



Prepared for:
United States Army Corps of Engineers
New York, New York
Contract No. W91236-09-D-0075; Delivery Order CE02

U. S. ARMY CORPS OF ENGINEERS FINDERNE FARM MITIGATION SITE GREEN BROOK FLOOD CONTROL PROJECT

Township of Bridgewater
Somerset County, New Jersey

2012 MONITORING REPORT
(Year 6)




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1.0 Introduction

1.1 Site Description

The Finderne Farm wetland mitigation site (Finderne site) is located in the Township of Bridgewater in Somerset County, New Jersey. Figure 1 provides a U.S. Geological Survey (USGS) map showing the site location. The site is located south of New Jersey Route 28, west of Finderne Avenue and is bound to the south, east and west by the Raritan River (Figure 2). The Finderne site occupies Block 303, Lot 8, and Block 303, Lot 1.03. The former Egan Machinery plant, a barn, and a historical building (the Van Veghten House) are located along the north border of the site. Several easements are located on the property, including a one-acre area set aside by Somerset County Parks as Green Acres land, a trunk sewer line right-of-way for the Somerset-Raritan Valley Sewer Authority and a PSE&G right-of-way.

1.2 Project Description

On August 5, 2005, the New Jersey Department of Environmental Protection, Division of Land Use Regulation (NJDEP) approved the New York District of the U.S. Army Corps of Engineers (Corps) wetland mitigation proposal, entitled, "Wetland Mitigation Design for the Finderne Site, Green Brook Flood Control Project, Bridgewater Township, Somerset County, New Jersey" (USACE 2005a). The Finderne site serves as off-site wetland and habitat mitigation acreage for the environmental impacts of the Bound Brook construction elements (Segments A, N, R1, R2, T, and U) and a portion of structural project elements proposed in Middlesex County that could not be mitigated on-site. Appendix A contains the NJDEP-issued Mitigation Permit.

The overall design goal of the mitigation plan was to provide in-kind mitigation for wetlands impacted by the Green Brook Flood Control Project at a minimum ratio of 2:1. Therefore, the mitigation plan was developed to provide a minimum of 21 acres of created forested wetlands to mitigate for anticipated wetland impacts. The project also includes the enhancement of approximately 32 acres of existing forested wetlands, six acres of scrub-shrub wetland, five acres of emergent wetland and preservation of six acres of palustrine emergent wetland, six acres of upland forest and 27 acres of riparian forest. Restoration of the unnamed stream on the western portion of the site (hereinafter referred to as Finderne Brook) was also performed along approximately 800 linear feet of the stream.

Construction of the Finderne site was completed in July 2006. To ensure compliance with Corps policy and the NJDEP wetland mitigation regulations, the mitigation site was monitored for five full growing seasons. As a result of indications that the site is not trended towards meeting success criteria as concluded in the previous years' monitoring reports, the Corps has elected to continue monitoring for Year-6 in conjunction with adaptive management strategies both proposed and currently underway onsite.

The first through fifth year monitoring reports were submitted to NJDEP on June 23, 2008, February 23, 2009, January 26, 2010, January 26, 2011, and December 7, 2011 respectively. Pursuant to the NJDEP *Mitigation Project Monitoring Reports – Checklist for Completeness*, the sixth year monitoring report (2012) includes the following information:

- Introduction with a brief explanation of the project;
- USGS topographic map, county road map and aerial photograph;
- Copies of all relevant NJDEP permits;
- Demarcation of the wetland mitigation areas with PVC pipe¹;
- Photos of the constructed wetland mitigation areas with a photo location map;
- Discussion of site soil and hydrology, including soil profile descriptions;

¹ Demarcation with PVC pipe occurred at the outset of the monitoring program. Extreme flood events over the course of the five year monitoring program may have removed or severely damaged such markers.

- Assessment of the planted vegetation, including vegetation survey data sheets;
- Documentation of invasive or noxious species present within the mitigation site and recommendations for elimination of undesirable species;
- Recommendations to rectify potential problems identified during the monitoring period; and
- A narrative evaluating the success and/or failure of the wetland mitigation areas.

This wetland mitigation project will be considered successful if, after five full growing seasons (*or longer as necessary*) the Corps demonstrates that the following four performance standards established in the permit conditions have been met:

1. That the goals of the wetland mitigation project including acreage and the required wetland buffer, as stated in the approved wetland mitigation proposal and the permit, have been satisfied. At the end of year-5, the Corps must submit a field wetland delineation of the wetland mitigation project based on the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (1989) which shows the exact acreage of the wetland mitigation areas.
2. The site has an 85 percent survival and 85 percent area coverage of the mitigation plantings or target hydrophytes which are species native to the area and similar to ones identified on the mitigation planting plan. All plant species in the mitigation area are healthy and thriving. All trees are at least five feet in height.
3. The site is less than 10 percent occupied by invasive or noxious species such as but not limited to *Phalaris arundinacea* (reed canary grass), *Phragmites australis* (common reed grass), *Pueraria montana* (kudzu), *Typha latifolia* (broad-leaved cattail), *Typha angustifolia* (narrow-leaved cattail), *Lythrum salicaria* (purple loosestrife), *Ailanthus altissima* (tree-of-heaven), *Berberis thunbergii* (Japanese barberry), *Berberis vulgaris* (common barberry), *Elaeagnus angustifolia* (Russian olive), *Elaeagnus umbellata* (autumn olive), *Ligustrum obtusifolium* (Japanese privet), *Ligustrum vulgare* (common privet) and *Rosa multiflora* (Multiflora rose).
4. The proposed hydrologic regime as specified in the mitigation proposal, which proves the mitigation site is a wetland, has been satisfied.

This report has been prepared by the Corps pursuant to NJDEP requirements and includes the results of the sixth annual monitoring event.

1.3 Wetland Design

The forested wetland creation areas were designed to provide sufficient flood storage to provide approximately 7 to 10 days of inundation followed by 7 to 11 days of soil saturation within the upper 12 inches of the soil profile during the growing season. The total wetland hydroperiod should range from 14 to 21 days in duration, which represents 6.5 percent to 10 percent of the growing season between March and October (about 215 days). Wetland enhancement areas were restored to increased surface water depth in open water areas and the duration of soil saturation in adjoining areas.

1.3.1 VEGETATION

All plantings were performed and completed in 2006. As shown on the As-Built Planting Plan (Appendix B) and Figure 3 Aerial Planting Zone Location Map, areas monitored for Year-5 includes eight planting zones encompassing 15 planting areas. Additional planting zones were established in upland and riparian areas during the design phase, however the monitoring efforts during Year-1 through -4 focused on the planting areas within the zones serving as wetland mitigation credit. Year-5 monitoring effort included monitoring of 2 acres of riparian area (Zone A) that serve as mitigation credit for riparian zone impacts regulated by the New Jersey Flood Hazard Area Control Act Rules as a result of construction of the Green Brook Flood

Control Segment B1 Project. Table 1 summarizes the mitigation design planting zones, associated planting areas, post-construction plant community cover types and total acreage of each. Table 2 presents the mitigation design planting densities and Table 3 lists the planted tree and shrub species.

Table 1
PLANTING ZONES, COVER TYPES AND ACREAGE SUMMARY

Planting Zone	Associated Planting Areas (E – Enhancement Area, C – Creation Area)	Goal Cover Type	Acreage
A	A1, A2, A3, A4, A4c, A5, A6, A7, A8-1, A8-2, A8-3, A8-4	Deciduous forest, moderate to dense shrub layer	26.98
D, I	E2	Scrub-shrub wetland	5.80
K	E8	Scrub-shrub wetland	2.07
F1, F2	E8, E9	Deciduous forest, moderate to dense shrub layer	1.50
E	E3	Palustrine emergent wetland	5.56
C	EC1, E1, C1, C2, C3, E4, E5, E6, E7	Palustrine forested wetland	35.25
Total			62.28

Table 2
PLANTING ZONE DENSITIES²

Zone	Trees/Acre	Shrubs/Acre	Plants/Acre
A	680	194	0
C	680	194	0
D	0	300	0
E	0	0	4920
F1	0	2784 ¹	0
F2	0	4840 ¹	0
I	0	680	0
K	0	1210 ¹	0

¹Live Stakes

²Plantings were completed in 2006.

Table 3
PLANTED TREES AND SHRUBS

Planting Zone	Scientific Name	Common Name
A	<i>Acer saccharinum</i>	Silver maple
	<i>Betula nigra</i>	River birch
	<i>Carya ovata</i>	Shagbark hickory
	<i>Platanus occidentalis</i>	American sycamore
	<i>Quercus palustris</i>	Pin oak
	<i>Cornus amomum</i>	Silky dogwood
	<i>Lindera benzoin</i>	Northern spicebush
	<i>Amelanchier canadensis</i>	Canadian serviceberry
	<i>Sambucus canadensis</i>	Common elderberry
	<i>Viburnum prunifolium</i>	Blackhaw
C	<i>Quercus bicolor</i>	Swamp white oak
	<i>Quercus phellos</i>	Willow oak
	<i>Fraxinus pennsylvanica</i>	Green ash
	<i>Platanus occidentalis</i>	American sycamore
	<i>Quercus palustris</i>	Pin oak
	<i>Nyssa sylvatica</i>	Black gum
	<i>Clethra alnifolia</i>	Coastal sweet pepperbush
	<i>Cornus amomum</i>	Silky dogwood
	<i>Vaccinium corymbosum</i>	Highbush blueberry
	<i>Viburnum dentatum</i>	Southern arrowwood
D	<i>Alnus serrulata</i>	Smooth alder
	<i>Cephalanthus occidentalis</i>	Common buttonbush
	<i>Cornus stolonifera</i>	Red-osier dogwood
	<i>Viburnum dentatum</i>	Southern arrowwood
E	<i>Pontederia cordata</i>	Pickernelweed
	<i>Sparganium americanum</i>	American bur-reed
	<i>Sagittaria latifolia</i>	Broadlead arrowhead
	<i>Scirpus atrovirens</i>	Softstem bulrush
	<i>Saururus cernuus</i>	Lizard's tail
	<i>Penstemon digitalis</i>	Talus slope penstemon
	<i>Carex stipata</i>	Owlfruit sedge
	<i>Carex lurida</i>	Shallow sedge
	<i>Eupatorium coelestinum</i>	Blue mistflower
	<i>Eupatorium maculatum</i>	Spotted trumpetweed
	<i>Eupatorium perfoliatum</i>	Common boneset
	<i>Eupatorium purpureum</i>	Sweetscented joe-pye-weed
F1, F2, K	<i>Spiraea tomentosa</i>	Steeplebush
	<i>Salix spp.</i>	Willow sp.
I	<i>Clethra alnifolia</i>	Coastal sweet pepperbush
	<i>Cornus amomum</i>	Silky dogwood
	<i>Vaccinium corymbosum</i>	Highbush blueberry
	<i>Viburnum dentatum</i>	Southern arrowwood

A description of the planting areas included in the monitoring program is presented below.

Planting Zone A (Riparian Forest): The majority of Planting Zone A, approximately 26.98 total acres, is located adjacent to and in close proximity to the Raritan River. The goal of the planting program in these areas was to create a deciduous floodplain forest with a moderate to dense shrub layer along a corridor parallel to the northern bank of the Raritan River. The corridor ranges in width from approximately 100 feet to 800 feet. This forested floodplain will provide additional stabilization for the banks of the Raritan River and portions of the unnamed perennial stream. The planting program included disking the upper 4 inches of the soil and seeding with a warm-season native seed mix. The seed mix was comprised of *Andropogon gerardii*, *Schizocharium scoparium*, *Elymus riparius*, *Panicum virgatum*, and various wildflowers. Following the completion of seeding, bare root or tubling tree stock consisting of *Acer saccharinum*, *Betula nigra*, *Carya ovata*, *Platanus occidentalis*, and *Quercus palustris* were installed at a density of 680 trees per acre, or approximately on 8-foot centers. In order to establish a moderate to dense shrub layer in Zone A, *Amelanchier canadensis*, *Cornus amomum*, *Lindera benzoin*, *Sambucus canadensis*, and *Viburnum prunifolium* were installed at a density of 194 shrubs per acre, or approximately on 15-foot centers. All planting was performed in a naturalized pattern. The list of planted species for all appropriate areas is shown in Table 3. Planting Zone A encompasses several planting areas, of which only A1, A4, and A5 were selected for monitoring to comply with the riparian zone mitigation requirements for the construction of Segment B1. Of these, A1 and A5 were captured by random sampling during Year-6.

Planting Zone C (Wetland Forest): Planting Zone C encompasses approximately 35.25 acres and includes ten separate areas of both wetland creation and enhancement. Within one of the planting areas, approximately 1.2 acres of vernal pools were established to provide amphibian-breeding habitat. The goal of the seeding and planting activities outlined in the planting program for Zone C was to create palustrine forested wetland. Following grading, the soils in these areas were bedded using a bedding harrow to create microtopography. Following bedding, a wet meadow seed mix comprised of *Echinochloa crusgalli*, *Poa palustris*, *Elymus virginicus*, *Agrostis alba*, *Panicum virgatum*, and various *Carex* species was applied to bare ground at a rate of 50 pounds per acre. Bare root or tubling stock of *Quercus bicolor* and *Quercus phellos* (substitutes for *Acer negundo*), *Fraxinus pennsylvanica*, *Platanus occidentalis*, *Quercus palustris*, and *Nyssa sylvatica* were installed at a density of 680 trees per acre, or approximately 8-foot centers. The shrub stratum of the forested wetlands was created by installing *Clethra alnifolia*, *Cornus amomum*, *Vaccinium corymbosum*, and *Viburnum dentatum* at a density of 194 shrubs per acre.

Planting Zone D and I (Wetland Scrub-Shrub): Planting Zone D encompasses approximately 5.4 acres and consists of palustrine scrub-shrub wetland within a degraded emergent wetland in the northern portion of the Finderne site adjacent to three open water areas. No regrading, disking, or seeding occurred within this planting zone. The areas were planted with *Alnus serrulata*, *Cephalanthus occidentalis*, *Cornus stolonifera*, and *Viburnum dentatum* at a density of 300 shrubs per acre, or approximately 12-foot centers. Zone I consists of a small area of scrub-shrub wetland in the northeastern corner of the site which covers approximately 0.4 acres. The area was planted with *Clethra alnifolia*, *Cornus amomum*, *Vaccinium corymbosum*, and *Viburnum dentatum* at a density of 680 shrubs per acre, or approximately 8-foot centers.

Planting Zone E (Emergent Wetland): Two existing degraded emergent wetland areas totaling approximately 5.56 acres were designated as Planting Zone E. The goal of the planting program for Planting Zone E was to create two densely vegetated and diverse palustrine emergent wetlands. No regrading or seeding occurred within these areas. Planting Zone E areas were densely planted with an equal distribution of *Pontederia cordata*, *Sparganium americanum*, *Sagittaria latifolia*, *Scirpus atrovirens*, *Saururus cernuus*, *Penstemon digitalis*, *Carex stipata*, *C. lurida*, *Eupatorium coelestinum*, *E. maculatum*, *E. perfoliatum*, and *E. purpureum* on approximately 3-foot centers. Dense plantings were proposed to discourage the colonization of these areas by *Typha*. *Spiraea tomentosa* was planted at approximately 30-foot centers in Zone E.

Planting Zones F and K (Streambank Planting): Planting Zones F1 and F2 (1.5 total acres) and K (2.07 acres) encompass a total of approximately 3.57 acres on streambank located along Finderne Brook (F1) and the Raritan River (F2, K). Prior to planting these areas were seeded at a density of 38 pounds per acre using a perennial grass mixture (Type W – Wet Meadow Seed Mix). This seed mix was comprised of

switchgrass (*Panicum virgatum*), big bluestem (*Andropogon gerardii*), red-top (*Agrostis alba*), fox sedge (*Carex vulpinoidea*), blue vervain (*Verbena hastata*), lurid sedge (*Carex lurida*), green bulrush (*Scirpus atrovirens*), New England aster (*Aster novae-angliae*) and oats (*Avena sativa*). In Planting Zone F1 along Finderne Brook, live stakes of *Salix* spp. were installed approximately three feet apart using triangular spacing. In Planting Zone F2, live stakes of *Salix* spp. were installed approximately three feet apart using triangular spacing. In Planting Zone K, live stakes of *Salix* spp. were installed approximately 6 feet apart.

1.3.2 HYDROLOGY

The intent of the forested wetland creation areas was to mimic the seasonally flooded hydrologic regime capable of supporting a forested wetland system. Seasonally flooded wetlands typically have surface water present for extended periods especially early in the growing season, but surface water is generally absent by the end of the season. When surface water is absent, the seasonal high water table is often within the root zone. Hydrologic sources for the wetland creation areas include precipitation, runoff from surrounding areas, groundwater, and flooding from the Raritan River. In order to establish a seasonally flooded hydroperiod across the wetland creation areas, the original design included a grading plan that created depressions intended to capture surface water for a period consistent with the development of wetland conditions. The design also included the enlargement of an existing swale to help convey flood waters from the Raritan River into two of the newly created wetland areas (C1 and C2). All of the features specified in the design plan were constructed in 2006. The existing emergent wetlands (E3) were enhanced to have a semi-permanently flooded hydroperiod with varying depths of inundation and saturation.

1.3.3 SOILS

The U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS), *Soil Survey of Somerset County, New Jersey* (NRCS-SCS, 1976) was reviewed prior to the design and construction of the wetland mitigation site. Soils within the mitigation site primarily consist of Rowland silt loam (RorAt), 0 to 2 percent slopes and frequently flooded. A soil map is presented in Figure 4.

NRCS describes the Rowland soils as deep, moderately well drained to somewhat poorly drained soils located on floodplains along major streams. These soils are generally nearly level, but there are minor hummocky areas and slopes of more than 2 percent. These soils are located about 3 to 8 feet above normal stream levels and are subject to frequent flooding from the Raritan River. The seasonal high water table for the Rowland series as described by the NRCS is 1 to 3 feet below the surface.

The typical Rowland silt loam soil type is nearly level, with some minor hummocks and slopes. This soil series includes sandy loam, loam, and gravelly loam soils. Some areas of well-drained Rowland soils are found nearer to streams and at slightly higher elevations. Bowmansville soils, a minor component of the series are included in mapping of Rowland silt loam and are sometimes found in depression areas.

1.3.4 STREAM RESTORATION

According to the June 2005 *Stream Restoration Design Report for the Finderne Site* (USACE 2005b), the restoration goals for Finderne Brook included reducing bank erosion, enhancing water quality, and improving the aquatic habitat and riparian corridor of the stream. The drainage basin for Finderne Brook totals approximately 206 acres. The area encompassed by the drainage basin is highly urbanized and a high volume of water reaches the stream channel very quickly during storm events. Because of the relatively small drainage area, it is assumed that base flow in Finderne Brook is from groundwater.

