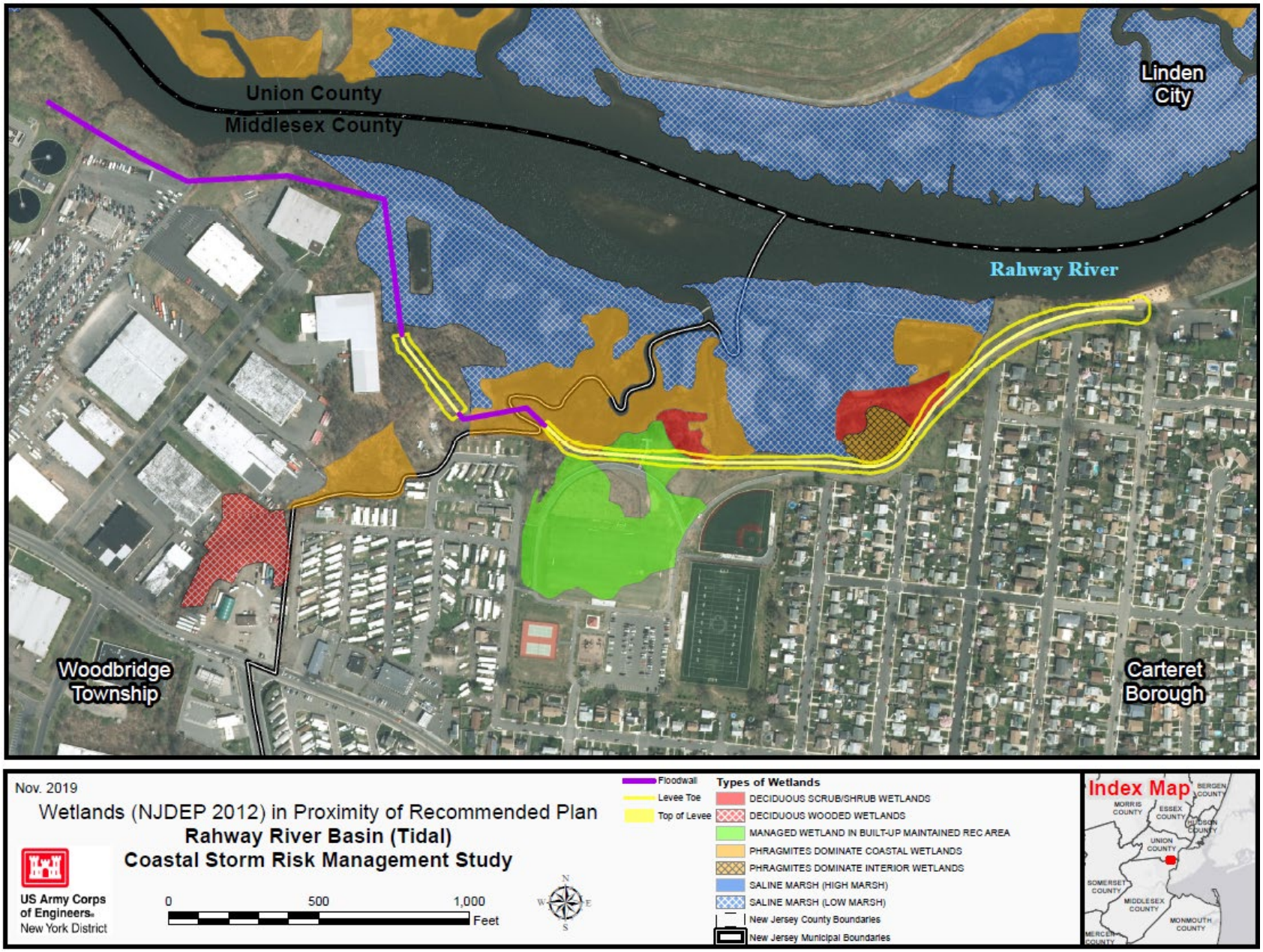

**Photo 1: Medwick Park Looking Southeast at NJDEP Designated Managed/Scrub Wetlands**

**Photo 2: Medwick Park looking northwest from Observation Deck at Phragmites Dominated High Marsh**

**Photo 3: Medwick Park, looking west at Phragmites Dominated Marsh**

## 3.0 **Impact Assessment/Mitigation Solution Development**

Approximately 2.99 acres of wetland habitat will be directly impacted by the Recommended Plan. Specific wetland habitat types impacted based on NJDEP mapped wetlands include: 1.13 acres of phragmites dominated high marsh, 1.29 acres of low marsh, and 0.57 acres of deciduous scrub-shrub wetland. In addition, 100 linear feet equaling to 0.05 acres of open water and 0.07 acres of mudflat will be impacted as a result of the proposed floodwall and associated drainage structure.

The overall objective of the compensatory mitigation ensure that adverse impacts to wetland resources are fully mitigated to meet goal outlined in the April 10, 2008 Federal Wetlands Mitigation Rule and USACE policy of no net loss of wetlands.

The District performed an Incremental Cost Analysis to determine the appropriate level of compensatory mitigation. Constraints requiring consideration in the formulation of compensatory mitigation solutions include the overall previously disturbed nature of the project area that has led to the establishment of invasive plant species and compatibility with the function of the Recommended Plan.

Based on the constraints, four scales, including No Action, were developed for the high marsh habitat, the low marsh habitat and scrub shrub wetland solutions that were analyzed in the ICA. The scales were then analyzed using the EPW to generate the FCI and FCU. Tables 1 through 3 summarize the results of the EPW analysis. Additional information on the results of the EPW analysis are included in Attachments A and B. As mentioned in section 1.1, the alternatives generated and results of the incremental cost analysis are presented in Appendix A.9.

**Table 1: High Marsh Solutions/Scales**

| Solution | Scale | Description | Average FCI | Average FCU |
|---|---|---|---|---|
| No Action (Existing Conditions) | 0 | 1.13 acres | 0.8 | 0.9 |
| Small | 1 | 1.13 acres | 0.9 | 1 |
| Medium | 2 | 2.26 acres | 0.9 | 2 |
| Large | 3 | 3.39 acres | 0.9 | 3 |

**Table 2: Low Marsh Solutions/Scales**

| Solution | Scale | Description | Average FCI | Average FCU |
|---|---|---|---|---|
| No Action (Existing Conditions) | 0 | 1.29 acres | 0.8 | 1.0 |
| Small | 1 | 1.29 acres | 0.9 | 1.1 |
| Medium | 2 | 2.58 acres | 0.9 | 2.3 |
| Large | 3 | 3.87 acres | 0.9 | 3.4 |

**Table 3: Scrub Shrub Wetland Solutions/Scales**

| Solution | Scale | Description | Average FCI | Average FCU |
|---|---|---|---|---|
| No Action (Existing Conditions) | 0 | 0.57 acres | 0.7 | 0.4 |
| Small | 1 | 0.57 acres | 0.8 | 0.5 |
| Medium | 2 | 1.14 acres | 0.8 | 0.9 |
| Large | 3 | 1.71 acres | 0.8 | 1.4 |

The District estimates that 100 ft of tidal channel equaling to 0.05 acres of open water and 0.07 acres of mudflat will be permanently adversely impacted. Functional assessment models become imprecise with impacts this small in that they are unable to differentiate functional capacity indices/units between existing conditions and various mitigation alternatives.

The NJDEP is the administering authority of the Section 404 of the Clean Water Act and utilizes a ratio based system of compensatory wetland mitigation. Therefore, the District is following the NJDEP ratio system to determine compensatory mitigation impacts for the tidal channel. In order to determine the appropriate ratio, the District conducted a qualitative analysis of Casey's Creek.

Because the tidal channel is part of a large wetland complex, exhibits mostly natural characteristics with minimal surrounding development, and has the potential ability to support fish species, particularly EFH designated species, the District is designating Casey's Creek as being of intermediate resource value. Therefore, the District will utilize a ratio of 2:1 to create/restore on-site 200 linear ft of tidal creek equaling to 0.10 acres of open water and 0.14 acres of mudflat habitat within the impacted wetland complex.

Approximately 0.55 acres of predominantly phragmites dominated low marsh, 0.44 acres of high marsh wetlands, 0.10 acres of scrub-shrub wetland and 0.15 acres of upland forest will experience temporary impacts during construction. These areas will be restored with native vegetation after construction is completed. In areas where phragmites dominates, elevation changes through excavation may occur to manage its reestablishment. Typical plant species found in deciduous scrub shrub wetlands and upland forest along with native pollinator species that will be evaluated during compensatory mitigation and overall site restoration plan development are included in Attachments D and E.

NJDEP designated managed wetlands within the footprint of the levee have been extensively modified to remediate the park and create recreational infrastructure (asphalt walking trail, athletic fields) within Joseph Medwick Park to the point where it no longer functions as wetlands. Therefore, no compensatory mitigation is proposed.

## 3.1 Reference Area

As mentioned in Section 2, the District performed compensatory mitigation for another project at the eastern end of the Joseph Medwick Park in 2007 (Figure 1)(Photo 4). The mitigation restored a total of 14 acres comprising of tidal creek, intertidal mudflat, low marsh and high marsh habitat. Work involved included removal of phragmites and excavating several feet to restore hydrology supportive of native marsh vegetation. The tidal creek restoration involved enhancing one of the existing creeks that enters the marsh surface by widening the mouth of the creek, deepening a

portion of the creek and branching off an additional tidal creek. The additional tidal creek meanders through to the middle of the site, providing tidal flow to the back of the project site (USACE, 2004).

Based on preliminary field investigations, the site is still functioning as designed and will potentially serve as a suitable reference area for the compensatory mitigation for the proposed action. Further field investigations will be conducted at the reference site during the preconstruction engineering design phase to support development of compensatory mitigation designs for the proposed action.

Species planted within the various hydrologic zones are listed in Table 4.

**Photo 4: USACE Mitigation Site Constructed in 2007**

**Table 4: Species Planted at Reference Site**

| Plant Community | Species | |
|---|---|---|
| | Latin Name | Common Name |
| Low Marsh | *Spartina alterniflora* | Smooth cordgrass |
| Low Marsh/High Marsh Transition | *Spartina alterniflora* | Saltmeadow cordgrass |
| | *Spartina patens* | Smooth cordgrass |
| Supratidal | *Iva frutescens* | Maritime marsh-elder |
| | *Spartina patens* | Smooth cordgrass |
| Supratidal to Upland Transition | *Distichlis spicata* | Saltgrass |
| | *Juncus gerardii* | Saltmarsh rush |
| | *Baccharis halmifoloa* | Groundsel tree |
| Upland | *Prunus maritime* | Beach plum |
| | *Myrica pennsylvanica* | Northern bayberry |
| | *Rhus copallina* | Winged sumac |