The channel restoration was designed to alleviate the excessive shear stress acting on the stream bed and banks during the high flow events. The restoration design elements included decreasing the slope of the banks to create a wider bankfull bench, distributing the slope break located at the original culvert structure across the project reach and replacing the original, structurally deficient culvert with an arched natural bottom culvert. With the exception of the stream reach at the on-site road crossing, the design anticipated that the stream course and channel would evolve over time within the created floodplain bench as the

natural channel processes of scour and deposition act on the stream. Stream channel surveys were conducted in Monitoring Years-1, -2, and -3 but were discontinued in Year-4, Year-5, and Year-6. As noted in the USACOE 2009 *Finderne Farm Mitigation Site Adaptive Management Plan (AMP)*, there was little change in stream morphology evident between the 2007 and 2008 surveys, and the stream morphology was not expected to show significant changes over the 2012 monitoring period.

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2.0 Methodology

Pursuant to the NJDEP *Mitigation Project Monitoring Reports – Checklist for Completeness* the Year-6 (2012) Monitoring Report for Finderne Farm Mitigation Site covers monitoring activities for wetland enhancement and creation areas and stream restoration. Based on NJDEP mitigation requirements, a monitoring methodology was developed to document the following parameters:

- Planted vegetation, as well as target hydrophytes which are naturally colonizing the site, is progressing toward 85 percent survival or 85 percent area coverage. In forested and scrub shrub wetland mitigation areas, woody species are thriving, increasing in stem density and height each year.
- Development of hydric soils within mitigation areas.
- The hydrologic regime as specified in the mitigation proposal is present. Forested and scrub/shrub wetland mitigation areas were designed and constructed to mimic a seasonally flooded hydrologic regime. Seasonally flooded wetlands typically have surface water present for extended periods during the growing season, but surface water is absent by the end of the growing season. Enhancement areas, consisting of emergent wetlands, were designed to have a semi-permanently flooded hydroperiod with varying depths of inundation.
- Less than 10 percent of the mitigation area is occupied by invasive or noxious species.

2.1 Vegetation Monitoring

Vegetation was monitored in both spring and fall 2012 to document conditions that indicate if there is at least 85% coverage of planted vegetation or target hydrophytes or to show a trend toward potential success. Similar to the 2007 through 2011 monitoring period, random circular plot sampling was conducted in areas planted with woody species, while quadrat plot sampling was used for emergent planting areas. Appendix C contains vegetation data forms and summary tables for 2012.

2.1.1 RANDOM CIRCULAR PLOT SAMPLING

Typically twenty foot radius plots were documented; however adjustments were made in areas of high planting density (E8-F2 and E9). In these locations, ten foot radius plots were utilized. Plot locations were chosen using a simple random sampling procedure. The field biologists would begin by walking to the edge of a planting area. Using a table of sets of random site selection directions, the biologist would choose a number from 1 to 100. The chosen number would be located on the table, and then the biologist would follow the instructions on the table describing the amount of steps to be taken in each direction. From the first plot, the planting area would be traversed for a random distance. A second sampling plot would then be chosen by using the table of random site selection directions.

Data recorded at each plot for both herbaceous and woody species included; species name, percent area coverage, and dominance. For woody species, additional data included whether the species was planted or is a recruit, number of live and number of dead stems, average height, and plant health. Plant health was rated as “E” representing excellent health (plant is thriving and has little to no signs of herbivory), “G” representing good health (plant is healthy and may have some herbivory), “F” representing fair health (plant is moderately healthy and may have moderate herbivory), and “P” representing poor health (plant is dying and/or has heavy herbivory). A photo and GPS location was taken at each plot. Photograph locations are indicated on Figure 5 and location coordinates are presented in Appendix D.

2.1.2 QUADRATE SAMPLING

One square meter quadrat plots were utilized in non-woody planting areas. Quadrat plots were collected in planting area E3 during the spring and fall surveys. The simple random sampling procedure described

above was also used to determine plot location. The species composition and dominance were recorded, as well as the total percent cover from all species. Data collected was used to determine; percent cover of vascular plants, percent cover of open water and/or bare ground, and arithmetic mean and frequency. A photo and GPS location was taken at each plot. Photograph locations are indicated on Figure 5 and location coordinates are located in Appendix D.

2.2 Soil Investigation

The objective of the soil investigation was to identify the existing characteristics of the surficial and subsurface soils at the site and perform the necessary laboratory analysis to determine; organic content, pH, macro and micro-nutrient content of the soil. The goal of this investigation was to document the presence or absence of groundwater and/or characteristics indicative of soils that may have been saturated due to high groundwater or surface inundation at certain times during the year. In addition, an added objective of the Year-6 soil investigation was to determine if there are any significant soil structure differences between the areas that are successfully ponding water and the mitigation areas that are experiencing failure in retaining the required hydrology. Soil sampling locations are indicated on Figure 5. The *Soil Investigation Report* (2012) is located in Appendix E.

2.2.1 SOIL PROFILES

During the 2012 soil investigation conducted on May 21, May 22 and May 24, 2012, scientists collected two sets of soil borings. Similar to previous year's investigations, a set of six standard wetland soil profiles were collected to a depth of two feet. Additionally, a set of 13 geotechnical borings were collected to a depth of three feet.

2.2.1.1 Wetland Profiles

One wetland soil profile was described in each selected creation area (C1, C2 and C3), and in select enhancement areas (E1, E3 and E6). Each profile was completed to a depth of two feet below the ground surface using a hand-operated soil auger with a 4-inch diameter bucket. Each location was recorded by a Wide Area Augmentation System (WAAS)-enabled handheld Global Positioning System (GPS) unit. The soil profile locations in 2012 were randomly selected within each area. A map showing the locations of soil profiles described in 2012 is presented in Figure 4.

Soil characteristics, including texture, color, and structure, were recorded for each of the six borings and summarized on datasheets, presented in Appendix E (*Soil Investigation Report*). Soil texture was estimated in the field using the USDA soil classification system. Soil color was described using Munsell color charts. Characteristics such as redoximorphic features, relative moisture content, structure and, if encountered, groundwater level, were estimated in the field and recorded.

2.2.1.2 Geotechnical Borings

Geotechnical borings were collected as per *Engineering Manual 1110-1-1804*. Within the various creation and enhancement areas on site, 13 borings were collected. Boring were collected within each of the wetland creation areas (C1, C2, and C3), and within the wetland enhancement areas (E1, E2, E3, E4, E5, E6, and EC1).

Geotechnical borings were collected to a maximum depth of three feet with a manual, continuous coring device. The corer used was a stainless steel device that collects a core approximately 40 inches long and four inches in diameter. The corer was driven into the ground with a slide hammer. The hammer was then removed, and a handle was placed on top of the coring device and manually removed from the ground. Once removed from the ground, the core was photographed and described similar to the wetland/agricultural borings above. Locations of the soil borings were also documented with a hand-operated GPS unit. After documenting the core's characteristics, the cored material was packaged and sent to a certified laboratory as described below in Section 2.2.4.2.

2.2.2 LABORATORY TESTING

2.2.2.1 Horticultural Testing

Fifteen soil subsamples were collected from each creation area. The subsamples were collected from approximately 6-inches below the ground surface and separately homogenized in a clean container for each creation area (C1, C2 and C3). The three composite samples (one from each creation area) were designated 7966-12001 C1 S/22, 7966-12001 C2 S/22, and 7966-12001 C3 S/22. The collected soil samples were submitted under chain-of-custody procedures to Rutgers New Jersey Agricultural Experiment Center Soil Testing Laboratory (Rutgers Lab) in New Brunswick, New Jersey for analysis. The soils were analyzed for standard soil horticultural characteristics including; phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), zinc (Zn), copper (Cu), manganese (Mn), iron (Fe) and boron (B)], soil pH, and soil organic matter.

2.2.2.2 Geotechnical Testing

Six of 13 total geotechnical boring were selected (i.e., C1, C2, C3, EC1, E2W, and E3S) for laboratory analyses. They were analyzed for the following:

- Sieve/Hydrometer Analysis – This test analyzes the percentage of different grain sizes contained within a soil.
- Liquid and Plastic Limit – When analyzed with other soil properties, liquid and plastic limits are used to correlate with engineering behavior such as compressibility, permeability, compatibility, shrink-swell and shear strength.
- Unit Weight/Specific Gravity – This test calculates the density of solids divided by the density of water in an undisturbed soil sample.

2.3 Hydrologic Assessment

Wetland hydrology was assessed by periodic observations of ponding or soil saturation, indicators of soil inundation, assessing of soil profiles, and assessing local stream gauges. Primary and secondary indicators of wetland hydrology are outlined in the *US Army Corps of Engineers Wetlands Delineation Manual* (1987).

Primary indicators of wetland hydrology include:

- Visual observation of inundation,
- Visual observation of soil saturation,
- Watermarks on woody vegetation, including stains on tree trunks and other fixed object (i.e. bridge pillars, buildings, fences, etc.),
- Drift lines including deposition of debris in a line on the surface or as debris entangled in above ground vegetation or other fixed objects,
- Sediment deposits consisting of thin layers, coatings, or depositions of mineral or organic matter, and
- Drainage patterns within wetlands.

Secondary Indicators of wetland hydrology include:

- Oxidized rhizospheres (pore linings) associated with living plant in the upper 12 inches of the soil,
- Water-stained leaves,
- Bare soil areas as a result of surface flows carrying away ground litter or the presence of standing water, and

- Morphological plant adaptations including buttressed trunks, pneumatophores, adventitious roots, shallow roots systems, multitrunks or stooling, etc.

2.4 Invasive Species Inspection and Management

Wetland enhancement/creation areas and stream corridors were inspected for the presence of invasive species. The extent of invasive species presence was documented during the spring and fall vegetation surveys.

Invasive or noxious species include, but are not limited to; *Phalaris arundinacea*, *Humulus japonica*, *Arctium lappa*, *Typha latifolia*, *Typha angustifolia*, *Lythrum salicaria*, *Polygonum cuspidatum*, *Ailanthus altissima*, *Berberis thunbergii*, *Berberis vulgaris*, *Elaeagnus angustifolia*, *Elaeagnus umbellata*, *Ligustrum obtusifolium*, *Ligustrum vulgare*, *Rosa multiflora* and other invasive species.

3.0 Monitoring Results

Vegetation monitoring plots, photo locations, and soil boring locations are included as Figure 5. Appendix C includes; vegetation species table, survey data sheets and summary calculations. Photos for spring and fall vegetation plots with associated NAD 1983 coordinates are found in Appendix D.

3.1 Vegetation Monitoring

Random Circular Plots Sampling

Spring vegetation surveys were conducted in late May (5/22/12 – 5/25/12). Fall surveys were conducted in mid-October (10/16/12 – 10/19/12). A total of 92 circular plots were sampled throughout the planted wetland areas and four throughout the planted riparian areas on the mitigation site. Tables 4 and 5 indicate the number of plots sampled within each planting area. Summary calculations for average survival, density and height per planting area are presented in Table 6.

Plots located within Enhancement/Creation Area 1 (EC1) averaged 18 percent woody plant survival and had an average density of 157 woody stems/acre. The average planted species height at the end of the sixth growing season was 37 inches. Including recruited species, EC1 averaged 160 stems/acre.

Enhancement Area 1 (E1) averaged 1 percent woody plant survival and had a density of 8 woody stems/acre. The average planted species height at the end of the sixth growing season was 38 inches. Including recruited species, E1 averaged 17 stems/acre.

Enhancement Area 2 (E2) averaged 7 percent woody plant survival and had a density of 21 woody stems/acre. The average planted species height at the end of the sixth growing season was 46 inches. Including recruited species, E2 averaged 121 stems/acre.

Enhancement Area 4 (E4) contained no planted woody species. Including recruits, E4 averaged 833 stems/acre.

Enhancement Area 5 (E5) averaged 12 percent woody plant survival and had a density of 108 woody stems/acre. The average planted species height at the end of the sixth growing season was 204 inches. Including recruited/mature (non-planted) species, E5 averaged 900 stems/acre.

Enhancement Area 6 (E6) contained no woody species but did include herbaceous species. E6 averaged 0 percent woody plant survival and had a density of 0 woody stems/acres. No recruited woody species were present.

Enhancement Area 7 (E7) averaged 4 percent woody plant survival and had a density of 38 woody stems/acre. The average planted species height at the end of the sixth growing season was 26 inches. Including recruited species, E7 averaged 63 stems/acre.

Enhancement Area 8 (E8) was divided into two areas (F2 and K) planted at different densities. Planting area F2 was designed with a density of 4,840 shrubs/acre, while planting area K was designed at 1,210 shrubs/acre. F2 averaged 75 percent woody plant survival and had a density of 3,643 woody stems/acre. The average planted species height in F2 at the end of the sixth growing season was 43 inches. Plots in area K averaged 4 percent woody plant survival and had a density of 44 woody stems/acre with an average height of 172 inches. The average total percent survival of both areas is 22% and had a total density of 944 stems/acre. Including recruited species, E8 averaged 1,107 stems/acre.

Enhancement Area 9 (E9) averaged 21 percent woody plant survival and had a density of 571 woody stems/acre. The average planted species height at the end of the sixth growing season was 49 inches. Including recruited species, E9 averaged 667 stems/acre.

Table 4
WETLAND ENHANCEMENT & CREATION AND RIPARIAN PLANTING AREAS
CORRESPONDING PLOTS
(SPRING 2012 SURVEYS)

Plots	Planting Areas														
	EC1	E1	E2	E3	E4	E5	E6	E7	E8	E9	C1	C2	C3	A5	A1
	50	15	55	32	13	9	11	1	5	42	26	20	17	48	49
	51	16	56	33	14	10	12	2	6	43	27	21	18		
	52		57	34				3	7	44	28	22	19		
	53		58	35				4	8	45	29	23			
	54			36						46	30	24			
				37						47	31	25			
				38											
				39											
				40											
				41											

Table 5
WETLAND ENHANCEMENT & CREATION AND RIPARIAN PLANTING AREAS
CORRESPONDING PLOTS
(FALL 2012 SURVEYS)

Plots	Planting Areas														
	EC1	E1	E2	E3	E4	E5	E6	E7	E8	E9	C1	C2	C3	A5	A1
	40	57	53	18	49	47	51	1	35	28	7	13	4	46	45
	41	58	54	19	50	48	52	2	36	29	8	14	5		
	42		55	20				3	37	30	9	15	6		
	43		56	21				39	38	31	10	16			
	44			22						32	11	17			
				23						33	12	34			
				24											
				25											
				26											
				27											

Table 6
SUMMARY OF PLANTED SPECIES DATA (Spring/Fall)

Planting Areas	Average Percent Survival ¹	Average Density (woody stems/acre)¹	Average Density (woody stems/acre)	Average Height (inches) ^{1,5}
EC1	18	157	160	37
E1	1	8	17	38
E2	7	21	121	46
E4 ²	0	0	833	0
E5	12	108	900	204
E6	0	0	0	0
E7	4	38	63	26
E8 ³	22	1107	944	86
E9	21	571	667	49
Average for site⁴ (enhancement)	9	223	412	54
C1	28	242	306	61
C2	23	203	228	79
C3	38	333	3106	52
Average for site⁴ (creation)	30	259	1213	64
A5	17	150	1000	10
A1	8	67	67	78
Average for site⁴ (riparian)	13	109	534	44
<p>Notes:</p> <p>¹ Excludes recruits (species that were not planted but have begun to establish)</p> <p>² Pre-existing mature canopy not included in density calculations</p> <p>³ Average of F2 and K Planting Zone vegetation monitoring data</p> <p>⁴ Average for overall enhancement, creation, or riparian areas are calculated using the averages shown above for each planting area.</p> <p>⁵ Average height was not included in total average when no woody plants were documented.</p>				

Creation Area 1 (C1) averaged 28 percent woody plant survival and had a density of 242 woody stems/acre. The average planted species height at the end of the sixth growing season was 61 inches. Including recruited species, C1 averaged 306 stems/acre.

Creation Area 2 (C2) averaged 23 percent woody plant survival and had a density of 203 woody stems/acre. The average planted species height at the end of the sixth growing season was 79 inches. Including recruited species, C2 averaged 228 stems/acre.

Creation Area 3 (C3) averaged 38 percent woody plant survival and had a density of 333 woody stems/acre. The average planted species height at the end of the sixth growing season was 52 inches. Including recruited species, C3 averaged 3106 stems/acre.

Riparian Area 5 (A5) averaged 17 percent woody plant survival and had a density of 150 woody stems/acre. The average planted species height at the end of the sixth growing season was 10 inches. Including recruited species, A5 averaged 1000 stems/acre.

Riparian Area 1 (A1) averaged 13 percent wood plant survival and had a density of 109 woody stems/acre. The average planted species height at the end of the sixth growing season was 44 inches. Including recruited species, A1 averaged 534 stems/acre.

Quadrat Sampling

Twenty (20) one-square meter plots were sampled within Wetland Enhancement Area 3 (E3) for herbaceous species (10 during spring and fall survey periods). The only vegetation identified in plots during the 2012 spring and fall survey that were on the design planting lists as shown on the As-Built Plans (Appendix B) included *Carex* spp.

Five species were present at five or more plots, including; *Lythrum salicaria* (average of 37% cover in 15 plots), *Lysimachia nummularia* (average of 21% cover in 7 plots), *Juncus effusus* (average of 15% cover in 11 plots), *Persicaria sagittata* (average of 14% cover in 12 plots), and *Polygonum* sp. (average of 24% cover in 10 plots).

Six species were present at 20% cover or greater in less than five plots, including; *Phalaris arundinacea*, (average of 50% in 2 plots), *Cyperus esculentus* (average of 57% in 3 plots), *Hypericum* sp. (average of 13% in 3 plots), *Ludwigia palustris* (average of 24% in 4 plots), *Stellaria* sp. (20% in 1 plot), and *Symphyotrichum ericoides* (average of 25% in 3 plots).

The remaining 21 species found in E3 encompassed 12% cover or less in 4 or fewer plots and are listed in Appendix C.

Plant Species Cover

Average percent coverage of both native and invasive species based on cover estimates from monitoring plots are shown in Table 7.

Area EC1 contained both native and invasive species that are dominant throughout the monitoring plots. Dominant (20% or greater, or most prevalent species encompassing 50% of total) native species in EC1 included *Carex vulpinoidea* (dominant in 1 plot) and *Symphyotrichum ericoides* (dominant in 1 plot). Invasive species documented as dominant included *Phalaris arundinacea* (dominant in 5 plots), *Phleum pretense* (dominant in 4 plots), *Brassica rapa* (dominant in 1 plot), and *Lythrum salicaria* (dominant in 1 plot).