# 4.0 **References**


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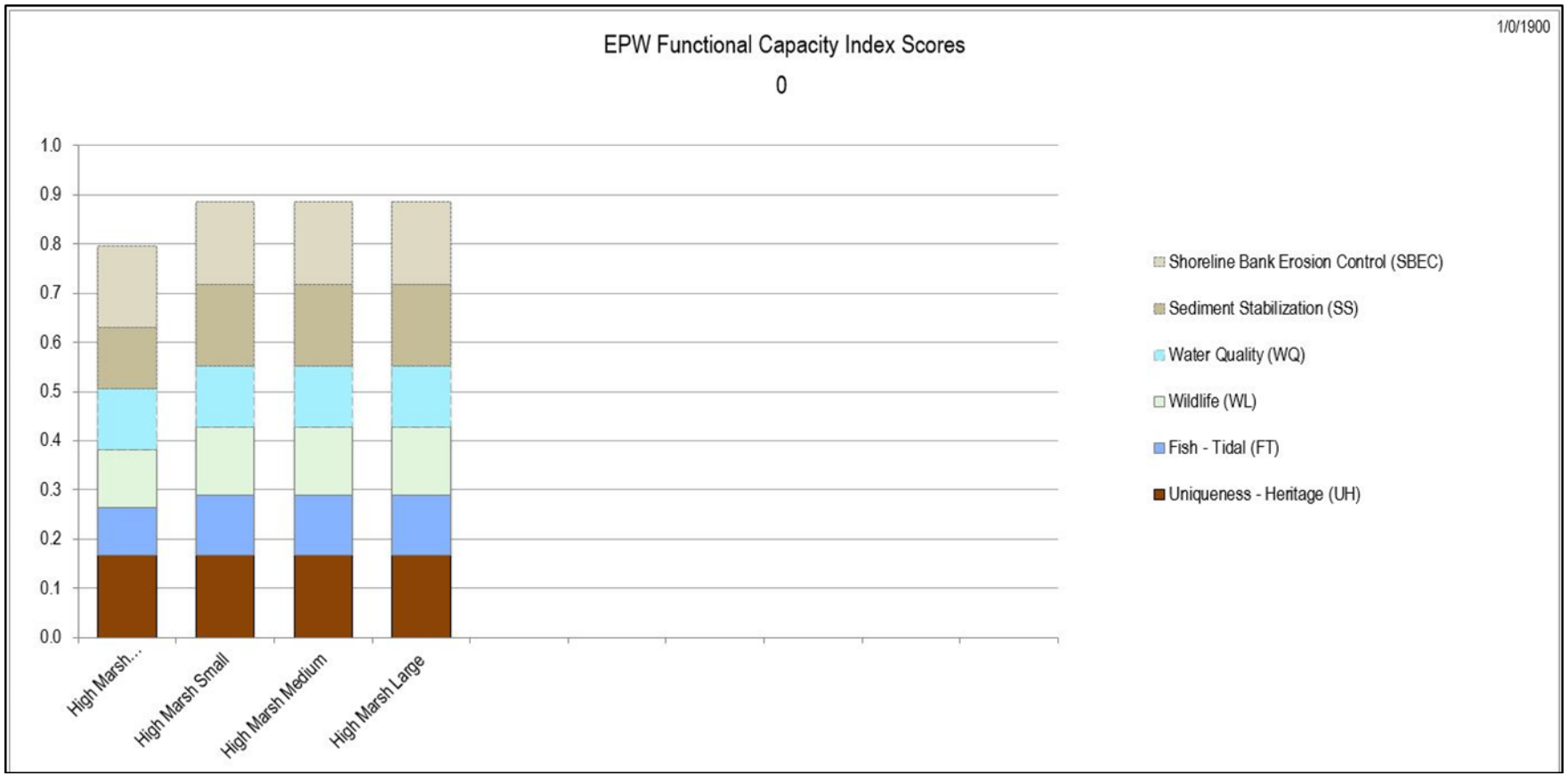
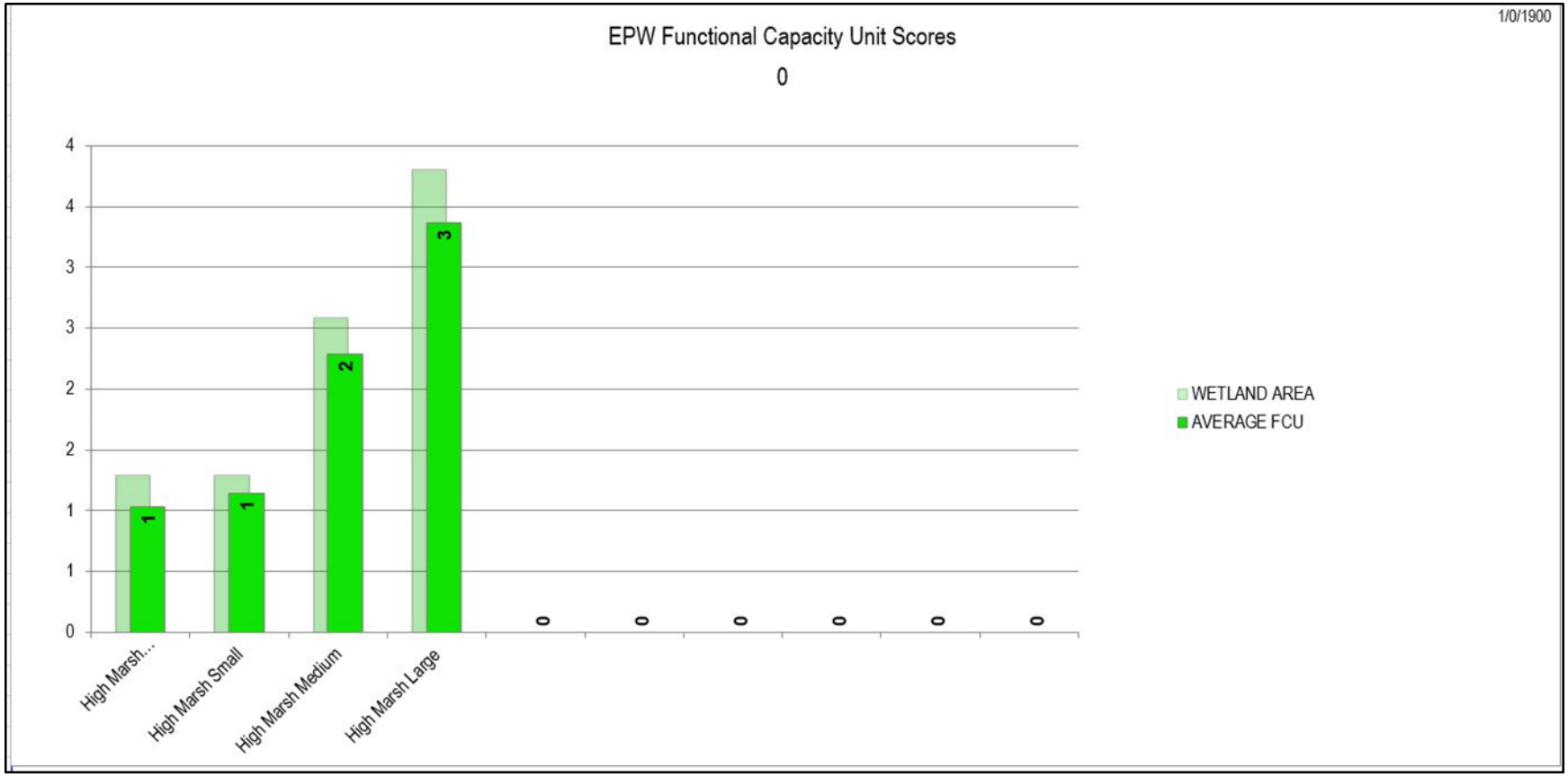
# Attachment A

# High Marsh EPW Results

| Solution | Scale | Description | Function | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Shoreline Bank Erosion Control | | Sediment Stabilization | | Water Quality | | Fish (Tidal) | | Wildlife | | Uniqueness-Heritage | |
| | | | FCI | FCU | FCI | FCU | FCI | FCU | FCI | FCU | FCI | FCU | FCI | FCU |
| No Action (Existing Conditions) | 0 | | | | | | | | | | | | | |
| Small High Marsh | 1 | 1.13 acres | 1 | 1 | 1 | 1 | 0.8 | 1 | 0.7 | 1 | 0.8 | 1 | 1 | 1 |
| Medium High Marsh | 2 | 2.26 acres | 1 | 2 | 1 | 2 | 0.8 | 2 | 0.7 | 2 | 0.8 | 2 | 1 | 2 |
| Large High Marsh | 3 | 3.39 acres | 1 | 3 | 1 | 3 | 0.8 | 3 | 0.7 | 3 | 0.8 | 3 | 1 | 3 |