Table 7
NATIVE AND INVASIVE SPECIES PERCENT COVER
(Spring/Fall)

Planting Area	Average Native/Target Plant Percent Cover	Average Invasive Percent Cover	No. of Monitoring Plots
EC1	37	63	10
E1/E2	20	79	12
E3	55	40	20
E4/E5/E6	29	69	12
E7/E8	48	46	16
E9	23	72	12
Enhancement Areas Total Average	34	63	82
C1	26	74	12
C2	98	2	12
C3	59	40	6
Creation Areas Total Average	61	39	30
A5	82	11	2
A1	9	91	2
Riparian Areas Total Average	46	51	4

Of the 30 plots monitored in wetland creation areas C1, C2 and C3, 15 were dominated by *Panicum virgatum*, one was dominated by *Persicaria hydropiper*, one by *Juncus effuses*, one by *Betula nigra*, and one by *Symphyotrichum ericoides*. Invasive species dominant within the wetland creation areas included *Phalaris arundinacea* (dominant in 10 of 30 plots), *Artemisia vulgaris* (dominant in 4 plots), *Persicaria maculosa* (dominant in 2 plots), and *Ranunculus ficaria* (dominant in 2 plots).

E1 and E2 were dominated by *Phalaris arundinacea* (dominant in 12 of 12 plots), *Lythrum salicaria* (dominant in 1 of 12 plots), *Phleum pretense* (dominant in 1 of 12 plots), *Artemisia vulgaris* (dominant in 1 plot), and *Humulus japonicas* (dominant in 1 plot). The only native species present as a dominant species was *Symphyotrichum ericoides* (dominant in 1 plot). Plant species cover for E3 is described above under Quadrat Sampling.

Areas immediately adjacent to the Raritan River (E4, E5 and E6) were sprayed to control invasive species with selective herbicide and subsequently hydroseeded in 2009. The primary goal of this hydroseed action was to provide soil stabilization in these river bank areas. As early as spring 2010, invasive species (predominantly *Humulus japonicas*) remained dominant in most areas. Success of the hydroseeding appeared limited as much of the seed material was either buried by wrack and siltation or may have been removed by high velocity flood flows prior to seed germination/root. Hydroseeding had limited effect on invasive species in the areas where it was applied. These areas (E4, E5 and E6) are regularly subjected to varying high floodwater velocities due to their close proximity to the river bank. These frequent high velocities appear to contribute to lower survival rates (physical damage or wash away) in planted vegetation installed without additional stabilization/anchoring during initial planting activities. *Humulus japonicus* dominated 7 of 12 plots. *Phalaris arundinacea* was dominant in three plots. *Rumex orbiculatus* was dominant in two plots. *Ranunculus ficaria*, *Polygonum sp.*, and *Fraxinus pennsylvanicum* were each dominant in one plot.

A portion of E7 is adjacent to the Raritan River and was treated in 2009 with herbicides to eliminate *Humulus japonicus* and subsequently hydroseeded. *Humulus japonicus* continues to dominate in 3 of 8 plots documented during the 2012 surveys. *Polygonum* spp. were dominant in 4 of 8 plots. *Phalaris arundinacea* was dominant in 2 of 8 plots. *Artemisia vulgaris* and *Rumex orbiculatus* were each dominant in one plot.

A large portion of Enhancement Area E8 (Planting Zone K) was also dominated by a near monoculture of *Humulus japonicus*. As such, this area was treated in 2009 with herbicides designed to eliminate the majority of *Humulus japonicus* individuals prior to their flowering and thereby reduce the future seed bank in this area. Furthermore, this area was hydroseeded in 2009 with native grasses and wildflowers prior to fall surveys. *Humulus japonicus* continues to dominate 3 of 5 plots in Planting Zone K (which were each located in the eastern portion of K/adjacent to the river). Additionally, *Salix* spp. were also present as dominants in 3 of 5 plots which were representative of the western portion of Planting Zone K. Additionally, *Polygonum* spp. were dominant in 2 plots and *Rumex orbiculatus* within one plot in Planting Zone K. Most of Planting Zone F2 within E8 supports a somewhat healthier population of planted *Salix* spp. dominating the northern reach of F2 (2 of 2 plots). *Solidago altissima* dominated one plot in F2 as did areas of bare ground and wrack debris from past flooding.

E9 was dominated by *Phalaris arundinacea* (dominant in 10 of 12 plots), *Artemisia vulgaris* (dominant in 8 of 12 plots), *Polygonum* spp. (dominant in 2 of 12 plots), *Humulus japonicus* (1 of 12), and bare ground/open water (Finderne Brook) encompassed a dominant portion of one plot.

Prevalent species within riparian area A5 were *Glechoma hederaceae* (dominant in two plots) and *Urtica dioica* (dominant in one plot) each within the herbaceous layer. A5 also contained a mature canopy of non-planted trees; *Platanus occidentalis*, *Acer saccharinum*, *Acer rubrum*, *Quercus palustris*, and *Quercus rubra*. Riparian area A1 was dominated by *Artemisia vulgaris* (dominant in 2 of 2 plots) and *Phalaris arundinacea* (dominant in 1 of 2 plots).

3.2 Soil Investigation

3.2.1 WETLAND PROFILES

Soil profiles were collected on May 21, 2012. One soil profile was described in each of creation areas (C1, C2 and C3) and enhancement areas (E1, E3 and E6). A total of six hand-augered soil borings were collected to a depth of 24 inches below grade. Soil profiles were described in the field and recorded on data forms (Appendix E). Typical profiles included a dark brown silty clay loam layer found at variable depths. The soils examined were generally consistent with the NRCS description of the Rowland silt loam soils. This layer was sometimes overlaid by a layer of slightly redder soil of varying texture. However, in most cases, the color and texture remained relatively consistent throughout depths of zero to 24 inches.

Redoximorphic features such as concentrations, mottles and oxidized root channels were observed in two of the six soil profiles. Soil was not saturated at any location. The water table was greater than 24 inches below the ground surface in each of the borings. A summary of the 2008 through 2012 soil observations are presented in Table 8.

Table 8
SUMMARY OF SOIL OBSERVATIONS

Planting Area	Redoximorphic Features Depth Range (inches below ground surface)					Saturation (inches below ground surface)				
	2012	2011	2010	2009	2008	2012	2011	2010	2009	2008
C1	NO		18 to 24	18 to 24	NO	> 24	3-4 ags	NO	NO	NO
C2	NO	NO	NO	NO	NO	> 24	3-4 ags	NO	NO	NO
C3	6 - 24	NO	NO	NO	NO	> 24	12	NO	NO	NO
EC1	-	NO	NO	NO	NO		3-4 ags	NO	NO	NO
E5	-	-	6 to 24	NO	NO		-	NO	NO	NO
E7	-	-	NO	NO	NO		-	NO	NO	NO
E2	-	NO	-	-	-		3-4 ags	-	-	-
E4	-	NO	-	-	-		18	-	-	-
E1	6 - 18	-	-	-	-	>24	-	-	-	-
E3	NO	-	-	-	-	> 24	-	-	-	-
E6*	NO	-	-	-	-	> 24	-	-	-	-
Notes: NO: None Observed (-): Indicates samples not taken at location during a particular year. ags: Above Ground Surface * Due to prior disturbances near location E6, several other borings were collected within and adjacent to E6. The findings were similar (i.e., no redoximorphic features and saturation greater than 24 inches).										

3.2.2 GEOTECHNICAL BORINGS

Geotechnical borings were collected on May 22 and May 24, 2012. A total of 13 samples were taken within each of the wetland creation areas (C1, C2, and C3), and within wetland enhancement areas (E1, E2, E3, E4, E5, E6, and EC1). Geotechnical borings were collected to a maximum depth of three feet with a manual, continuous coring device. Table 9 describes the conditions pertaining to soil saturation and groundwater encountered in the boreholes. The cored soils were generally consistent with the NRCS description of the Rowland silt loam soils. Red parent material was encountered in the soils throughout the site. The top three feet of soils on site are generally fine grained materials (clay loams and silt clays). Areas of ponded and occasionally ponded water typically had high clay content in the soil profile.

Creation areas C1 and C2 have similar profiles. In area C3, a 26-inch dense clay layer overlaid a layer of wet, silty sand. All three locations had very faint mottling in the upper part of the profiles; however, due to large amount of red parent material, it is unclear if the mottling was a result of redoximorphic conditions. Other redoximorphic features common to wetlands (e.g., sulphidic odor, concretions, etc.) were not identified in the soil cores.

In the enhancement areas that are sometimes ponded (E1 and EC1), redoximorphic features were observed in the upper part of the soil. Location E4, which is near the river, consisted of almost uniform soils throughout the profile. Location E5, located further inland, consisted of a silt clay loam and clay loam in the upper part and very dense clay in the lower part of the profile. For location E6, anthropogenic debris (e.g., plastic lid, pen cap, etc.) was found in the borehole at 12 inches in depth within the profile. This is consistent with evidence of prior disturbance found near this location: large surface tanks (estimated at greater than 1,000 gallons capacity), remnants of earthmoving activities/structures, and a drainage pipe of unknown origin. The soils in location E7 were saturated to the surface. At approximately 20 inches below the ground surface, organic material was encountered, and throughout the profile coarser grained material was encountered.

Table 9
SOIL SATURATION AND GROUNDWATER LEVELS
OBSERVED AT GEOTECHNICAL BORING LOCATIONS

Location	Description
C1	Soils dry, no water observed on bore hole
C2	Soils dry, no water observed on bore hole
C3	Soils in the upper part were dry. Sand layer was saturated.
EC1	Soils saturated at 18 inches
E1	Slight saturation of soils throughout the profiles, water collected in bottom 4 inches of bore hole
E2 East	Six inches of standing water above ground surface
E2 West	Soil saturated to surface, approximately 2 inches of water in bore hole
E3 North	Ten inches of standing water above ground surface
E3 South	Eight inches of standing water above ground surface
E4	Soil damp throughout profile, no water observed on bore hole
E5	Soils very dry throughout profile, no water observed on bore hole
E6	Soils dry, no water observed on bore hole
E7	Saturated to surface

3.2.3 HORTICULTURAL ANALYSIS

The laboratory reported analytical data for the three 15-point composite soil samples collected in May 2012 from approximately 6-inches below the ground surface in creation areas C1, C2 and C3. The data provided information on the following horticultural parameters:

- Standard fertility analysis for soils [phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), zinc (Zn), copper (Cu), manganese (Mn), iron (Fe) and boron (B)];
- Soil pH; and
- Soil organic matter.

Results of the analyses are presented in Table 10 and the detailed laboratory reports are provided in Appendix E. Additionally, Table 10 includes a summary of reported laboratory results from 2002 and 2007 through 2012 for comparison.

Table 10
HORTICULTURAL CHARACTERISTIC OF SOILS

	Micronutrients													
	Zinc (ppm)							Copper (ppm)						
Location	2012	2011	2010	2009	2008	2007	2002	2012	2011	2010	2009	2008	2007	2002
C1	7.25	6.01	8.48	4.8	5.1	6	2	6.17	6.45	10.09	5.2	7.8	9.2	4.1
C2	7.12	6.27	8.24	2.1	4.2	3.9	5.7	4.89	4.90	5.5	2.5	4.8	3.5	8.2
C3	9.96	9.18	2.7	2.0	2.9	3.5	2.4	6.33	6.57	4.38	2.2	4	3.8	3.9
Maximum	9.96	9.18	8.48	4.8	5.1	6	5.7	6.33	6.57	10.09	5.2	7.8	9.2	8.2
Mean	8.11	7.15	6.47	3.0	4.1	4.5	3.4	5.80	5.97	6.66	3.3	5.5	5.5	5.4
Minimum	7.12	6.01	2.7	2.0	2.9	3.5	2	4.89	4.90	4.38	2.2	4	3.5	3.9

	Micronutrients													
	Manganese (ppm)							Boron (ppm)						
Location	2012	2011	2010	2009	2008	2007	2002	2012	2011	2010	2009	2008	2007	2002
C1	92.15	61.13	52.61	87	97	173	20	0.86	0.89	1.11	2.8	2.1	0.7	0.6
C2	186.10	130	73.01	59	119	136	28	0.73	0.95	0.96	2.5	1.9	0.6	1.5
C3	197.10	154.5	126.3	84.0	119.0	141	23	0.89	0.84	0.51	2.5	1.5	0.7	0.8
Maximum	197.10	154.5	126.3	87	119	173	28	0.89	0.95	1.11	2.8	2.1	0.7	1.5
Mean	158.45	115.21	83.97	76.7	112	150	24	0.83	0.89	0.86	2.6	1.8	0.7	1
Minimum	92.15	61.13	52.61	59.0	97	136	20	0.73	0.84	0.51	2.5	1.5	0.6	0.6

Table 10
HORTICULTURAL CHARACTERISTIC OF SOILS (CONTINUED)

Location	Micronutrients						
	Iron (ppm)						
	2012	2011	2010	2009	2008	2007	2002
C1	553.9	384	161.3	214	312	409	NA
C2	467.1	323	121.9	153	291	369	NA
C3	371.4	266	74.56	173	248	331	NA
Maximum	553.9	384	161.3	214	312	409	NA
Mean	464.1	325	119.25	180.0	284	370	NA
Minimum	371.4	266	74.56	153.0	248	331	NA

Location	pH							Organic Matter (%)						
	2012	2011	2010	2009	2008	2007	2002	2012	2011	2010	2009	2008	2007	2002
C1	5.98	5.92	5.6	6.1	5.6	6.2	5.6	4.20	3.60	4.99	1.85	2.3	2.2	1.9
C2	5.60	6.58	6.2	5.8	5.8	6	5.6	3.70	3.90	5.07	1.44	2.3	2.1	3.2
C3	6.09	6.08	6.25	5.8	5.7	6.1	5.7	3.80	4.40	2.06	1.5	2.1	2.1	1.9
Maximum	6.09	6.58	6.25	6.1	5.8	6.2	5.7	4.2	4.40	5.07	1.85	2.3	2.2	3.2
Mean	5.89	6.19	6.02	5.9	5.7	6.1	5.6	3.9	3.97	4.04	1.6	2.2	2.1	2.3
Minimum	5.60	5.92	5.6	5.8	5.6	6	5.6	3.7	3.60	2.06	1.4	2.1	2.1	1.9

Table 10
HORTICULTURAL CHARACTERISTIC OF SOILS (CONTINUED)

Location	Macronutrients													
	Phosphorus (lbs/ac)							Potassium (lbs/ac)						
	2012	2011	2010	2009	2008	2007	2002	2012	2011	2010	2009	2008	2007	2002
C1	141	66	70	31	55	138	20	87	232	153	80	139	216	22
C2	51	57	52	13	24	48	37	128	205	151	83	153	186	50
C3	94	70	16	25	19	54	22	141	192	96	70	129	140	29
Maximum	141	70	70	31	55	138	37	141	232	153	83	153	216	50
Mean	95	64	46	23	33	80	26	118	210	133	77.7	140	181	34
Minimum	51	57	16	13	19	48	20	87	192	96	70	129	140	22

Location	Macronutrients													
	Magnesium (lbs/ac)							Calcium (lbs/ac)						
	2012	2011	2010	2009	2008	2007	2002	2012	2011	2010	2009	2008	2007	2002
C1	318	478	500	470	474	540	218	2211	2540	2588	2109	2595	2780	1376
C2	386	487	491	484	507	380	317	2362	3275	3019	1901	2645	1940	1740
C3	489	540	556	411	508	470	266	3165	2910	2300	1841	2366	2100	1617
Maximum	489	540	556	484	508	540	317	3165	3275	3019	2109	2645	2780	1740
Mean	398	502	516	455	496	463	267	2579	2908	2636	1950	2535	2273	1578
Minimum	318	478	491	411	474	380	218	2211	2540	2300	1841	2366	1940	1376

3.2.3.1 Soil pH

The Rowland soil series, mapped as occurring throughout the Site, is described as having moderately acidic soils (pH 5.5-6.0) to a depth of 16 inches. The average pH for the 3 soil samples collected in 2012 was 5.89, which is considered medium to slightly acidic and is described as the best range for the growth of most crops, but is somewhat high for acid-loving plants (Appendix E). The average pH reported was 6.19 in 2011, 6.02 in 2010, 5.9 in 2009, 5.7 in 2008, 6.1 in 2007, and 5.6 in 2002.

Based on a review of the site background data, the pH increase between 2002 and 2007 may have resulted from soil augmentation associated with the initial restoration. Between 2007 and 2010 the pH moved close to the 2002 baseline, but increased slightly in 2011. In 2012, the pH decreased and is now consistent with the expected pH values for Rowland soils.

3.2.3.2 Macro and Micronutrients

Macronutrients

The Rutgers Lab classifies relative fertility levels into three main categories: below optimum, optimum and above optimum. Below optimum is further divided into three subcategories: very low, low and medium. The “optimum” designation included below in the discussion of results is referenced by the laboratory to agricultural production and may not be “optimum” in all circumstances for wetland success. The Mehlich-3 soil test extraction method, developed for soil types found in the Mid-Atlantic Region, was used. Soil test values for macronutrients (phosphorus, potassium, magnesium and calcium) are expressed in pounds per acre.

Phosphorus

The optimum range for phosphorus (P) in soil is between 72 and 137 pounds per acre (lbs/acre). The three soil samples yielded varying results. The phosphorous in C1 (141 lbs/acre) was above optimum, location C2 (51 lbs/acre) was below optimum, medium range, and location C3 (94 lbs/acre) had optimum levels. Phosphorus levels have been variable, but have generally increased from an average of 26 lbs/acre in 2002 to 95 lbs/acre in 2012.

Potassium

The optimum range for potassium (K) in soil is between 146 and 277 lbs/acre. All three soil samples collected in 2012 were within the below optimum, medium range. Potassium levels have been variable and have generally increased from an average of 34 lbs/acre in 2002 to 210 lbs/acre in 2011; however average potassium levels decreased to 118 lbs/acre in 2012.

Magnesium

The optimum range for magnesium (Mg) is between 144 and 295 lbs/acre. All three soil samples collected in 2012 contained above optimum, very high range (greater than 296 lbs/acre) for Mg. The average Mg level for the 2012 samples was 398 lbs/acre, the maximum was 489 lbs/acre (C3) and the minimum was 318 lbs/acre (C1). Magnesium levels generally increased from 2002 (267 lbs/acre) to a maximum in 2010 (516 lbs/acre), but have been decreasing since then (502 lbs/acre in 2011 and 398 lbs/acre in 2012).

Calcium

Based on the Mehlich-3 soil test, the optimum concentration ranges for calcium (Ca) are multiplied by a factor of 1.5 for silt loam soils. Based on the optimum range for silt loam soil, all three soil samples collected in 2012 appear within the above optimum, very high range for Ca. The average Ca level for the 2012 samples was 2,579 lbs/acre, the maximum was 3,165 lbs/acre (C2) and the minimum was 2,211 lbs/acre (C1). Calcium levels generally increased from 2002 (1,578 lbs/acre) to a maximum in 2011 (2,908 lbs/acre), before decreasing to 2,579 lbs/acre in 2012.

Micronutrients

The soil samples were tested for the following micronutrients: zinc, copper, manganese, boron and iron. The Rutgers Lab analytical results rated the micronutrient results relative to recommended levels for agricultural production. The micronutrients zinc and copper were adequate for all three samples collected. Manganese and iron were generally high for all samples (for C1, manganese was 8 ppm below the high classification). Boron was low for all three sites, but above the critical level of 0.5 ppm. Zinc, iron and manganese all increased to a maximum concentration in 2012. Copper and boron were within the ranges measured between 2002 and 2010.

3.2.3.3 Organic Material

Percent organic matter is a measurement of the amount of plant and animal residue in the soil. The organic matter in the soil supplies nitrogen and other elements to plants as it decays from microbial activity. Plants replenish this resource when they decay. Soils with less than 20-35% organic matter by weight are generally classified as mineral soils.

The average organic matter content in the three samples analyzed in 2012 was 3.90 percent, which was slightly lower than the average in 2011 (3.97 percent) but still almost twice as high as average percentages measured in 2002 and 2007-2009. Overall, the difference between organic matter content among the six sampling events is not ecologically substantive. The organic matter increase from 2010 (4.04%) to 2012 (3.90%) may be due to the presence of root matter in collected soil samples or flood deposition of organic matter.

3.2.4 GEOTECHNICAL BORINGS

Laboratory data for the geotechnical borings are provided in Appendix E. Six geotechnical boring were selected (i.e., C1, C2, C3, EC1, E2W, and E3S) for laboratory analyses. For each boring, except location C3, the 0-18 inch layer and 18-36 inch layer were treated as two separate samples. For location C3, due to the distinct change between dense clays and silt sands at 26 inches in depth, the 0-26 inch layer was treated as one sample and the material below 26 inches was treated as another sample. On the data sheets in Appendix E, the modifier UP and LOW for each sample corresponds to sampled soils position within the core. UP is the 0-18 inch layer (0-26 for Location C3) and LOW are the soils below the UP sample.

Laboratory findings confirmed the field analyses with respect to soil composition. All samples, except for C2 UP and C3 LOW, were comprised of over 88 percent fine particles (silts and clays). C2 UP was only comprised of 71.4 percent fine materials and 28.6 percent sand material; however, a closer look at the data shows that almost the entire amount of sand is fine sand, which is close in grain size to silts. The slightly larger grain sizes at C2 may be a result of the prior disturbances to the soil profile associated with excavation and habitat creation activities. As anticipated, dramatic differences in grain size were observed when comparing Locations C3 UP and C3 LOW. The percent sand composition in C3 UP and C3 LOW is 9.7 and 61.3 percent, respectively. The grain size of C3 UP is similar to grain size in other UP samples that were analyzed throughout the site.

The plastic index (PI) of soil is identified in Table 11, below:

Table 11
PLASTIC INDEX OF SOILS

Plastic Index	Description
0	Non-plastic
1-5	Slightly plastic
5-10	Low plasticity
10-20	Medium plasticity
20-40	High plasticity
>40	Very high plasticity
Table adapted from Das, 2010	

Review of the soil data indicates that Sample C3 LOW would be classified as a slightly plastic soil. Sample E2W LOW soils would be classified as a soil with high plasticity. Samples C1 LOW and E2W UP each with a PI of 20, would classify them at the low range of high plasticity soils or the high range of medium plasticity soils. The PI of all other samples ranged from 10-19 which would be classified as soils of medium plasticity.

3.3 Hydrologic Assessment

As continued support of the ongoing hydrologic assessment, several activities are currently underway as part of Adaptive Management Plan (AMP) strategies being evaluated for the site. These include:

- Refinement and calibration of the existing HEC-RAS model to utilize for designing adaptive management measures and;
- Development of individual water budgets for each wetland creation/enhancement area. Water budget development will include existing conditions and proposed adaptive management measures.

In addition to the above identified activities, general observations of hydrologic conditions were made during vegetation and soil investigation site visits. Both primary and secondary indicators of wetland hydrology were observed in the wetland enhancement and creation areas.

Primary wetland indicators observed in some locations included limited areas of surface ponding, selected areas of saturated soils, and groundwater encountered near the surface. Evidence of flood events were documented on-site, however wrack debris did not appear to be newly deposited. Photos of wrack debris deposited on plantings during flooding events can be seen in the Spring Photo Log (Appendix D).

Secondary indicators included redoximorphic features which were observed in two of the six wetland profiles described during the soils investigation. None of the assessed profiles were saturated at the time of study. Additionally, geotechnical borings were observed for redoximorphic features and depth of saturation. As discussed in Section 3.2.2, very faint mottles were observed in the upper 12 inches of the soil in the wetland creation areas and in areas selected for their frequently ponded nature. However, it is not definitive if the faint mottles in the creation areas are a result of redoximorphic activity or due to red parent material abundant in the profile. Standing water and or saturation in the upper 12 inches was present in the Planting Areas E1, E2, and E7. The remaining locations that were identified as saturated were either at depths beyond 12 inches or located in ponded areas used as reference locations outside of where plantings were installed.

The USGS Real-time Water Data (01400500 Raritan River at Manville NJ) reported flows exceeding on-site flood stages of 6,000 cubic feet per second (cfs) during 5 events during the period of November 2011 through November 2012 (11/23/11, 12/8/11, 12/28/11, 1/12/12, and 4/23/12) (USGS 2012). As

determined by the flood analysis provided in the revised 2011 AMP (USACE 2011), flows less than 5,000 cfs result in no flooding on-site. Flows less than 7,200 cfs result in inundation of only portions of E7, E8, and EC1. Flows greater than 9,200 cfs inundate Planting Area C3 and the majority of the remaining enhancement areas, while flows of 10,200 cfs flood C1 and C2. The 11/23/11 and 12/8/11 events were the only events to exceed 9,200 cfs; at 14,100 and 15,000 cfs peak flows, respectively. The remaining flows were 6,990, 8,620, and 7,310 cfs peak flows, respectively.

3.4 Invasive Species and Management

3.4.1 INVASIVE SPECIES INSPECTION

As required by the NJDEP-DLUR permit conditions, documentation that the restoration/creation areas have less than 10 percent cover provided by invasive or noxious species within wetland mitigation areas is required during each of the monitoring years. As described in Table 7 above, all but one of the planting and enhancement areas (C2) had more than 10 percent cover by invasive/noxious plant species.

The following invasive species were observed within the wetland mitigation components of the site during the 2012 spring and fall surveys: *Phalaris arundinacea*, *Lythrum salicaria*, *Humulus japonicus*, *Persicaria maculosa* (previously *Polygonum persicaria*), *Lysimachia nummularia*, *Arctium lappa*, *Ambrosia trifida*, *Ambrosia artemisiifolia*, *Artemisia vulgaris*, *Microstegium vimineum*, *Phleum pretense*, *Cirsium arvense*, *Brassica rapa*, *Typha angustifolia*, *Rumex obtusifolius*, *Ranunculus ficaria*, and *Xanthium strumarium*.

In general, both creation and enhancement areas had significant, often dominant, levels of invasive species cover provided by *Phalaris arundinacea* and *Lythrum salicaria*. *Phalaris arundinacea* dominated sample plots in planting areas C1, EC1, E1, E2, E3, E5, E7, E9 and A1. *Lythrum salicaria* was dominant in plots in EC1 and E3.

Areas previously dominated by *Humulus japonicus* were treated with herbicides in June and July 2009 and were hydroseeded with a mixture of annual ryegrass and native wildflowers in October of 2009. These areas include the south and eastern border of the site along the Raritan River including Enhancement areas E4, E6, E7 and E8. As similarly reported for 2010 and 2011 surveys, *Humulus japonicus* continued to dominate large portions of E4, E6, E7, and E8 during the spring and fall 2012 investigation.

Lysimachia nummularia was dominant in some areas of E3. *Artemisia vulgaris* was dominant within portions of A1, E2, and E9. *Phleum pretense* was dominant within plots in EC1 and E2. *Brassica rapa* was dominant in one plot within EC1. *Ranunculus ficaria* was dominant in portions of E4 and C3. The remaining invasive species documented on site were present only as sub-dominant or non-dominant species within the sampled plots.

3.4.2 INVASIVE SPECIES MANAGEMENT

Herbicides were applied in 2009 to manage populations of selected invasive species in selected planting areas, including E1, E2, E3, E4, E5, E6, E7, E9 and EC1. Herbicides were applied by Allied Biological of Hackettstown, New Jersey. Herbicide applications (trade name followed by generic name) were performed on the following dates:

June 2 & 15, 2009

- Treatment 1 of 2 for *Lythrum salicaria* (Touchdown Pro [glyphosate])
- Treatment 1 of 2 for *Phalaris arundinacea* application (Touchdown Pro [glyphosate])
- Treatment 1 of 2 for *Humulus japonicus* (Habitat [imazapyr])

July 15, 2009

- Treatment 2 of 2 for *Humulus japonicus* (Habitat [imazapyr])

August 13, 2009

- Treatment 2 of 2 for *Lythrum salicaria* (Touchdown Pro [glyphosate])
- Treatment 2 of 2 for final *Phalaris arundinacea* (Touchdown Pro [glyphosate])

On December 18, 2008, Allied Biological conducted mechanical removal of *Lythrum salicaria* within planting area E3. Mowing was conducted to remove the remaining dry seed heads from the previous season, as well as inhibit growth by cutting stems at ground level. Re-emergence of *Lythrum* was noted in this area during the 2009 Spring Vegetation Survey. Following the 2009 spring survey, herbicide treatments were applied to E3. As manual cutting apparently had limited effect, this management technique was discontinued.

During the 2012 surveys, continued assessment of the effectiveness of the 2009 herbicide applications was made. As described above in Section 3.4.1, areas previously dominated by *Humulus japonicus* were treated with herbicides in June and July 2009 and were hydroseeded with a mixture of annual ryegrass and native wildflowers in fall of 2009. These areas include the south and eastern border of the site along the Raritan River including Enhancement areas E4, E6, E7 and E8. During fall and spring 2012 surveys, *Humulus japonicus* continued to dominate portions of E4, E6, E7, and E8.

Of the treated areas listed above, *Phalaris arundinacea* continues to be dominant in portions of planting areas E1, E2, E3, E5, E7, E9, and EC1. *Lythrum salicaria* remains dominant in portions E3 as well as in other untreated areas.

4.0 Conclusions

For the sixth year following planting and mitigation efforts in 2006, the USACE monitored the performance of planted vegetation and documented the presence of indicators of wetland hydrology within created wetlands. In addition, the presence and cover density of invasive species was also recorded within the wetland mitigation areas.

Table 12 provides a comparative summary of the wetland creation and enhancement areas to the permit conditions, which require providing 85 percent survival or 85 percent coverage of mitigation plantings or target hydrophytes.

Table 12
SUMMARY OF AVERAGE PERCENT SURVIVAL AND NATIVE PLANT COVERAGE

Planting Areas	2012 Average Percent Survival of Planted Material ¹	Satisfies Permit Performance Standards	2012 Average Native/Target Plant Percent Cover	Satisfies Permit Performance Standards
EC1	18	No	37	No
E1	1	No	18	No
E2	7	No	22	No
E3	NA ²	No	55	No
E4	0	No	16	No
E5	12	No	44	No
E6	0	No	28	No
E7	4	No	40	No
E8	22	No	56	No
E9	21	No	23	No
Average for Enhancement Areas	9	No	34	No
C1	28	No	26	No
C2	23	No	98	Yes
C3	38	No	59	No
Average for Creation Areas	30	No	61	No
A5	17	-	82	-
A1	8	-	9	-
Average for Riparian Areas	13	-	46	-
Notes: ¹ Planted in 2006 according to the Wetland Mitigation Design Report (USACE 2005a). ² It is not practical to survey percent survival of dense herbaceous cover in E3 by individual planting; therefore percent cover was used to estimate survival. Overall percent cover of planted species in E3 was approximated and equals 0.3% of the total herbaceous cover.				

In general, survival of planted trees and shrubs has been low across the site. Average stem density is low, at 223 stems/acre for enhancement areas, and 259 for creation areas. Evidence of recruitment of additional tree species has been documented. Including recruits, the stem densities per acre increased to 412 and 1213, respectively. Average native/target plant cover is low in enhancement areas averaging 34 percent. Success of 85 percent survival or cover of native or target hydrophytes was not reached in any enhancement areas. Creation areas averaged 30 percent survival and 61 percent cover of native/target hydrophytes. Only one creation area (C2) met success criteria of 85 percent native/target hydrophytes for the 6th year in a row, with 98 percent success in Year-6.

Table 13 provides a comparison of results of 2007 through 2012 vegetation surveys. Enhancement areas have gone from 27% (2007) to 9% (2011 and 2012) survival of planted material and 61% (2007) to 34% (2012) native plant percent cover. Creation areas have gone from 56% (2007) to 61% (2011 and 2012) average native/target species percent cover. Plant height in 2007 was 30 inches in enhancement areas, and 38 inches in creation areas. Plant height in 2012 averaged 54 inches in enhancement areas and 64 inches in creation areas.

Riparian planting areas were monitored for the first time in 2011; therefore, only comparative data from 2011 and the original planting design exist. Sample plots were only taken within Planting Areas A5 and A1 and therefore, did not capture all riparian planting areas. Monitoring results were similar to wetland creation and enhancement areas with low survival and low native/target hydrophyte cover. Average stem density was 109 woody stems/acre as compared with planted density of 874 stems/acre. Including recruited species, average stem density was 534 stems/acre. Survival of planting material averaged 8% in 2011 and 13% in 2012. Native/target hydrophytes averaged 26% cover in sample plots taken in 2011 and 46% in 2012. The apparent increased survival is a function of the variability of survival at different plot locations sampled in 2011 and 2012.

As discussed in the previous years' Monitoring Reports, invasive species are having a significant impact on the survival of planted material and potential success in a number of planting areas. Invasive species management measures are being utilized onsite focusing on the most densely colonized areas (specifically enhancement areas). A significantly larger number of percent invasive species cover was documented in enhancement areas compared with creation areas (63% to 39% respectively). Only one planting area (C2) contained less than 10 percent invasive species cover.

Herbicide management in 2009 for *Humulus japonicus*, *Phalaris arundinacea*, and *Lythrum salicaria* has had limited success. During fall and spring 2012 surveys, *Humulus japonicus* continued to dominate portions of E4, E6, E7, and E8. In addition, it was also found dominant in some portions of E1 and E9. *Phalaris arundinacea* dominated sample plots in planting areas C1, EC1, E1, E2, E3, E5, E7, E9, and A1. *Lythrum salicaria* was dominant in portions of EC1 and E3.

Low-lying areas with inundation or signs of inundation were a common habitat for *Phalaris arundinacea* and *Lythrum salicaria*. Furthermore, riparian areas adjacent to the Raritan River, where flooding appears to be a fairly frequent and intense, were dominated by *Humulus japonicus*, *Phalaris arundinacea*, and bare ground or wrack debris from flood events.

From 2007 to 2012, there was a general decrease in percent survival of planted material and percent cover of target hydrophytes in both enhancement and creation areas. The results show that the wetland creation/enhancement and planting efforts have been trending away from success of meeting 85 percent aerial coverage of planted vegetation or target hydrophytes.

Evidence of wetland hydrology was recorded over the course of field inspections within each of the created wetlands and the enhancement areas. Observations of wetland hydrology such as recent wrack debris and ponding were limited during the 2012 surveys. Only one high flow event occurred within the growing season. Flows were less than 7,200 cfs indicating inundation of only portions of E7, E8, and EC1. Residual wrack debris was present, however it did not appear recent and was most likely a result of flooding occurring earlier in 2011.

Table 13
COMPARISON OF VEGETATION MONITORING RESULTS

Planting Areas	2007 Average Percent Survival Planted Material	2008 Average Percent Survival Planted Material	2009 Average Percent Survival Planted Material	2010 Average Percent Survival Planted Material	2011 Average Percent Survival Planted Material	2012 Average Percent Survival Planted Material	2007 Average Native/ Target Plant Percent Cover	2008 Average Native/ Target Plant Percent Cover	2009 Average Native/ Target Plant Percent Cover	2010 Average Native/ Target Plant Percent Cover	2011 Average Native/ Target Plant Percent Cover	2012 Average Native/ Target Plant Percent Cover
EC1	51	2	16	15	7	18	90	57	35	65	42	37
E1	24	3	0	20	1	1	20	15	34	45	37	18
E2	20	5	11	17	11	7	20	15	42	65	50	22
E3	25	NA ¹	NA ¹	NA ¹	NA ¹	NA ¹	96	55	59	36	31	55
E4	0	12	3	1	0	0	11	11	7	24	9	16
E5	28	13	34	11	2	12	11	11	38	64	22	44
E6	0	0	0	0	0	0	11	11	9	24	29	28
E7	29	3	2	1	3	4	61	23	29	20	16	40
E8	29	18	54	21	36	22	61	23	38	28	48	56
E9	63	21	57	58	23	21	88	22	25	18	24	23
Average for Enhancement Areas	27	9	20	16	9	9	61	31	32	36	31	34
C1	49	24	30	23	33	28	68	64	63	37	36	26
C2	68	42	38	48	22	23	95	91	91	94	93	98
C3	50	29	39	49	39	38	98	70	52	80	55	59
Average for Creation Areas	56	32	36	40	31	30	87	75	69	70	61	61
A5	-	-	-	-	0	17	-	-	-	-	31	82
A1	-	-	-	-	15	8	-	-	-	-	21	9
Average for Riparian Areas²	-	-	-	-	8	13	-	-	-	-	26	46

Notes:

1 - It is not practical to survey percent survival of dense herbaceous cover in E3 by individual planting; therefore percent cover was used to estimate survival in 2007 through 2012. Overall percent cover of planted species in E3 was approximated and equals 0.3% of the total herbaceous cover.

2 - Riparian areas were not monitored until Year-5 (2011), therefore, no data other than original planting design exists for comparison.

In addition to observations of wetland hydrology, several investigations have been conducted since development of the 2009 AMP and revised 2011 AMP to analyze the hydrology on-site. The results of these studies indicate that the wetland hydroperiod, as anticipated in the original design, would not be wet during normal years. Activities initiated in 2012 support the development of a new design for remedial activities to develop a suitable hydrologic regime. Additional discussion of completed and ongoing adaptive management activities can be found in Section 5.0.