1/0/1900
EPW Functional Capacity Index Scores
0
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
High Marsh...
High Marsh Small
High Marsh Medium
High Marsh Large
Shoreline Bank Erosion Control (SBEC)
Sediment Stabilization (SS)
Water Quality (WQ)
Wildlife (WL)
Fish - Tidal (FT)
Uniqueness - Heritage (UH)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EPW Functional Capacity Unit Scores
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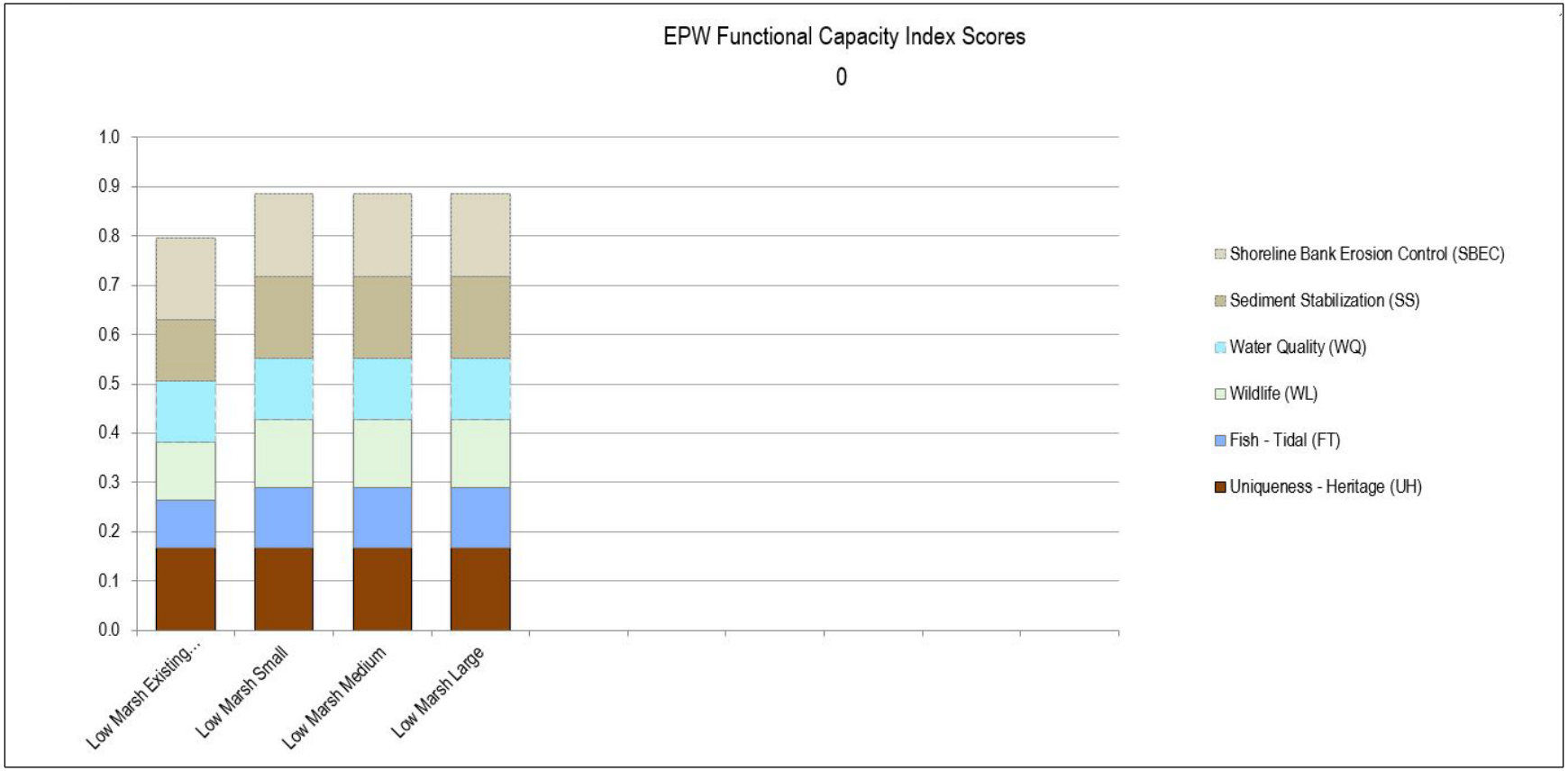
High Marsh...
High Marsh Small
High Marsh Medium
High Marsh Large
WETLAND AREA
AVERAGE FCU

# Attachment B

# Low Marsh EPW Results

| Solution | Scale | Description | Function | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Shoreline Bank Erosion Control | | Sediment Stabilization | | Water Quality | | Fish (Tidal) | | Wildlife | | Uniqueness-Heritage | |
| | | | FCI | FCU | FCI | FCU | FCI | FCU | FCI | FCU | FCI | FCU | FCI | FCU |
| No Action (Existing Conditions) | 0 | | | | | | | | | | | | | |
| Small Low Marsh | 1 | 1.29 | 1 | 1 | 1 | 1 | 0.8 | 1 | 0.7 | 1 | 0.8 | 1 | 1 | 1 |
| Medium Low Marsh | 2 | 2.58 | 1 | 3 | 1 | 3 | 0.8 | 2 | 0.7 | 2 | 0.8 | 2 | 1 | 3 |
| Large Low Marsh | 3 | 3.87 | 1 | 4 | 1 | 4 | 0.8 | 3 | 0.7 | 3 | 0.8 | 3 | 1 | 4 |


EPW Functional Capacity Index Scores
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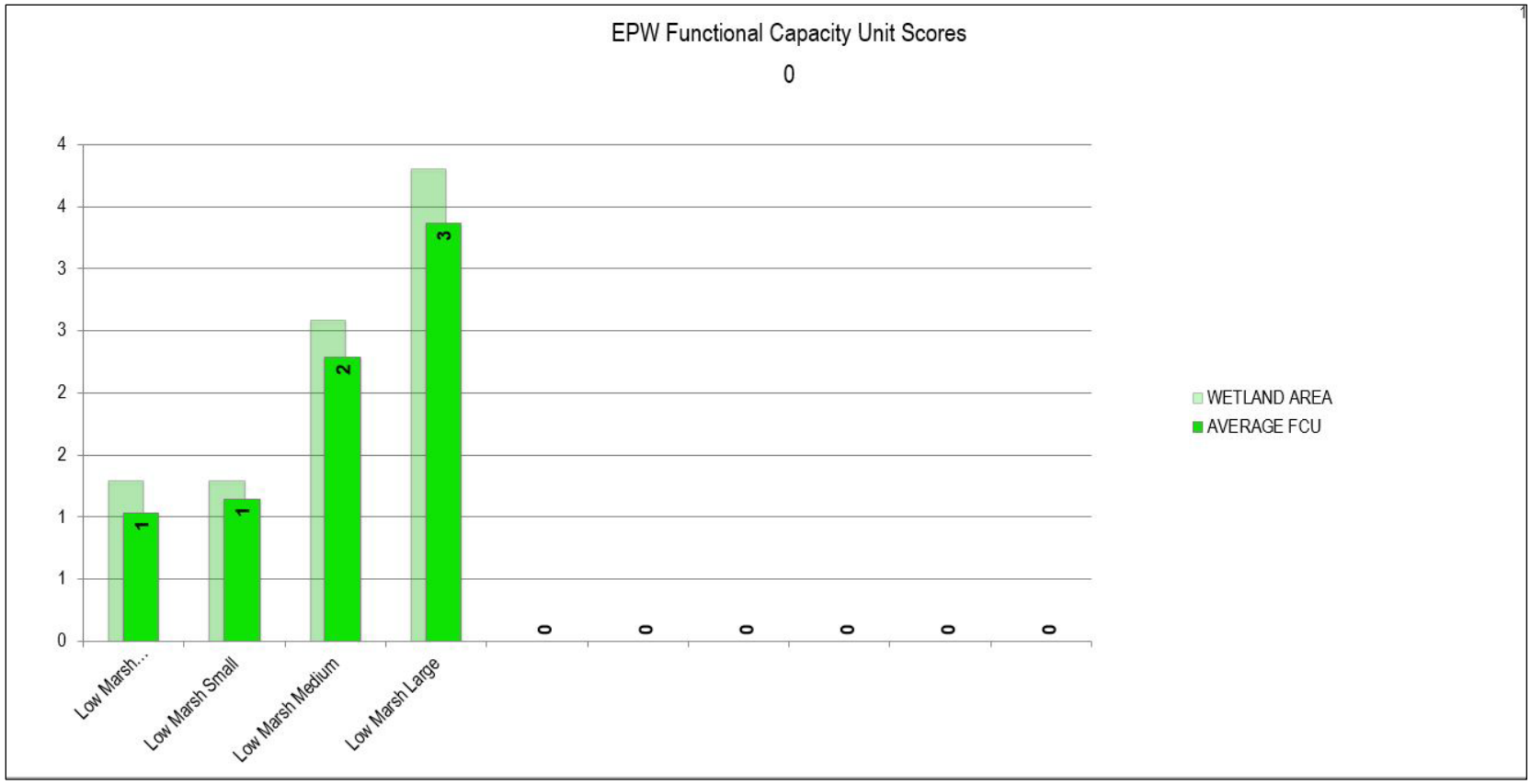
Low Marsh Existing...
Low Marsh Small
Low Marsh Medium
Low Marsh Large
Shoreline Bank Erosion Control (SBEC)
Sediment Stabilization (SS)
Water Quality (WQ)
Wildlife (WL)
Fish - Tidal (FT)
Uniqueness - Heritage (UH)


EPW Functional Capacity Unit Scores
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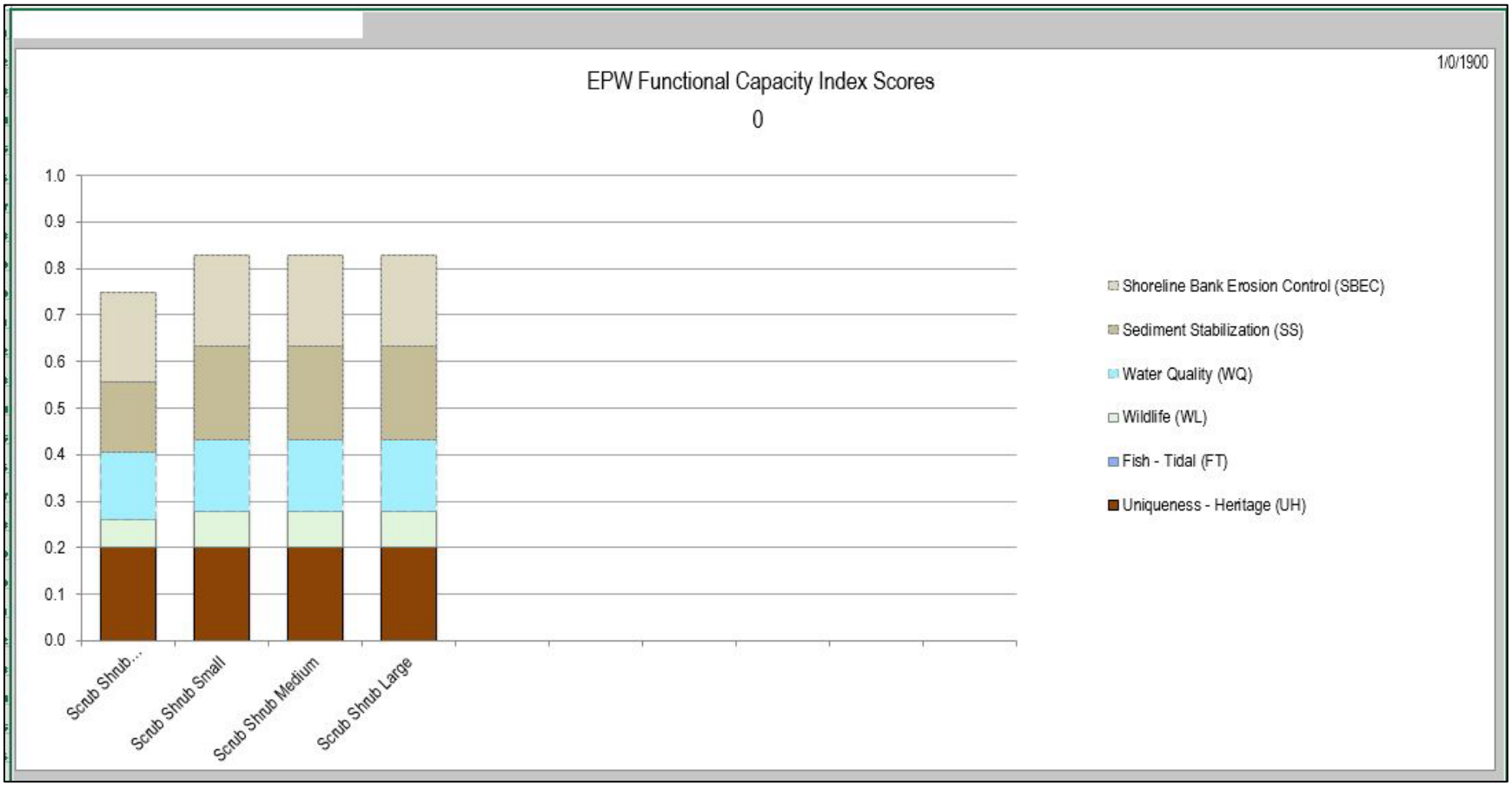
Low Marsh...
Low Marsh Small
Low Marsh Medium
Low Marsh Large
WETLAND AREA
AVERAGE FCU