Six years after wetland enhancement construction activities were completed; soils in the wetland creation and enhancement areas do not appear to be trending towards developing typical wetland soil characteristics. The examination of soil borings resulted in the conclusive presence of redoximorphic features within 12 inches of the soil surface for only planting areas C3, E1, and EC1. Very faint mottles observed in other areas may be a result of red parent material rather than redoximorphic conditions. The water table was greater than 24 inches below the ground surface in each of the six wetland 24-inch soil profiles; however, 36-inch geotechnical borings revealed saturation within 18 inches of the soil surface at borings in select locations in EC1, E1, E2 (west), and E7. Saturation/inundation was noted in other areas; however these areas were not within planting areas, but rather selected for comparison due to their ability to successfully retain water.

Laboratory data indicated that the soils generally have sufficient nutrients for plant growth; although, there were some deficiencies and exceedences for macro and micronutrients. The differences in nutrients for the three creation areas may be a result of geographical position to nutrient producing sources (e.g., urban runoff, ball fields, etc.) and depth of excavation. Regardless, both the wetland plantings and species growing on site showed no signs of nutrient deficiencies.

Based on results obtained in the 2012 soil investigation, the soil characteristics in the wetland creation areas do not appear to have substantially changed from the 2002 base-line data and they do not correspond to the characteristic of a wetland soil.

Overall, each planting area appears to be remaining below compliance with the stated success criteria in at least one or more category. Only Wetland Creation Area C2 met the success criteria for an acceptable range for target hydrophyte cover (98%). Area C2 has also maintained a low (less than 10 percent) cover of invasive species, however survival of planted species criteria in C2 has not been met and evidence of a successful hydrologic regime has not been observed to date.

Section 5.0 outlines adaptive management efforts and future recommendations.

5.0 Recommendations and Actions

The Green Brook Flood Control Project, *Finderne Mitigation Site Adaptive Management Plan* (AMP) was developed in response to areas of the mitigation which are not trending toward the permitted success criteria identified by the Year-1 (2007) through Year-4 (2010) mitigation success monitoring. The AMP was originally developed in 2009 (USACE, 2009) and was updated in 2011 based on the most recent monitoring data and the results of supplemental field and design assessments. The AMP identifies and describes potential limiting conditions and suggested adaptive management strategies that may be employed to investigate and correct limiting conditions.

The following conditions were identified in the AMP that may be limiting potential success include:

- Roles current soil characteristics and topography are playing in the function of the site.
- Whether the shrub/tree species and sizes used during the initial planting, particularly those used for forested wetlands, are appropriate for site conditions and recommendations if replanting efforts should utilize different shrub/tree species and container sizes.
- Determining the impact invasive species and herbivory damage to the planted vegetation has had on the mitigation site, and potential remedies and evaluating the remedies.
- Review of site hydrology and particularly comparison of the severity and frequency of the flood events that have occurred on the site from July 2006 to present to the flood estimates used to develop the mitigation design.
- Review of restoration and enhancement habitat designs to identify where design may not be appropriate to the existing conditions.

Components of the AMP have been implemented in 2010 through 2012 and are summarized in section 5.1 below.

5.1 Actions

The Corps has completed the following studies recommended in the 2009 AMP and 2011 AMP update to identify the cause(s) of site deficiencies in order to develop a more comprehensive adaptive management strategy:

1. Performed a spot ground elevation survey to supplement the as-builts and use for hydrologic investigations (2010/Year-4).
2. Installed shallow piezometers and conducted monitoring on a weekly basis during March through June and monthly basis for the months of July through October of both 2010 (Year-4) and 2011 (Year-5).
3. Conducted on-site post flood analysis of multiple events and documented the duration, inundation and saturated soil conditions within individual wetland areas on the site (2010).
4. Performed a river hydrology analysis involving a statistical analysis on the valid portion of USGS gage record, and develop a discharge frequency relationship for the March to June period (2010/Year-4).
5. Surficial geotechnical analysis within the various wetland creation/enhancement areas to determine if there are any significant differences in soil structure in the mitigation areas that are successfully retaining water for the designed target hydroperiod from the those areas that are not (Year-6).

6. In addition, as recommended in the AMP, the Corps reseeded the 12 acre area treated with herbicide with a native wetland seed mix to provide erosion control and deter the reestablishment of invasive plant species (2009/Year-3).

The following activities are currently underway:

1. Refinement and calibration of the existing HEC-RAS model to utilize for designing adaptive management measures.
2. Development of individual water budgets for each wetland creation/enhancement area. Water budget development will include existing conditions and proposed adaptive management measures.
3. Evaluation of the installation of swales as the primary adaptive management measure to allow lower flows into wetlands from further upstream on the site and from the Raritan River.
4. Evaluation of stabilization measures (e.g., brush mattresses or similar) or other efforts to minimize the impact of highly erosive river flows on newly established vegetation for the southeastern site wetlands (E4, E5, E6, and E7).
5. Development of a revised planting plan to include species observed as recruits that may be better suited to site conditions than species used in the original planting plan. Considerations for the planting plan include utilizing larger trees above browsing reach (5 to 8 feet tall) and/or maintain additional deer deterrent strategies. The planting plan will also consider the potential for establishment of well anchored trees at a size better able to survive the documented rapid flow hydrologic conditions.
6. Development of a conceptual plan of proposed adaptive management measures that also includes a comprehensive invasive plant species management plan and schedule.

5.2 Recommendations

The Corps will update the AMP upon completion of the in-progress actions outlined in section 5.1. The AMP will contain specific recommendations to address the deficiencies that are preventing mitigation success and a conceptual plan of the proposed adaptive management measures to be implemented. Generally, it is anticipated that the AMP will recommend topographical modifications of the site to improve hydrology, additional soil amendments and/or modifications, an invasive species management plan, a revised planting plan and herbivory prevention measures. The updated AMP is scheduled to be completed in mid-2013. The AMP and conceptual adaptive management plan will be coordinated with the NJDEP for approval and will be followed by the development of plans and specifications in order to proceed with construction of the adaptive management measures. Construction is anticipated to occur in 2014.

6.0 References

- Brown, Lauren. 1979. Grasses, an Identification Guide. Houghton Mifflin Company. New York.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. The Classification of Wetlands and Deepwater Habitats of the United States. US Fish and Wildlife Service, Washington, D.C. FWS/OBS-79/31.
- Federal Interagency Committee for Wetland Delineation. 1989. Federal Manual for Identifying and Delineating Jurisdictional Wetlands. U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and U.S. Department of Agriculture, Soil Conservation Service. Washington, D.C. Cooperative Technical Publication.
- Harlow, William M. 1957. Trees of the Eastern and Central United States and Canada. Dover Publications, Inc. New York, NY.
- Knobel, Edward. 1980. Field Guide to the Grasses, Sedges and Rushes of the United States. Dover Publications, Inc. New York, NY.
- Kollmorgen Corporation. 1975. Munsell Soil Color Charts. Macbeth Division of Kollmorgen Corporation. Baltimore, Maryland.
- Little, Elbert L. 1980. The Audubon Society Field Guide to North American Trees (Eastern Region). Alfred A. Knopf. New York.
- Newcomb, Lawrence. 1977. Newcomb's Wildflower Guide. Little, Brown and Company, Inc., Boston, MA.
- Reed, P.B., Jr. 1988. National list of plant species that occur in wetlands: Northeast (Region 1). U.S. Fish and Wildlife Service. Biol. Rep.
- Resource Management Group. 1999. National List of Plant Species That Occur In Wetlands, Region 1-Northeast.
- Rosgen, D. (1996). *Applied river morphology*. Wildlife Hydrology, Pagosa Springs, CO.
- U.S. Army Corps of Engineers (USACE). 2005a. Design Report: Wetland Mitigation Design for Finderne Site – Green Brook Flood Control Project, Somerset County, NJ.
- U.S. Army Corps of Engineers. 2005b. Design Report: Stream Restoration Design for Finderne Site – Green Brook Flood Control Project.
- U.S. Army Corps of Engineers. 2007. U.S. Army Corps of Engineers Finderne Farms Mitigation Site – Green Brook Flood Control Project 2007 Fall Monitoring Report.
- U.S. Army Corps of Engineers, New York District. 2011. Finderne Farm Mitigation Site Adaptive Management Plan (Revised April 2011).
- U.S. Department of Agriculture – Natural Resource Conservation Service. 1995. Hydric Soils of New Jersey.
- U.S. Department of Agriculture – Soil Conservation Service. 1976. Soil Survey of Somerset County, New Jersey.

USGS Real-time Water Data. 2012. USGS 01400500 Raritan River at Manville NJ.
http://nwis.waterdata.usgs.gov/nwis/uv?cb_00060=on&cb_00065=on&format=html&period=90&site_no=01400500 Accessed on November 14, 2012.

Wolman, M.G., 1954. A method of sampling coarse river-bed material: Transactions of the American Geophysical Union (EOS), v. 35, p. 951-956.

Appendix A

Permits



State of New Jersey

Department of Environmental Protection
Land Use Regulation Program
P.O. Box 439, Trenton, NJ 08625-0439
Fax # (609) 777-3656
www.state.nj.us/dep/landuse

Richard J. Codey
Acting Governor

Bradley M. Campbell
Commissioner

Attn: Ms. Megan Grubb
US Army Corps of Engineers, NY District
Planning Division
RM2146
26 Federal Plaza
New York, New York 10278-0090

August 5, 2005

RE: Wetland Mitigation Plan Approval – Finderne Farm
Project: Green Brook Flood Control Project
Project Location: Bridgewater Township, Somerset County
NJDEP Permit No: 1804-00-0005.2 FWIP Segment T
Bound Brook Borough, Somerset County, New Jersey

Dear Ms. Grubb,

This letter is in response to your request for an approval of a wetland mitigation proposal, entitled, "Wetland Mitigation Design for the Finderne Site, Green Brook Flood Control Project, Bridgewater Township, Somerset County, New Jersey", sheets 1 - 46 of 46, all plans dated 5/11/05 with no revisions, and prepared by The Department of the Army, New York District Corps of Engineers, and The Louis Berger Group, Inc., which was submitted to the Land Use Regulation Program to satisfy the freshwater wetland individual permit mitigation requirements for the above-referenced permit as well as in anticipation of future impacts from the Greenbrook Flood Control Project. The Finderne Farm mitigation area is located off-site in Bridgewater Township, Somerset County.

It has been estimated that 7.13 acres of forested wetland area will be impacted by sections T,U, R1 and R2 of the Green Brook Flood Control Project. The conceptual design for the Finderne Mitigation site anticipates creation of 24 acres of forested wetlands and enhancement of an additional 31 acres. The additional wetland acreage is intended to act as compensation for future wetland impacts associated with other sections of the Green Brook Flood Control Project. It should be noted that approval of the Finderne Mitigation Site in advance of project impact authorizations does not suggest that future wetland impacts will be automatically authorized. All wetland impacts associated with the Green Brook Flood Control Project will be reviewed by this Program in accordance with the Freshwater Wetland Protection Act, Stream Encroachment Act and all other applicable statutes. This letter should not be construed as an approval of the entire Greenbrook Flood Control project and the US Army Corps of Engineers should proceed with this project at their own risk.

The Program has completed the review of the mitigation proposal and based on the submitted materials, the Program approves the proposed design. In order to ensure that the proposed design and wetland hydrology are realized in the landscape the Program is requiring construction oversight by mitigation specialists from the US Army Corps of Engineers and The Louis Berger Group, Inc. during critical stages of construction to confirm proposed site conditions have been met.

Mitigation Plan Review
FW IP # 1804-00-0005.2 Segment T
Finderne Farm Mitigation - Greenbrook Flood Control Project

Provided that the mitigation specialists are present during critical stages of construction and the conditions within this letter are satisfied, the Program approves of the above-referenced wetland mitigation proposal. In addition to the conditions placed on the above referenced permit, this approval of a plan to create and enhance wetlands is subject to the following conditions:

1. Pursuant to mitigation condition # 4(e) of the above referenced permit the permittee shall complete and sign the Department approved conservation restriction for the mitigation site (attached). The restriction shall be included on the deed, and recorded in the office of the County Clerk, in the county wherein the lands of the mitigation project are located, within 10 days of this approval of the wetland mitigation proposal.
2. Mitigation Condition # 4(f) requires the permittee to notify the Land Use Regulation Program, in writing, at least 14 days in advance of the start of construction of the wetland mitigation project for an on-site pre-construction meeting between the permittee, the contractor, the consultant, and the Program.
3. The permittee shall assume all liability for accomplishing corrective work should the Department determine that the compensatory mitigation has not been 100% satisfactory. Remedial work may include re-grading and/or replanting the mitigation site. This responsibility is incumbent upon the permittee until such time that the Department makes the finding that the mitigation project is successful.

We look forward to working with you in the coming months as this mitigation project progresses. Please contact Jo Dale Legg of my staff at (609) 777-0454 or by email at JoDale.Legg@dep.state.nj.us, should you have and questions concerning this letter.

Sincerely,

A handwritten signature in black ink, appearing to read 'Virginia KopKash', with a stylized flourish at the end.

Virginia KopKash
Mitigation Unit Supervisor
Land Use Regulation Program

Cc: Richard C. Reilly, Acting Bureau Manager, Bureau of Inland Regulation



STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
(See Issuing Division below)
PERMIT*



The New Jersey Department of Environmental Protection grants this permit in accordance with your application, attachments accompanying same application, and applicable laws and regulations. This permit is also subject to the further conditions and stipulations enumerated in the supporting documents which are agreed to by the permittee upon acceptance of the permit.

Permit No. 1804-00-0005.2-FWIP		Application No. 1804-00-0005.2-FWIP	
Issuance Date OCT 19 2001	Effective Date OCT 19 2001	Expiration Date OCT 19 2006	
Name and Address of Applicant State of New Jersey DEP/ Division of Engineering and Construction Attn: Charles Defendorf		Name and Address of Owner N/A	Name and Address of Operator
Location of Activity/Facility (Street Address) Portions of Areas adjacent to Billian Legion Park, E. Main Street, East Street. Bound Brook Borough, Somerset County		Issuing Division Land Use Regulation Program	Statute(s) NJSA 13:9B NJSA 58:10A
Type of Permit Individual Permit Water Quality Certificate		Maximum Approved Capacity, if applicable	

This permit grants permission to:
Impact 0.56 of an acre of State open waters and 0.034 of an acre of wetlands in order to construct Segment "T" of the Green Brook Flood Control Project in the Borough of Bound Brook, Somerset County. Segment "T" includes construction of a levee/ floodwall system with appurtenant features. The levee/ floodwall system will run along the west bank of the Green Brook from the embankment of the NJ Transit Rail Lines upstream to the confluence of Vosseller Brook. Vosseller Brook will be realigned and channelized to a point just downstream from Hamilton Street to its confluence with Green Brook. This project will cause the temporary disturbance of 0.63 of an acre of wetlands. All temporary impacts to wetlands by construction activities will be restored at the conclusion of the construction. A pump station and new discharge channel will also be constructed to move interior drainage to behind the levee system.

The permittee shall allow an authorized representative of the Department the right to inspect construction pursuant to N.J.A.C. 7:7A-13.1(a)9.

This permit is issued subject to and provided that the following conditions can be met to the satisfaction of the Land Use Regulation Program. All conditions must be met prior to construction unless otherwise specified. Compliance with Administrative conditions shall be determined once copies of all specified permits, certifications, plans, agreements, etc. have been received, not less than 60 days prior to construction, and approved by the Land Use Regulation Program. All Physical conditions are subject to onsite compliance inspection by the Bureau of Coastal and Land Use Enforcement.

This permit is authorized under, and in compliance with the Freshwater Wetlands Protection Act Rules, NJAC 7:7A et seq.

Prepared By:

Andrew Clark

Environmental Specialist

(See page 8 for manager's signature.)

Revised Date	Approved by the Department of Environmental Protection	
	Name (Print or Type) _____	Title _____
	Signature _____	Title _____

* The word permit means "approval, certification, registration, etc."

This permit is subject to the following standard terms and conditions:

1. This permit is revocable, or subject to modification or change at any time, pursuant to the applicable regulations, when in the judgement of the Department of Environmental Protection of the State of New Jersey such revocation, modification or change shall be necessary.
2. The issuance of the permit shall not be deemed to affect in any way action by the Department of Environmental Protection of the State of New Jersey on any future application.
3. The works, facilities, and/or activities shown by plans and/or other engineering data, which are this day approved, subject to the conditions herewith established, shall be constructed and/or executed in conformity with such plans and/or engineering data and the said conditions.
4. No change in plans or specifications shall be made except with the prior written permission of the Department of Environmental Protection of the State of New Jersey.
5. The granting of this permit shall not be construed to in any way affect the title or ownership of property, and shall not make the Department of Environmental Protection or the State a party in any suit or question of ownership.
6. This permit does not waive the obtaining of Federal or other State or local government consent when necessary. This permit is not valid and no work shall be undertaken until such time as all other required approvals and permits have been obtained.
7. A copy of this permit shall be kept at the work site, and shall be exhibited upon request of any person.
8. In cases of conflict, the conditions of this permit shall supersede the plans and/or engineering data.

This permit is issued subject to and provided the following conditions can be met to the satisfaction of the Land Use Regulation Program. All conditions must be met prior to construction unless otherwise specified. Compliance with Administrative conditions shall be determined once copies of all specified permits, certifications, plans, agreements, etc. have been received and approved by the Land Use Regulation Program. NJ 08753), in writing, at least three (3) days prior to commencement of construction or site preparation.

ADMINISTRATIVE CONDITIONS

1. This permit shall be RECORDED in the office of the County Clerk (the REGISTRAR OF DEEDS AND MORTGAGES in the applicable counties) in the county wherein the lands included in the permit are located within ten (10) days after receipt of the permit by the

applicant and verified notice shall be forwarded to the Land Use Regulation Program immediately thereafter.

2. This permit is NOT VALID until the permit acceptance form has been signed by the applicant, accepting and agreeing to adhere to all permit conditions, and returned to the Land Use Regulation Program at P.O. Box 439, Trenton, NJ 08625-439.
3. This permit does not waive the obtaining of any local, State or Federal permits that may be required. This permit is not valid and no work shall be undertaken until such time as all other required approvals and permits have been obtained.

PHYSICAL CONDITIONS

1. A timing restriction of April 1 through June 30 is imposed on any in-channel/ bank/ or sediment generating activity in order to protect anadromous and warmwater fish species.
2. A timing restriction of April 15 through July 15 is imposed on any initial tree and brush clearing for the construction of the levees and floodwalls in order to protect nesting birds.
3. All pier protection armoring at the NJ Transit RR crossing must be set at grade as shown on the approved plan.
4. The applicant must sign and return to the Bureau the attached "Acceptance of Revocable Permit" form.
5. All precautions must be taken to prevent raw concrete from coming in contact with the waters of Vosseller Brook and Green Brook during construction activities. Raw concrete is toxic to aquatic biota.