# Attachment C

# Scrub Shrub EPW Results

| | Scale | Description | Function | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Shoreline Bank Erosion Control | | Sediment Stabilization | | Water Quality | | Wildlife | | Uniqueness-Heritage | |
| | | | FCI | FCU | FCI | FCU | FCI | FCU | FCI | FCU | FCI | FCU |
| No Action | 0 | 0.57 | | | | | | | | | | |
| Small Scrub Shrub | 1 | 0.57 | 1 | 1 | 1 | 1 | 0.8 | 0 | 0.4 | 0 | 1 | 1 |
| Medium Scrub Shrub | 2 | 1.14 | 1 | 1 | 1 | 1 | 0.8 | 0 | 0.4 | 0 | 1 | 1 |
| Large Scrub Shrub | 3 | 1.71 | 1 | 2 | 1 | 2 | 0.8 | 1 | 0.4 | 1 | 1 | 2 |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EPW Functional Capacity Index Scores
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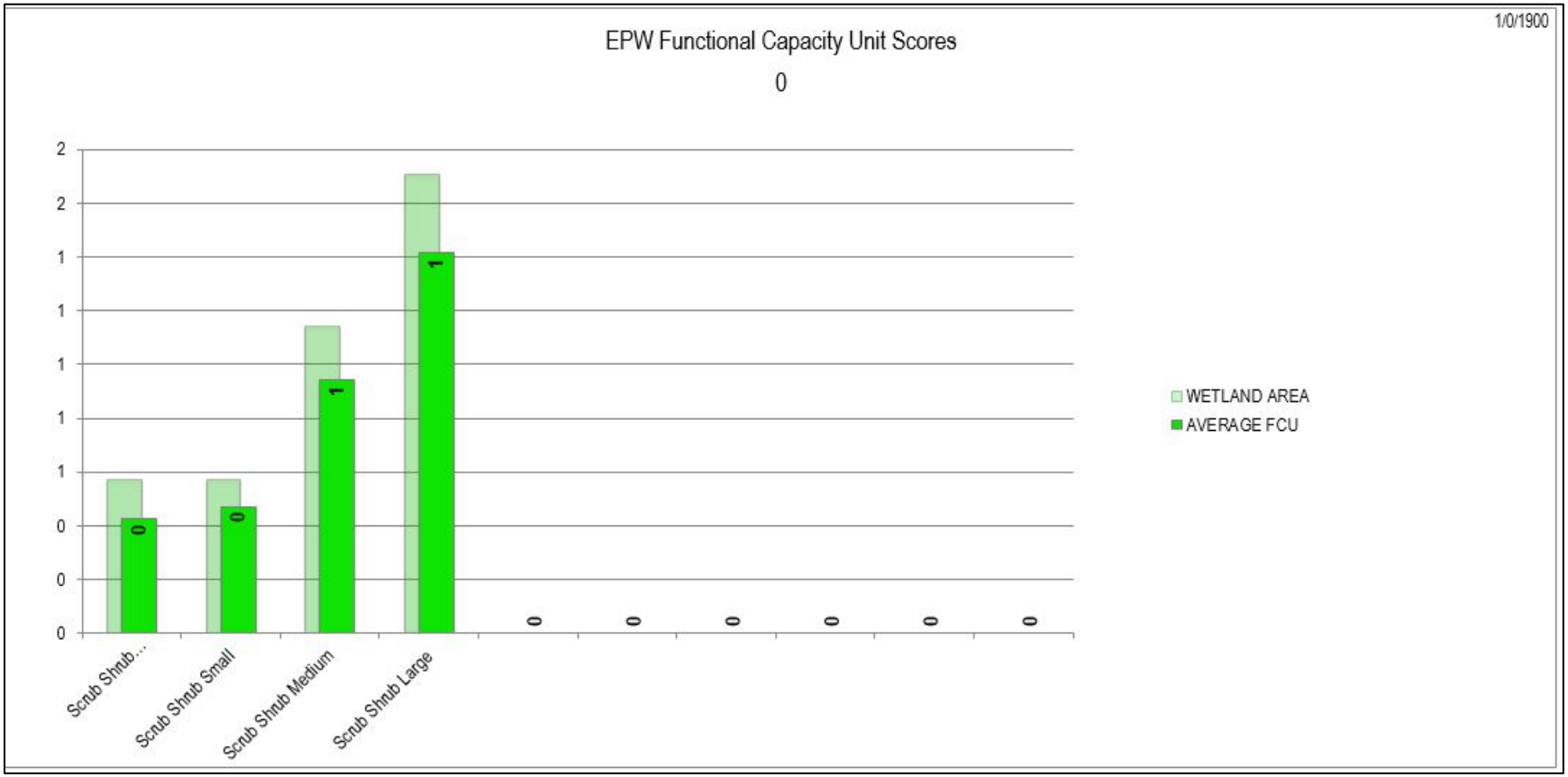
0.1
0.0
Scrub Shrub...
Scrub Shrub Small
Scrub Shrub Medium
Scrub Shrub Large
Shoreline Bank Erosion Control (SBEC)
Sediment Stabilization (SS)
Water Quality (WQ)
Wildlife (WL)
Fish - Tidal (FT)
Uniqueness - Heritage (UH)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EPW Functional Capacity Unit Scores
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Scrub Shrub...
Scrub Shrub Small
Scrub Shrub Medium
Scrub Shrub Large
WETLAND AREA
AVERAGE FCU

**Attachment D**

# Tables of Common Tree and Shrub Species Used for Habitat Mitigation

**Table 1: Native**

| Common Name | Latin Name |
|---|---|
| Alder | *Alnus spp* |
| Sea-myrtle | *Baccharis halmifolia* |
| Common buttonbush | *Cephalanthus occidentalis* |
| Silky dogwood | *Cornus amomum* |
| Red osier dogwood | *Cornus sericea* |
| Inkberry | *Ilex glabra* |
| Common winterberry | *Ilex verticillata* |
| Marsh elder | *Iva frutescens* |
| Steeplebush | *Spiraea tomentosa* |
| Highbush blueberry | *Vaccinium corymbosum* |

**Table 2: Native Upland Species**

| Common Name | Latin Name |
|---|---|
| Ash-leaf maple | *Acer negundo* |
| Red maple | *Acer rubrum* |
| Canadian serviceberry | *Amelanchier Canadensis* |
| Shagbark hickory | *Carya ovata* |
| American beech | *Fagus grandifolia* |
| Tuliptree | *Liriodendron tulipfera* |
| Black gum | *Nyssa sylvatica* |
| White oak | *Quercus alba* |
| Northern red oak | *Quercus rubra* |

# Attachment E

# Native Pollinator Species

NRCS Natural Resources Conservation Service

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Somerset, NJ 08873
Tel. 732-537-6040
Fax: 732-537-6095

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**NJ BIOLOGY TECHNICAL NOTE**

**Habitat Development for Pollinators**

As many as two-thirds of the world's crop species depend on insects for pollination, and this may account for 15-30 percent of the food we consume. In the United States one third of all agricultural output depends on pollinators. More than 90 crops in North America depend upon bees for pollination. In New Jersey crops such as apples, peaches, strawberries, blueberries, cranberries, pumpkins, cucumbers, squash and more depend upon insect pollination. The seeds of many forage crops used by New Jersey livestock producers such as clover and alfalfa require insect pollinators. Pollinators are also important to the function of many terrestrial ecosystems because they enhance native plant reproduction. Native plants provide food and cover for numerous wildlife species, help stabilize the soil and improve water quality. As a group, pollinators are threatened worldwide by habitat loss and fragmentation, pesticides, disease, and parasites. This has serious economic implications for native ecosystem diversity and stability, for agricultural producers, and for all consumers of agricultural products.

Honey bees, first brought to the United States from Europe in the 1600s, have been used by farmers for many years for pollination of crops. Honey bee populations are experiencing sharp declines recently due to honey bee pests and diseases. Prices for rental of honey bee colonies have doubled in recent years and many crop producers report it has even become hard to secure any honey bees for pollination services. Wild honey bee colonies, once common on New Jersey farms, are almost non-existent due to the recent pests and diseases.

Native pollinators such as bees and butterflies are often underestimated when it comes to pollination. Except for the larger bumble bees, many native bees are small, solitary, non-social insects. While some species look like bees, many are very small and look like flies or flying ants. Native bees can contribute significantly to crop pollination, and if the proper conditions exist on farms they may provide all the pollination needs of some crops. Some researchers suggest that crops pollinated by wild bees in the United States are valued at $2 to $3 billion annually. Researchers around the country are learning more about native pollinators such as their role in crop pollination and what producers can do to benefit habitat for native bees on their farms.

To provide habitat for native pollinators, diverse floral sources that provide a succession of flowers are needed. Some floral sources should be available throughout the spring, summer and fall so nectar and pollen are available to insects for the entire growing season. Bees and butterflies have good color vision so choose flowers of several colors – particularly blues, purple, violet, yellow and white. Provide flowers of different shapes to attract pollinators with different body sizes and mouthparts. Use native plants first since these are usually adapted to New Jersey's growing conditions and native pollinators evolved with these plants.

Quality nesting sites must also be available for native pollinators to thrive. Many native bee species are digger bees that nest underground. Nesting sites may be underground in sunny, well drained, partially bare areas adjacent to crop fields. Other species nest in hollow twigs of dead shrubs,

tunnels in dead trees left behind by wood-boring beetles, or excavate nests in above-ground rotting logs and stumps. Cranberry growers report some success in providing artificial nesting structures or "trap nests" made by drilling ten to twenty 5/16" diameter holes, 4"-10" deep, in blocks of wood that are erected near bogs for leaf-cutting bees. Bumble bees are social insects and build nests just under or near the soil surface in small depressions such as old mammal borrows or under fallen plant matter. Leaf cutting bees and bumble bees are very effective pollinators of cranberries and blueberries. Bee nesting areas can be established on sunny, south facing slopes on well-drained soils. A combination of bare soil, brush piles, standing dead trees and flowering forbs, shrubs and trees is ideal. Several of these areas could be located strategically around a farm since many native pollinators do not fly long distances like honeybees.

Another practice important to native pollinators on farms is integrated pest management. Pesticides can inadvertently kill beneficial insects or beneficial plants. Contaminated nectar and pollen can be collected by bees and brought back to nests to feed to larvae, causing reproduction failures. Insecticides, if necessary, should be chosen wisely and applied during times when beneficial insects are least active. Indiscriminant herbicide use should be discouraged, and herbicides should be targeted directly at specific weed problems. Odd areas, hedgerows, filter strips and field borders may appear "weedy" but can provide important pollinator habitat and should be protected from pesticides.

NRCS can assist landowners with habitat enhancement for pollinators by encouraging them to establish an array of plants that flower throughout the growing season to provide a source of nectar for adult pollinators and a diversity of herbaceous material for immature pollinator life stages. In addition, bee shelter areas can be designated on farms to provide nesting sites. The Upland Wildlife Habitat Management or Early Successional Habitat Development/Management standards and specifications could be used in conservation plans for pollinator habitat. In general, diverse upland wildlife habitat on farms, in areas such as hedgerows, odd areas and field borders, with diverse native plants and if protected from pesticides, will be good pollinator habitat.

The pollinator habitat development practices discussed above will help enhance farms for native pollinators and likely help with crop pollination. One or more of the items discussed above could easily be worked into most farm conservation plans. These practices will also provide habitat for many other wildlife species including many beneficial insects. In 2007, the New Jersey Wildlife Habitat Incentive Program (WHIP) includes cost sharing assistance for "Pollinator Meadows" as a component of Early Successional Habitat Development/Management (Practice Code 647). The plants on the attached list provide some good guidance on pollinator plants for New Jersey and will be updated as further results are obtained from ongoing local research projects. For specific planting recommendations or developing seed mixes, contact the NRCS Biologist in your region. The references listed provide more detailed information on specific pollinator topics and should be reviewed prior to adding pollinator practices into conservation plans. Selected references could also be provided to landowners interested in pollinator habitat enhancement.