Plans Approved by this Permit

Sheet #	Sheet Title*	Dated	Last Revised
2	General Plan	3/14/01	unrevised
4	Plan Sta 0+00GB to Sta6+94GB	3/14/01	unrevised
5	Sta 0+00T to Sta 7+85T		
	Sta 6+94GB to Sta 14+73GB	3/14/01	unrevised
6	Sta 7+85T to 13+57T		
	Sta 14+73GB to 20+43GB	3/14/01	unrevised
7	Profiles Sta 13+57T to Sta 24+30.02		
	Sta 20+43GB to 24+12.20GB		
	Sta 0+25VB to Sta 12+06.59VB	3/14/01	unrevised
8	Sta 0+00 to Sta 24.21T		
	Sta 0+00SD to Sta 9+60SD	3/14/01	unrevised
9	Sta 0+00GB to 24+00GB		
	Sta 0+50VB to 12+00VB	3/14/01	unrevised

* All sheets reference "Green Brook Sub-Basin of the Raritan River, Green Brook Flood Control Project, Segment "T", Borough of Bound Brook, New Jersey" all prepared by the U.S Army Engineer District, Corps of Engineers, New York, New York.

MITIGATION CONDITIONS

The following special conditions must be met for the activity to be authorized under these permits:

1. All temporary disturbed wetland areas must be restored within 6 months of initial disturbance. If the wetland is not restored within 6 months of disturbance, then these impacts shall be considered permanent and mitigation for these areas will be required at a ratio of 2 to 1.
2. Mitigate for the loss of .034 of an acre of forested wetlands and 0.56 acres of State open waters through either an on-site or off-site creation, restoration or enhancement project as detailed in condition number 3 below or through the purchase of mitigation credits as detailed in condition 2 below.
3. Purchase 0.7 credits from the Wyckoff Mills Mitigation Bank as detailed below.
 - a) The permittee must submit proof of the purchase of 0.7 mitigation credits to Virginia Kop'Kash, from the Land Use Regulation Program, before the authorized construction may begin. To purchase credits from the Wyckoff Mills Wetland Mitigation Bank the permittee must contact Eric Gleason of Wyckoff Mills at 301-986-9800. If the permittee waits more than sixty days to make that purchase she/he must first contact Virginia Kop'Kash, from the Land Use Regulation Program at (609) 777-0454 to determine if the mitigation credits are still available for
4. For an on-site or off-site individual mitigation project the permittee must submit a mitigation proposal to the Land Use Regulation Program, to create, enhance or restore an area of wetlands and State open water of equal ecological value to those, which will be lost by the authorized activity for review and approval. Because of the difficulty involved in trying to mitigate for a State open water area, the Department will allow the applicant to mitigate for the loss of the water area by the creation of an emergent wetland area at a 1 to 1 ratio. Attached to this permit is a list of the necessary information that must be included in that on-site or off-site mitigation proposal. If the permittee is proposing to construct a wetland creation or restoration project, one acre of creation or restoration must be performed for each acre disturbed and the mitigation area must, in addition to this, include a 50-foot transition area. The slope of the created transition area must be fairly flat and therefore have a slope no greater than 10:1. If the permittee is proposing to construct a wetland enhancement project, the ratio of wetlands enhanced to State open water disturbed

shall be sufficient to replace loss of ecological value from the permitted project and shall be approved by the Program. The following conditions and information must be adhered to when performing mitigation off-site.

- a) Submit for review and approval a conceptual plan showing the location and proposed hydrology of the mitigation site.
- b) Once the Program has approved the conceptual plan of the mitigation project the permittee must submit a final design of the mitigation project and include all the items listed on the attached on-site/off-site mitigation proposal checklist.
- c) The mitigation project must be conducted prior to or concurrent with the construction of the approved project.
- d) In accordance N.J.A.C. 7:7A-14.1, obtain a secured bond, or other financial surety acceptable to the Department including an irrevocable letter of credit or money in escrow, that shall be sufficient to hire an independent contractor to complete and maintain the proposed mitigation should the permittee default. The financial surety for the construction of the mitigation project shall be posted in an amount equal to 115 percent of the estimated cost of the construction. In addition, financial surety to assure the success and maintenance of the mitigation project shall be posted in an amount equal to 30 percent of the estimated cost of construction. The Department will review the financial surety annually and the permittee shall adjust the surety to reflect current economic factors. Please be advised if a governmental body is performing the mitigation the need for financial assurance is waived.
- e) The permittee shall complete and sign the Department approved conservation restriction for the mitigation site (copy attached). The restriction shall be included on the deed, and recorded in the office of the County Clerk (the Registrar of Deeds and Mortgages in some counties), in the county wherein the lands of the mitigation project are located, within 10 days of approval of the wetland mitigation proposal.
- f) The permittee shall notify the Land Use Regulation Program, in writing, at least 14 days in advance of the start of construction of the wetland mitigation project for an on-site pre-construction meeting between the permittee, the contractor, the consultant and the Program.
- g) Immediately following the final grading of the mitigation site and prior to planting, the permittee shall notify the Program for a post-grading construction meeting between the permittee, contractor, consultant and the Program.
- h) Immediately following final grading and planting of the wetland mitigation project, the permittee shall notify the Land Use Regulation Program, in writing that the construction of the mitigation project has been completed in accordance with the approved plan. In

addition to the notice, the permittee shall submit as built plans of the site and photos with a photo location map of the completed project.

- i) The permittee shall post the mitigation area with several permanent signs, which identify the site as a wetland mitigation project and that mowing, cutting, dumping and draining of the property is prohibited. The sign must also state the name of the engineering or environmental firm that designed and constructed the mitigation site with a phone number. In addition, the permittee shall visibly mark/staked (oak stakes) the extent of the wetland mitigation area and ensure the stakes remain that way for the entire monitoring period with the location of those stakes shown on the as built plan.
- j) If the Program determines that the mitigation project is not constructed in conformance with the approved plan, the permittee will be notified in writing and will have 60 days to submit a proposal to indicate how the project will be corrected. No financial surety will be released by the Program until the permittee demonstrates that the mitigation project is constructed in conformance with the approved plan and all soil has been stabilized and there is no active erosion.
- k) The permittee shall monitor the wetland mitigation project for 5 full growing seasons if it is a proposed-forested wetland and for 3 full growing seasons for a scrub/shrub or emergent wetland after the mitigation project has been constructed. The permittee shall submit monitoring reports to the Land Use Regulation Program no later than November 15th of each monitoring year (All monitoring report must include the standard items identified in the attachment and the information requested below).
- l) All monitoring report will include the following information:
 - i. The monitoring reports submitted prior to the final one must include documentation that it is anticipated, based on field data, that the goals of the wetland mitigation project including the transition area, as stated in the approved wetland mitigation proposal and the permit will be satisfied. If the permittee is finding problems with the mitigation project and does not anticipate the site will be a full success then recommendations on how to rectify the problems must be included in the report with a time frame in which they will be completed. The final monitoring report must include documentation to demonstrate that the goals of the wetland mitigation project including the required transition area, as stated in the approved wetland mitigation proposal and the permit, has been satisfied. Documentation for this report will also include a field wetland delineation of the wetland mitigation project based on techniques as specified in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989);
 - ii. The monitoring reports submitted prior to the final one must include documentation that the site is progressing towards the 85 percent survival and percent areal coverage of mitigation plantings or target hydrophytes which are species native to the area and similar to ones identified on the mitigation planting plan. If the permittee is finding problems with

the mitigation project and does not anticipate the site will or has achieved the 85 percent survival and 85 percent areal coverage criteria then recommendations on how to rectify the problems must be included in the report with a time frame in which they will be completed. The final monitoring report must include documentation the site has an 85 percent survival and 85 percent areal coverage of the mitigation plantings or target hydrophytes which are species native to the area and similar to ones identified on the mitigation planting plan;

iii. Documentation to demonstrate the site is less than 10 percent occupied by invasive or noxious species such as but not limited to *Phalaris arundinacea* (Reed canary grass), *Phragmites australis* (Common reed grass), *Pueraria montana* (Kudzu), *Typha latifolia* (Broad-leaved cattail), *Typha angustifolia* (Narrowed leaved cattail), *Lythrum salicaria* (Purple loosestrife), *Ailanthus altissima* (Tree-of-heaven), *Berberis thunbergii* (Japanese barberry), *Berberis vulgaris* (Common barberry), *Elaeagnus angustifolia* (Russian olive), *Elaeagnus umbellata* (Autumn olive), *Ligustrum obtusifolium* (Japanese privet), *Ligustrum vulgare* (Common privet) and *Rosa multiflora* (Multiflora rose). If the site is more than 10 percent occupied by invasive or noxious species then the monitoring report must include a proposed remediation plan and a time frame in which it will be completed.

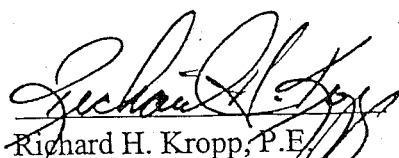
iv. Demonstrate through soil borings and a soil test that a minimum six inch layer of top-soil or A-Horizon was used/retained on the mitigation site and if the natural top-soil was used at least 8% organic carbon content (by weight) was incorporated into the A-horizon for sandy soil and for all other soil types 12% organic content or if manmade top soil was used it consisted of equal volumes of organic and mineral materials. If the site fails to meet this standard the monitoring report must include a proposed remediation plan and a time frame in which it will be completed. The final monitoring report must include documentation that the site contains hydric soils or there is evidence of reduction occurring in the soil; and

v. The monitoring reports submitted prior to the final report must include documentation that demonstrates the proposed hydrologic regime as specified in the mitigation proposal appears to be met. If the permittee is finding problems with the mitigation project and does not anticipate the proposed hydrologic regime will be or has not been met then recommendations on how to rectify the problem must be included in the report along with a time frame within which it will be completed. The final monitoring report must include documentation that demonstrates that the proposed hydrologic regime as specified in the mitigation proposal, which proves the mitigation site is a wetland has been satisfied. The documentation shall include when appropriate monitoring well data, stream gauge data, photographs and field observation notes collected throughout the monitoring period.

- m) Once the required monitoring period has expired and the permittee has submitted the final monitoring report, the Program will make the finding that the mitigation project is either a success or a failure. This mitigation project will be considered successful if the permittee demonstrates all of the following:

- i. That the goals of the wetland mitigation project including the required transition area, as stated in the approved wetland mitigation proposal and the permit, has been satisfied. The permittee must submit a field wetland delineation of the wetland mitigation project based on the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989) which shows 0.068 of an acre of emergent wetlands have been created, as well as 0.56 of an acre of State open water;
- ii. The site has an 85 percent survival and 85 percent areal coverage of the mitigation plantings or target hydrophytes which are species native to the area and similar to ones identified on the mitigation planting plan;
- iii. The site is less than 10 percent occupied by invasive or noxious species such as but not limited to *Phalaris arundinacea* (Reed canary grass), *Phragmites australis* (Common reed grass), *Pueraria montana* (Kudzu), *Typha latifolia* (Broad-leaved cattail), *Typha angustifolia* (Narrowed leaved cattail), *Lythrum salicaria* (Purple loosestrife), *Ailanthus altissima* (Tree-of-heaven), *Berberis thunbergii* (Japanese barberry), *Berberis vulgaris* (Common barberry), *Elaeagnus angustifolia* (Russian olive), *Elaeagnus umbellata* (Autumn olive), *Ligustrum obtusifolium* (Japanese privet), *Ligustrum vulgare* (Common privet) and *Rosa multiflora* (Multiflora rose);
- iv. The site contains hydric soils or there is evidence of reduction occurring in the soil; and,
- v. That the proposed hydrologic regime as specified in the mitigation proposal, which proves the mitigation site is a wetland has been satisfied. The documentation shall include when appropriate monitoring well data, stream gauge data, photographs and field observation notes collected throughout the monitoring period.
- n) All remaining financial surety, if required, will be released concurrent with the Program notifying the permittee that the mitigation project is a success.
- o) If the mitigation project is considered a failure, the permittee is required to submit a revised mitigation plan to rectify the wetland mitigation site. The plan shall be submitted within 60 days of receipt of the letter from the Program indicating the wetland mitigation project was a failure. The financial surety, if required, will not be released by the Program until such time that the permittee satisfies the success criteria as stipulated in item (m).

Approved By:


Richard H. Kropp, P.E.

Director, Land Use Regulation Program

Date:

10/19/01

I. CONDITIONS TO BE ATTACHED AS AN ADDENDUM TO THE PERMIT

Required components for Individual on-site or off-site mitigation proposals

All wetland mitigation proposals submitted to the Land Use Regulation Program must include the following items in order to be considered complete for review:

1. An introduction to describe the wetland mitigation proposal. That introduction should include the following:
 - a. The type of permit which was conditioned to require wetland mitigation and how many acres of wetland mitigation are required to create, enhance and/or restore an area of freshwater wetlands of equal ecological value to those which will be lost (include a copy of the permit);
 - b. The specific goals of the mitigation proposal as stated in the permit and a discussion of how the mitigation proposal will satisfy those goals. (e.g., The goal of the wetlands mitigation project is to establish a young palustrine forest surrounding an emergent wetland and open water pond, which provides flood water retention in the impacted watershed, fish and wildlife habitat, etc.);
 - c. The reason why the mitigation site was chosen and why it is highly probable that it will be a success because of its location; and
 - d. A copy of a USGS quad showing the location of the permitted activity and the mitigation site with the state plan coordinates of the mitigation site.
2. A description (e.g., size, type, vegetation, hydrology, etc.) of the wetlands that are being destroyed or disturbed.
3. Photos of the proposed mitigation site.
4. Names and addresses of current and proposed owner(s) of the mitigation project site. In addition the lot block, township and county of the mitigation project site must also be clearly visible on the front page of the proposal and placed on the mitigation plans.
5. A description of the existing ecosystem of the mitigation site. Include a discussion of the vegetation, soils, hydrology, wildlife and adjacent land use.
6. Submit a water budget for the proposed mitigation site. The water budget should focus on the sources of water for the mitigation project as well as the losses and include information on the seasonal high water table from collected monitoring well data and/or information on the level of the stream from collected stream gauge data. The projected water budget should document that

an ample supply of water is available to create/enhance/restore wetland conditions. Please note this is one of the most critical items in your mitigation package and the water budget must contain sufficient data to support the hypothesized wetland hydrology.

7. Existing soil types with soil borings to document seasonal high water tables. Provide a detailed discussion relative to the created substrate of the proposed mitigation site (e.g. How will the substrate of the site be prepared? How much topsoil will be added? Is the pH appropriate?). The Program requires a minimum six inch layer of top soil or A-Horizon is used/retained on the mitigation site and if the natural top soil is used at least 8% organic carbon content (by weight) was incorporated into the A-horizon for sandy soil and for all other soil types 12% organic content or if manmade top soil was used it consisted of equal volumes of organic and mineral materials. Please be advised, unless absolutely necessary do not include the application of lime in your planting specifications (liming a site may cause a more favorable environment for invasive species).

8. A planting scheme of the proposed vegetative community depicted on the mitigation site plans. Include the species, quantity spacing of all plantings, stock type (bare root, potted, seed) and the source of the plant material. Please be advised the required transition area must also be planted. The plan must identify the proper time to plant and include if appropriate acceptable substitutions. Please note if bare root stock is being used they should be planted in the spring.

9. A preventive maintenance control plan for invasive or noxious vegetation as well as a plan to control the potential adverse impacts of predation on the mitigation plantings. The plan shall explain the techniques, which will be used and the measures that will be taken if a problem begins to present itself through the monitoring period. Please note if there is a problem with *Lythrum salicaria* (purple loosestrife) in the watershed, the Program has serious reservations in approving the establishment of an emergent freshwater wetland system. If this is the case, contact the Program mitigation staff (Virginia Kop'Kash) to discuss possible options.

10. A metes and bounds description of the proposed mitigation site which forms the basis for the deed restriction. The metes and bounds description shall include the transition area.

11. An actual cost estimate of carrying out the construction of the mitigation project. The cost estimate should include the cost of land, site preparation, engineering costs, plantings and any other items incidental to the mitigation project. Please note the cost estimate of the project will be used to justify the amount of the financial assurance. Once the mitigation proposal and plans have been approved by the Program and the permittee must in accordance with N.J.A.C. 7:7A-14.1, obtain a secured bond, or other financial surety acceptable to the Department including an irrevocable letter of credit or money in escrow, that shall be sufficient to hire an independent contractor to complete and maintain the proposed mitigation should the permittee default. The financial surety for the construction of the mitigation project shall be posted in an amount equal to 115 percent of the estimated cost of construction. In addition, financial surety to assure the success of the mitigation project shall be posted in an amount equal to 30 percent of the estimated cost of construction. The financial surety will be reviewed annually and shall be

adjusted to reflect current economic factors. Please be advised if the proposed mitigation project is being conducted by a governmental agency the requirement to provide financial assurance is waived

12. Five folded copies of a site plan for the mitigation project that includes:

- i. Project location within the region;
- ii. The lot and block number of the mitigation project location;
- iii. Existing and proposed elevations and grades of the mitigation site and when necessary off-site in one foot intervals. Please be advised, any berms that may function as water control structures or created along a stream and in the transition area must have a slope no greater than 10:1;
- iv. The appropriate transition area (50/150-foot) must be shown on the project plans;
- v. A detail on the plans noting the soil amendments and the seed stabilization mix. Please note the seed mix can not include red fescue and reed canary grass. It should either be a mixture of native noninvasive plant species or include an annual rye grass;
- vi. A note stating that following grading of the site, a disc will be run over the site to eliminate compaction;
- vii. A note stating how micro-topography will be created on the mitigation site. Please note a cultivator or a bedding harrow is equipment that could be used to create micro-topography;
- viii. Plan views and cross sectional views; and,
- ix. Location of monitoring wells and/or stream gauges to be used to record the hydrology of the mitigation site after construction is complete.

13. A copy or photocopy of a portion of the U.S.G.S. 7.5 minute quadrangle map showing the location of the property and its general vicinity, indicating and labeling the location of the proposed mitigation and the property boundaries, and a determination of the State Plane Coordinates for the center of the mitigation site. The accuracy of these coordinates should be within 50 feet of the actual center point. For linear mitigation projects, the applicant shall provide State plane coordinates for the end-points of those projects that are 1999 feet or less, and for those projects which are 2000 feet and longer, additional coordinates at each 1000-foot interval.