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# Beneficial Plant Species for NJ Pollinators on Farms

| Common Name | Scientific Name | Early-Mid-Late Summer Flowering Period | Wetland Indicator Status* | Benefits |
|---|---|---|---|---|
| **Native Herbaceous Perennials** | | | | |
| Goldenrods | *Solidago* spp. | Mid and Late | various | Many native bee spp. and honeybees use, one of the best bee plants |
| Asters | *Aster* spp. | Late | various | Many native bee spp. and honeybees use, one of the best bee plants |
| Bee Balm, Wild Bergamot | *Monarda fistulosa* | Mid | UPL | Excellent bee plant. Substitute M. *punctata* (horsemint) in S. Jersey |
| Showy Tick Treefoil | *Desmodium canadense* | Mid | FAC | Long summer flowering period |
| Wild Columbine | *Aquilegia canadensis* | Early | FAC | Good early bee plant |
| Wild Indigo | *Baptisia tinctoria* | Mid | **U** | Yellow flowers |
| Common Boneset | *Eupatorium perfoliatum* | Mid to Late | FACW | Excellent butterfly and bee plants |
| Joe-Pye Weed | *Eupatorium purpureum* | Mid to Late | FAC | Excellent butterfly and bee plants |
| Giant Sunflower | *Helianthus giganteus* | Mid to Late | FACW | Large, up to 8' tall, very showy |
| Ox Eye Sunflower | *Heliopsis helianthoides* | Mid to Late | **U** | Long bloom period, up to 4' tall, yellow flowers |
| Round-headed Bush Clover | *Lespedeza capitata* | Late | FACU | Native clover |
| Milkweeds | *Asclepias* spp. | Mid | various | Excellent butterfly and bee plants |
| Blazing Star | *Liatris spicata* | Mid | FAC | Pink, purple spikes |
| Wild Lupine | *Lupinus perennis* | Early | **U** | Large blue flowers |
| Beardtounge | *Penstemon digitalis* | Early | FAC | White to purple tinged flowers |
| Black-eyed Susan | *Rudbeckia hirta* | Mid to Late | FACU | Common volunteer |
| Blue Vervain | *Verbena hastata* | Late | FACW | Moist areas |
| Jewelweed | *Impatiens capensis* or *pallida* | Mid | FACW | Common in moist woodlands, no commercial seed source |
| Great Blue lobelia | *Lobelia siphilitica* | Late | FACW | Showy blue flowers |
| Purple Coneflower | *Echinacea purpurea* | Mid | **U** | Showy pink flowers |
| Evening Primrose | *Oenothera biennis* | Mid to Late | FACU | Common volunteer, showy yellow flowers |
| Fleabanes | *Erigeron* spp. | Mid to Late | various | Common weed on farms, no seed sources |
| **Non-native Herbaceous Perennials** | | | | |
| White Clover | *Trifolium repens* | Mid | FACU | Excellent honeybee nectar source, native bee use |
| Red Clover | *Trifolium pratense* | Mid | FACU | Excellent honeybee nectar source, native bee use |
| Crimson Clover (annual) | *Triflium incarnatum* | Early to Mid | **U** | Excellent honeybee nectar source, native bee use |
| Bird's Foot Trefoil | *Lotus corniculatis* | Mid | FACU | Excellent honeybee nectar source, native bee use |
| Sweet Clover (biennial) | *Melilotus officinalis* | Mid | **U** | Excellent honeybee nectar source, native bee use. Can be invasive |
| Mustards | *Brassica* spp. | Early | various | Very early yellow flowers |
| Dandelion | *Taraxacum officinale* | Early | FACU | Very common weed, good pollen source. Can be invasive |
| Daisies | *Chrysanthemum* spp. | Mid to Late | various | Showy white flower |

| **Trees/Shrubs** | | | | |
|---|---|---|---|---|
| New Jersey Tea | *Ceanothus americanus* | Mid | **U** | Low upland woodland shrub |
| Sweet Pepperbush | *Clethra alnifolia* | Mid | FAC | Moist woodland shrub, sweet smelling flowers |
| Wild Plum | *Prunus americana* | Early | FACU | Shrub. Substitute *P. maritima* (Beach Plum) in coastal areas |
| Black locust | *Robinia pseudoacacia* | Early | FACU | Tree. Excellent bee nectar source. Some authors list as non-native |
| Steeplebush, Meadowsweet | *Spirea tomentosa* | Mid to Late | FACW | Small shrub in moist soils |
| Willow | *Salix* spp. | Early | various | Trees and shrubs. Early pollen source, impt. to many native bees. |
| Hawthorns, Thorn Apple | *Crataegus* spp. | Early to Mid | various | Many species, thorny shrubs |
| Red Maple | *Acer rubrum* | Early | FAC | Tree provides abundant early pollen sources |
| Sumac | *Rhus* spp. | Mid | various | Common shrub of odd areas on farms |
| Juneberry, Shadbush | *Amalanchier* spp. | Early | various | Small tree with early white flowers attract many insects |
| Dogwoods | *Cornus* spp. | Early-Mid | various | Showy white spring flowers attract many insects |
| Apple, Crabapple (non-native) | *Malus* spp. | Early-Mid | various | Showy white spring flowers attract many insects |
| Raspberries, Blackberries | *Rubus* spp. | Early-Mid | various | Showy white spring flowers attract many insects |
| Black Cherry | *Prunus serotina* | Early-Mid | FACU | Common tree on NJ farms. Good fall fruit for wildlife |
| Button Bush | *Cephalanthus occidentalis* | Mid | OBL | Shrub of very wet sites only |

*From US Fish Wildlife Service National List of Plant Species That Occur in Wetlands – Northeast Region. Plants with a "**U**" normally would not occur in wetlands and are totally upland species and are not on the list ("**U**" is not an official US FWS designation). Plants with the "various" designation include several species that are good pollinator plants, with several different wetland indicator status designations. Check the wetland indicator status from the US FWS list for the specific plant chosen.

**Plant List References:**

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**Table 2: Native Upland Species**

| Common Name | Latin Name |
|---|---|
| Ash-leaf maple | *Acer negundo* |
| Red maple | *Acer rubrum* |
| Canadian serviceberry | *Amelanchier Canadensis* |
| Shagbark hickory | *Carya ovata* |
| American beech | *Fagus grandifolia* |
| Tuliptree | *Liriodendron tulipfera* |
| Black gum | *Nyssa sylvatica* |
| White oak | *Quercus alba* |
| Northern red oak | *Quercus rubra* |