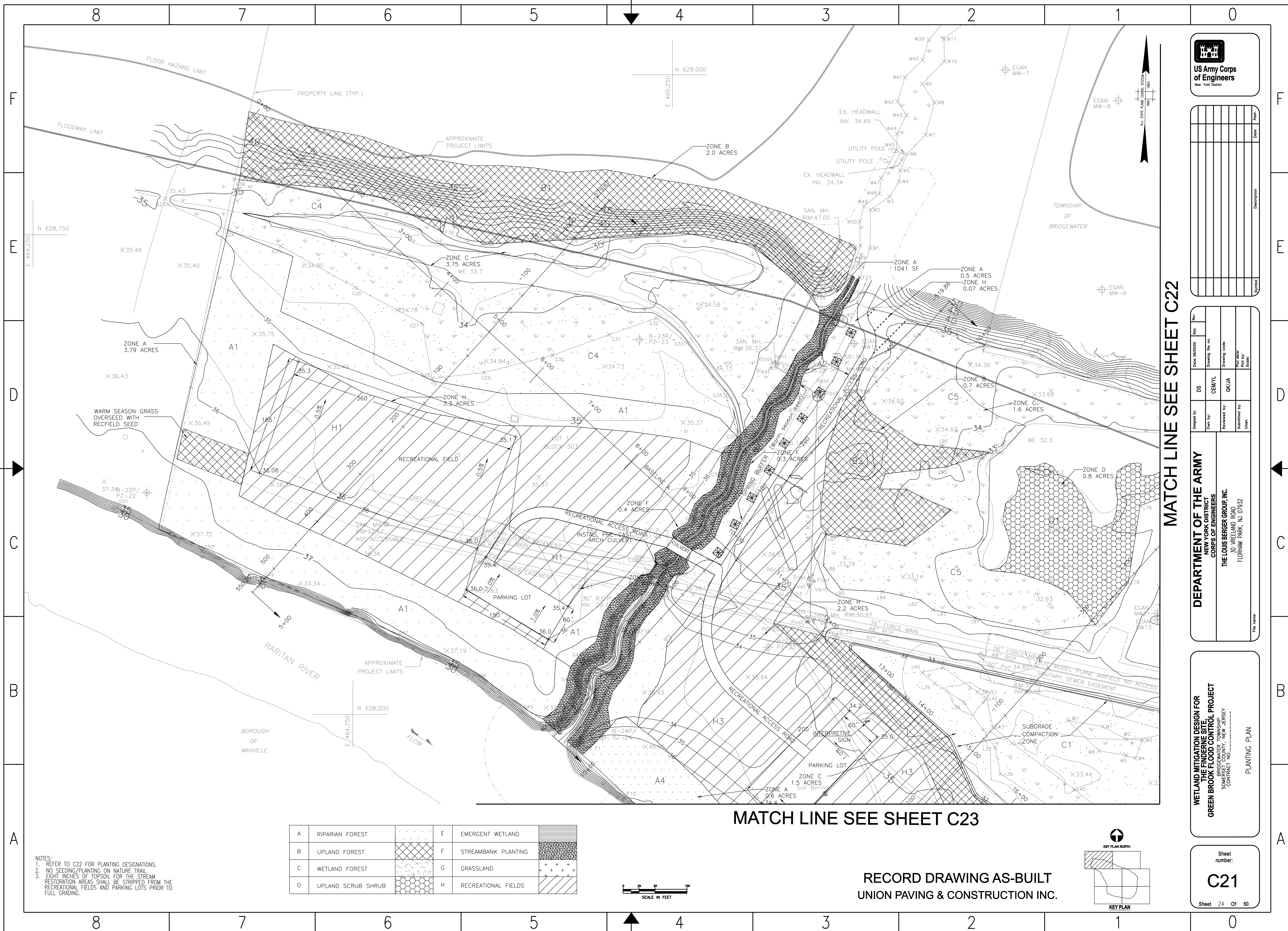
14. Submit a construction schedule including dates of excavation, planting, fertilizing, etc.

15. All mitigation sites must be monitored beginning the first growing season after the construction/planting of the mitigation project is completed. Depending on the type of wetlands being created, restored and/or enhanced the mitigation project must be monitored for three to five years. At a minimum a monitoring report must include the following information: USGS quad and a county road map showing the location of the mitigation site including the lot and block of the mitigation site; a copy of the permit; a brief description of the mitigation project; an assessment of the planted vegetation as well as the species that are naturally colonizing the site; documentation that demonstrate through soil borings and a soil test that a minimum six inch layer of top soil or A-Horizon was used/retained on the mitigation site and if the natural top soil was used at least 8% organic carbon content (by weight) was incorporated into the A-horizon for sandy soil and for all other soil types 12% organic content or if manmade top soil was used it consisted of equal volumes of organic and mineral materials. The final monitoring report must include documentation that the site contains hydric soils or there is evidence of reduction occurring in the soil; documentation that demonstrates that the proposed hydrologic regime as specified in the mitigation proposal, which proves the mitigation site is a wetland, appears to be met: The documentation shall include when appropriate monitoring well data, stream gauge data, photographs and field observation notes collected throughout the monitoring period.

A narrative on the success/failure of the site; If problems with the site are identified, note any recommendations on actions that should be taken to rectify the situation to ensure success of the project; data sheets from sampling points which describe the vegetation present, percent coverage of the vegetation, soil borings and location of the water table; Photographs of the mitigation site; and documentation that it is anticipated, based on field data, that the goals of the wetland mitigation project including the transition area, as stated in the approved wetland mitigation proposal that the wetland mitigation proposal and the permit will be satisfied. The final report must include documentation to demonstrate that the goals of the wetland mitigation project including the required transition area, as stated in the approved wetlands mitigation proposal and the permit has been satisfied. Documentation for this report will also include a field wetland delineation of the wetlands mitigation project based on techniques as specified in the Federal Manual for Identifying and Delineation Jurisdictional Wetlands (1989).





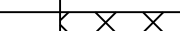
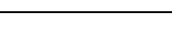


Appendix B

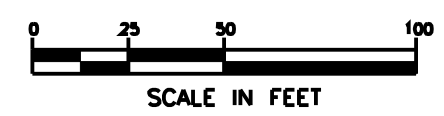
As-built Plans



NOTES:

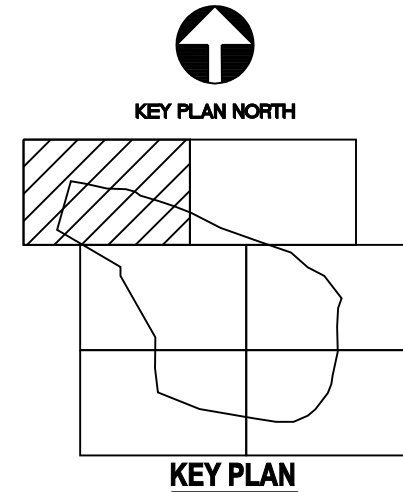
1. REFER TO C22 FOR PLANTING DESIGNATIONS.
2. NO SEEDING/PLANTING ON NATURE TRAIL.
3. EIGHT INCHES OF TOPSOIL FOR THE STREAM RESTORATION AREAS SHALL BE STRIPPED FROM THE RECREATIONAL FIELDS AND PARKING LOTS PRIOR TO FULL GRADING.

A	RIPARIAN FOREST		E	EMERGENT WETLAND	
B	UPLAND FOREST		F	STREAMBANK PLANTING	
C	WETLAND FOREST		G	GRASSLAND	
D	UPLAND SCRUB SHRUB		H	RECREATIONAL FIELDS	




MATCH LINE SEE SHEET C23

RECORD DRAWING AS-BUILT
UNION PAVING & CONSTRUCTION INC



MATCH LINE SEE SHEET C22



**US Army Corps
of Engineers**
New York District

[illegible]

DEPARTMENT OF THE ARMY NEW ORLEANS DISTRICT CORPS OF ENGINEERS THE LOUIS BERGER GROUP, INC. 30 WELAND ROAD FLORHAM PARK, NJ 07932	Designed by:	DS	Drawing file no.	Date: 06/03/00	Size:	Sheet:
	Dwn by:	CEW/YL				
	Reviewed by:	OK/UA	Drawing code	PG# date		
	Submitted by:			Plot by:		
	Check'd:			Issue:		
File name:						

**WETLAND MITIGATION DESIGN FOR
THE FINDERNE SITE,
GREEN BROOK FLOOD CONTROL PROJECT**

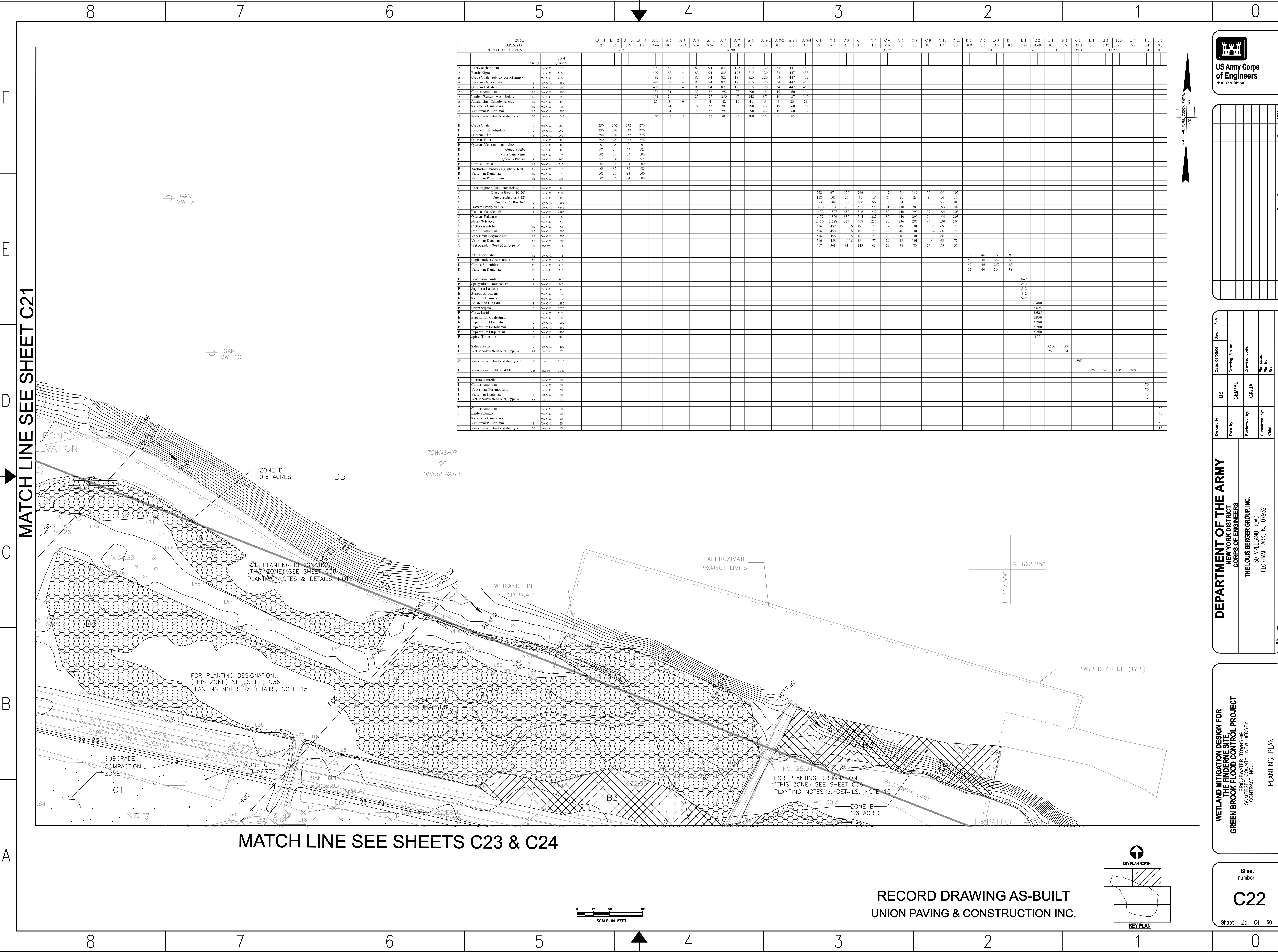
BRIDGEWATER TOWNSHIP
SOMERSET COUNTY, NEW JERSEY
CONTRACT NO. _____

PLANTING PLAN

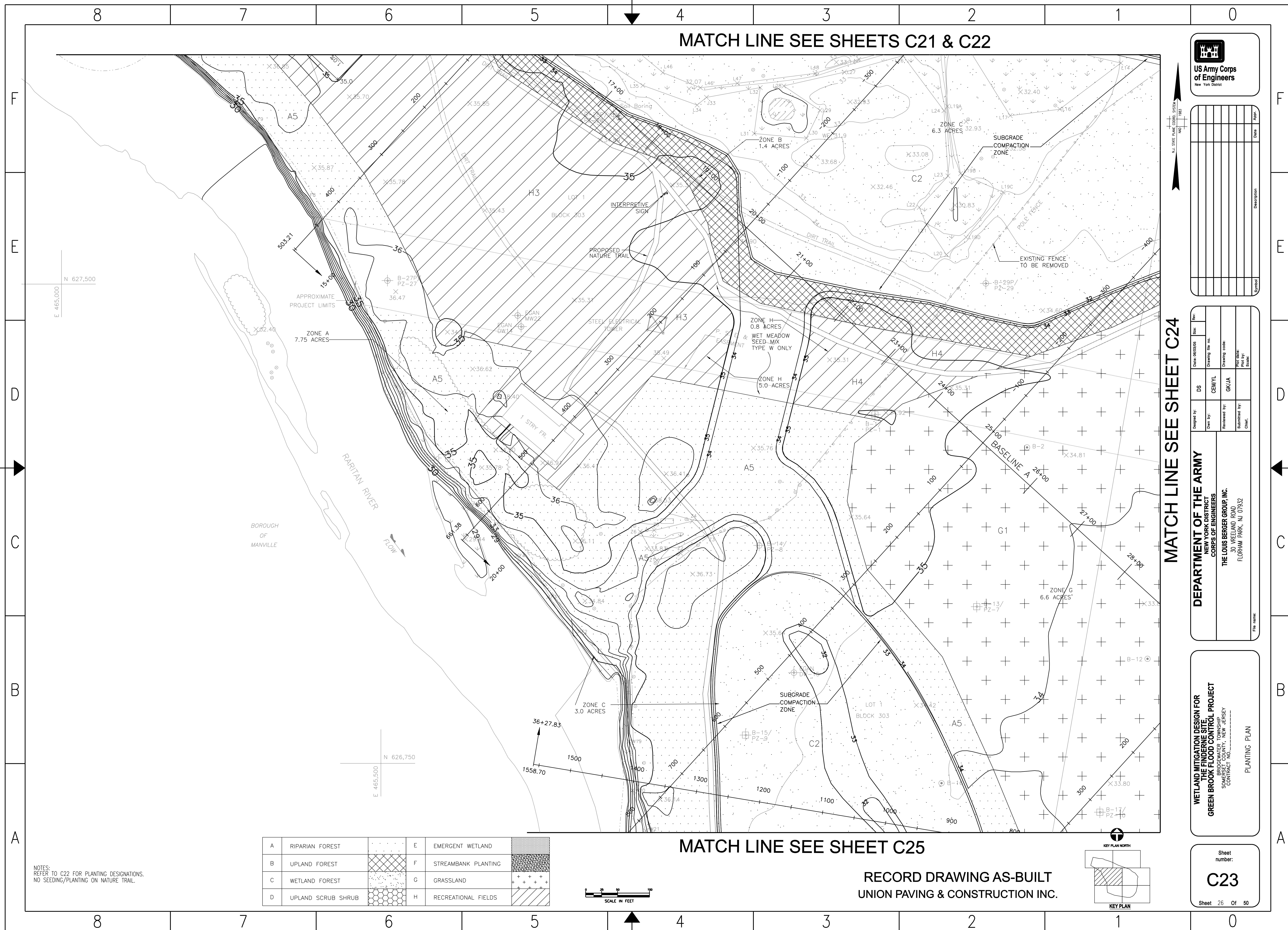
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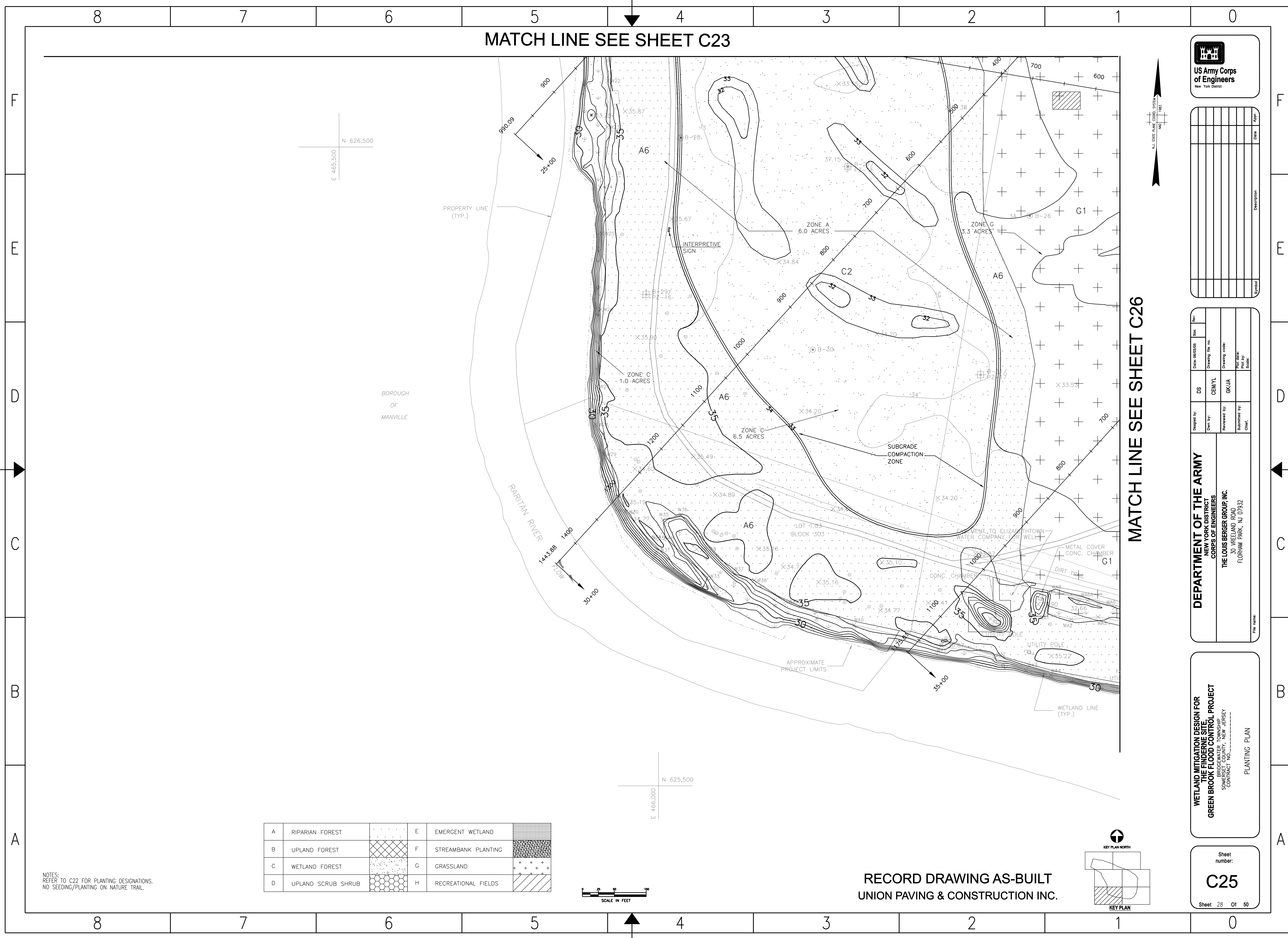
C21

Sheet 24 Of 50



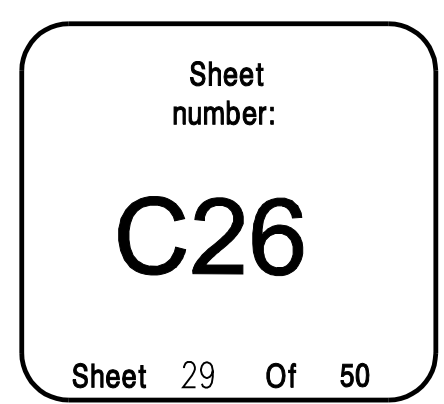
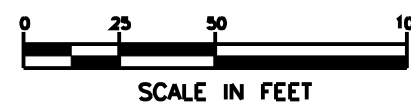
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NOTES:
REFER TO C22 FOR PLANTING DESIGNATIONS.
NO SEEDING/PLANTING ON NATURE TRAIL.



**WETLAND MITIGATION DESIGN FOR
THE FINDERNE SITE.
EEN BROOK FLOOD CONTROL PROJECT**
BRIDGEWATER TOWNSHIP
SOMERSET COUNTY, NEW JERSEY
CONTRACT NO. _____

Appendix C

Vegetation Species Table, Survey Data Sheets and Summary Calculation Tables

Vegetation Species Table

Appendix C
Plant Species Documented at the Finderne Farm Mitigation Site

Common Name	Scientific Name	Indicator Status
<u>Herbaceous Species</u>		
Allegheny blackberry	<i>Rubus allegheniensis</i>	FACU
American burro-reed	<i>Sparganium americanum</i>	OBL
American marshpennywort	<i>Hydrocotyle americana</i>	OBL
Arrow arum	<i>Peltandra virginica</i>	OBL
Arrow-leaf tearthumb	<i>Polygonum sagittatum</i>	OBL
Aster spp.	<i>Aster spp.</i>	—
Barnyard grass	<i>Echinochloa crus-galli</i>	FAC
Bearded beggar-ticks	<i>Bidens aristosa</i>	FACW
Beggar-ticks	<i>Bidens sp.</i>	—
Bentgrass	<i>Agrostis sp.</i>	—
Bindweed	<i>Calystegia sepium</i>	FAC
Bitter dock	<i>Rumex obtusifolius</i>	FAC
Black mustard	<i>Brassica nigra</i>	NI
Black-eyed Susan	<i>Rudbeckia hirta</i>	FACU
Bladder sedge	<i>Carex intumescens</i>	FACW
Blue vervain	<i>Verbena hastata</i>	FACW
Broadleaf arrowhead	<i>Sagittaria latifolia</i>	OBL
Broad-leaved cattail	<i>Typha latifolia</i>	OBL
Brome grass	<i>Bromus spp.</i>	—
Buttercup	<i>Ficaria verna</i>	FACW
Canadian goldenrod	<i>Solidago canadensis</i>	FACU
Canadian thistle	<i>Cirsium arvense</i>	FACU
Clearweed	<i>Pilea pumila</i>	FACW
Climbing false buckwheat	<i>Polygonum scandens</i>	NI
Common boneset	<i>Eupatorium perfoliatum</i>	FACW
Common chickweed	<i>Stellaria media</i>	FACU
Common cocklebur	<i>Xanthium strumarium</i>	FAC
Common milkweed	<i>Asclepias syriaca</i>	NI
Common mugwort	<i>Artemisia vulgaris</i>	NI
Common plantain	<i>Plantago major</i>	FACU
Common pokeweed	<i>Phytolacca americana</i>	FACU
Common ragweed	<i>Ambrosia artemisiifolia</i>	FACU
Common sunflower	<i>Helianthus annuus</i>	FACU
Common yarrow	<i>Achillea millefolium</i>	FACU
Crabgrass	<i>Digitaria sp.</i>	—
Creeping wood sorrel	<i>Oxalis corniculata</i>	FACU
Crested sedge	<i>Carex cristatella</i>	FACW
Crowned beggar-ticks	<i>Bidens coronata (tichosperma)</i>	OBL
Curly dock	<i>Rumex crispus</i>	FAC
Cut-leaf evening primrose	<i>Oenothera lacinata</i>	FACU
Dames rocket	<i>Hesperis matronalis</i>	FACU
Deertongue witchgrass	<i>Dicanthelium clandestinum</i>	FACW
Devil's beggar-ticks	<i>Bidens frondosa</i>	FACW
Dodder	<i>Cuscuta sp.</i>	—
Dogbane	<i>Apocynum spp.</i>	—
Duckweed	<i>Lemna minor</i>	OBL
English plantain	<i>Plantago lanceolata</i>	FACU
European stickseed	<i>Lappula squarrosa</i>	—
False daisy	<i>Eclipta prostrata</i>	FACW
False nettle	<i>Boehmeria cylindrica</i>	OBL
Field mint	<i>Mentha arvensis</i>	FACW
Field mustard	<i>Brassica rapa</i>	—
Field pennycress	<i>Thlaspi arvense</i>	NI
Field pepperweed	<i>Lepidium campestre</i>	NI
Fireweed	<i>Erechtites hieracifolia</i>	FACU
Fox grape	<i>Vitis labrusca</i>	FACU
Fox sedge	<i>Carex vulpinoidea</i>	OBL
Garlic mustard	<i>Alliaria petiolata</i>	FACU
Giant foxtail	<i>Setaria faberi</i>	FACU
Giant hogweed	<i>Heracleum mantegazzianum</i>	NI
Giant ragweed	<i>Ambrosia trifida</i>	FAC
Goldenrod	<i>Solidago spp.</i>	—
Grass	<i>Gramineae (family)</i>	—
Great water dock	<i>Rumex orbiculatus (britannica)</i>	OBL

Appendix C
Plant Species Documented at the Finderne Farm Mitigation Site

Common Name	Scientific Name	Indicator Status
<u>Herbaceous Species</u>		
Allegheny blackberry	<i>Rubus allegheniensis</i>	FACU
Greater burdock	<i>Arctium lappa</i>	—
Ground ivy	<i>Glechoma hederacea</i>	FACU
Halberd-leaf tearthumb	<i>Persicaria arifolium</i>	OBL
Hedge mustard	<i>Sisymbrium officinale</i>	NI
Hop sedge	<i>Carex lupulina</i>	OBL
Horse nettle	<i>Solanum carolinense</i>	FACU
Hypericum sp.	<i>Hypericum sp.</i>	—
Indian grass	<i>Sorghastrum nutans</i>	FACU
Indian hemp dogbane	<i>Apocynum cannabinum</i>	FAC
Japanese hop	<i>Humulus japonicus</i>	FACU
Japanese knotweed	<i>Polygonum cuspidatum</i>	FACU
Japanese stiltgrass	<i>Microstegium vimineum</i>	FAC
Jewelweed	<i>Impatiens capensis</i>	FACW
Jimsonweed	<i>Datura stramonium</i>	NI
Joe pye-weed	<i>Eupatorium purpureum</i>	FAC
Lady's thumb	<i>Persicaria maculosa</i>	FAC
Little bluestem	<i>Schizachyrium scoparium</i>	FACU
Lizard's tail	<i>Saururus cernuus</i>	OBL
Marshpepper smartweed	<i>Persicaria hydropiper</i>	OBL
Mermaid weed	<i>Proserpinaca palustris</i>	OBL
Milkweed	<i>Asclepias sp.</i>	—
Mint	<i>Mentha spp.</i>	—
Moneywort	<i>Lysimachia nummularia</i>	FACW
Multiflora rose	<i>Rosa multiflora</i>	FACU
Mustard	<i>Brassica spp.</i>	—
Narrow-leaved cattail	<i>Typha angustifolia</i>	OBL
Narrow-leaved goldenrod/Flat-topped	<i>Euthamia graminifolia</i>	FAC
New York ironweed	<i>Vernonia noveboracensis</i>	FACW
Northern blue violet	<i>Viola septentrionalis</i>	FACU
Northern bugleweed	<i>Lycopus uniflorus</i>	OBL
Ovate spikerush	<i>Eleocharis obtusa</i>	OBL
Oxeye Daisy	<i>Chrysanthemum leucanthemum</i>	NI
Ox-eye sunflower	<i>Heliopsis helianthoides</i>	FACU
Panicled aster	<i>Symphyotrichum lanceolatum</i>	FACW
Partridge pea	<i>Chamaecrista nictitans</i>	FACU
Path rush	<i>Juncus tenuis</i>	FAC
Pennsylvania bittercress	<i>Cardamine pennsylvanica</i>	FACW
Pennsylvania smartweed	<i>Persicaria pennsylvanica</i>	FACW
Pickeralweed	<i>Pontederia cordata</i>	OBL
Poison hemlock	<i>Conium maculatum</i>	FACW
Purple loosestrife	<i>Lythrum salicaria</i>	OBL
Queen Anne's lace	<i>Daucus carota</i>	NI
Ragweed	<i>Ambrosia sp.</i>	—
Reed canary grass	<i>Phalaris arundinacea</i>	FACW
Rice cutgrass	<i>Leersia oryzoides</i>	OBL
Rush	<i>Juncus spp.</i>	—
Rye	<i>Elymus spp.</i>	—
Sedges	<i>Carex spp.</i>	—
Sensitive fern	<i>Oncolea sensibilis</i>	FACW
Shallow sedge	<i>Carex lurida</i>	OBL
Small crapgrass	<i>Arthraxon hispidus</i>	FACW
Small water plantain	<i>Alisma subcordatum</i>	OBL
Smartweed	<i>Polygonum spp.</i>	—
Snakeroot	<i>Eupatorium sp.</i>	—
Sneezeweed	<i>Helenium autumnale</i>	FACW
Soft rush	<i>Juncus effusus</i>	OBL
Soft-stemmed bulrush	<i>Schoenoplectus tabernaemontani</i>	OBL
Spike rush	<i>Eleocharis spp.</i>	—
Spotted Joe-Pye weed	<i>Eutrochium maculatum</i>	OBL
Stinging nettle	<i>Urtica dioica</i>	FAC
Strawberry	<i>Fragaria sp.</i>	—
Swamp milkweed	<i>Asclepias incarnata</i>	OBL
Swamp smartweed	<i>Persicaria hydropiperoides</i>	OBL

Appendix C
Plant Species Documented at the Finderne Farm Mitigation Site

Common Name	Scientific Name	Indicator Status
<u>Herbaceous Species</u>		
Allegheny blackberry	<i>Rubus allegheniensis</i>	FACU
Sweetflag	<i>Acorus calamus</i>	OBL
Switchgrass	<i>Panicum virgatum</i>	FAC
Tall goldenrod	<i>Solidago altissima</i>	FACU
Thistle	<i>Cirsium spp.</i>	—
Threeway sedge	<i>Dulichium arundinaceum</i>	OBL
Timothy	<i>Phleum pratense</i>	FACU
Tumble mustard	<i>Sisymbrium altissimum</i>	FACU
Velvet grass	<i>Holcus lanatus</i>	FACU
Water hemlock	<i>Circuta maculata</i>	OBL
Water horehound	<i>Lycopus americanus</i>	OBL
Water purslane	<i>Ludwigia palustris</i>	OBL
Watercress	<i>Nasturtium officinale</i>	OBL
White beardtongue	<i>Penstemon digitalis</i>	FAC
White heath aster	<i>Symphotrichum ericoides var. ericoides</i>	FACU
White snakeroot	<i>Ageratina altissima</i>	FACU
White vervain	<i>Verbena urticifolia</i>	FAC
Whorled loosestrife	<i>Lysimachia quadrifolia</i>	FACU
Wild cucumber	<i>Echinocystis lobata</i>	FACW
Wild mustard	<i>Brassica rapa</i>	NI
Wood-sorrel	<i>Oxalis sp.</i>	—
Wrinkleleaf goldenrod	<i>Solidago rugosa</i>	FAC
Yellow foxtail	<i>Setaria glauca (pumila)</i>	FAC
Yellow nutsedge	<i>Cyperus esculentus</i>	FACW
Yellow rocket	<i>Barbarea vulgaris</i>	FAC
Yellow wood-sorrel	<i>Oxalis stricta</i>	FACU
<u>Woody Species</u>		
American elder	<i>Sambucus canadensis (nigra)</i>	FACW
American elm	<i>Ulmus americana</i>	FACW
Blackgum	<i>Nyssa sylvatica</i>	FAC
Box Elder	<i>Acer negundo</i>	FAC
Chokecherry	<i>Prunus virginiana</i>	FACU
Common buttonbush	<i>Cephalanthus occidentalis</i>	OBL
Cottonwood	<i>Populus deltoides</i>	FAC
Elm	<i>Ulmus spp.</i>	—
False indigo bush	<i>Amorpha fruticosa</i>	FACW
Gray birch	<i>Betula populifolia</i>	FAC
Green ash	<i>Fraxinus pennsylvanica</i>	FACW
Highbush blueberry	<i>Vaccinium corymbosum</i>	FACW
Honey locust	<i>Gleditsia tricanthos</i>	FAC
Oak	<i>Quercus sp.</i>	—
Pepperbush	<i>Clethra alnifolia</i>	FAC
Pin oak	<i>Quercus palustris</i>	FACW
Pyrus sp.	<i>Pyrus sp.</i>	NI
Red maple	<i>Acer rubrum</i>	FAC
Red osier dogwood	<i>Cornus alba</i>	FACW
River birch	<i>Betula nigra</i>	FACW
Royal paulownia	<i>Paulownia tomentosa</i>	NI
Shadblow serviceberry	<i>Amelanchier canadensis</i>	FAC
Silky dogwood	<i>Cornus amomum</i>	FACW
Silver maple	<i>Acer saccharinum</i>	FACW
Smooth alder	<i>Alnus serrulata</i>	OBL
Southern arrowwood	<i>Viburnum dentatum</i>	FAC
Speckled alder	<i>Alnus incana</i>	FACW
Swamp white oak	<i>Quercus bicolor</i>	FACW
Sycamore	<i>Platanus occidentalis</i>	FACW
Tulip poplar	<i>Liriodendron tulipifera</i>	FACU
Willow	<i>Salix spp.</i>	—

* Table includes a combine list of all species identified on-site from 2008 through 2012.

Summary Calculation Tables

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Planted Woody Species
Forested Wetland Enhancement/Creation Area 1 (EC1)

Species	Spring Survey Plot #50					Spring Survey Plot #51				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
Acer rubrum										
<i>Nyssa sylvatica</i>						1	0	<1	29	P
<i>Quercus bicolor</i>	1	0	<1	24	F	1	0	<1	46	P
<i>Fraxinus pennsylvanica</i>										
<i>Quercus palustris</i>	2	0	<1	45	P	11	0	5	35	P
Total Trees	3	0				13	0			
Rosa multiflora										
<i>Cornus amomum</i>										
<i>Viburnum dentatum</i>						1	0	<1	8	P
Total Shrubs	0	0				1	0			
Total Woody Stems	3	0				14	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Includes Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	11%					53%				
Average Density (woody stem/acre)	100.0					466.7				
Average Height (inches)	38.0					33.43				

Calculations (Average Per Planting Area) **Includes Recruits										
Average Percent Survival	18%									
Average Density (woody stem/acre)	160.00									
Average Height (inches) ***not averaging in plots with none present	33.0									

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival	11%					53%				
Average Density (woody stem/acre)	100.0					466.7				
Average Height (inches)	38.0					33.43				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival	18%									
Average Density (woody stem/acre)	156.7									
Average Height (inches) ***not averaging in plots with none present	37.2									

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Planted Woody Species
Forested Wetland Enhancement/Creation Area 1 (EC1)

Species	Spring Survey Plot #52 (NO WOODY PLANTS)					Spring Survey Plot #53				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
Acer rubrum						1	0	<1	8	P
<i>Nyssa sylvatica</i>										
<i>Quercus bicolor</i>										
<i>Fraxinus pennsylvanica</i>										
<i>Quercus palustris</i>										
Total Trees						1	0			
Rosa multiflora										
<i>Cornus amomum</i>										
<i>Viburnum dentatum</i>										
Total Shrubs	0	0				0	0			
Total Woody Stems	0	0				1	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Includes Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					4%				
Average Density (woody stem/acre)	0					33.33				
Average Height (inches)	0					8				

Calculations (Average Per Planting Area) **Includes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Planted Woody Species
Forested Wetland Enhancement/Creation Area 1 (EC1)

Species	Spring Survey Plot #54					Fall Survey Plot #40				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer rubrum</i>										
<i>Nyssa sylvatica</i>										
<i>Quercus bicolor</i>										
<i>Fraxinus pennsylvanica</i>										
<i>Quercus palustris</i>	8	0	7	44	P	4		2	36.8	P
Total Trees	8	0				4	0			
<i>Rosa multiflora</i>	1	0	<1	30	F					
<i>Cornus amomum</i>										
<i>Viburnum dentatum</i>										
Total Shrubs	1	0				0	0			
Total Woody Stems	9	0				4	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Includes Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	34%					15%				
Average Density (woody stem/acre)	300					133.3				
Average Height (inches)	42.44					36.8				

Calculations (Average Per Planting Area) **Includes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival	34%					15%				
Average Density (woody stem/acre)	300					133.3				
Average Height (inches)	42.44					36.8				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Planted Woody Species
Forested Wetland Enhancement/Creation Area 1 (EC1)

Species	Fall Survey Plot #41					Fall Survey Plot #42 (NO WOODY PLANTS)				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer rubrum</i>										
<i>Nyssa sylvatica</i>										
<i>Quercus bicolor</i>	1		<1	44	F					
<i>Fraxinus pennsylvanica</i>	1		<1	40	F					
<i>Quercus palustris</i>	2		<1	34.5	P					
Total Trees	4	0				0	0			
<i>Rosa multiflora</i>										
<i>Cornus amomum</i>										
<i>Viburnum dentatum</i>										
Total Shrubs	0	0				0	0			
Total Woody Stems	4	0				0	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Includes Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	15%					0%				
Average Density (woody stem/acre)	133.3					0				
Average Height (inches)	38.25					0				

Calculations (Average Per Planting Area) **Includes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival	15%					0%				
Average Density (woody stem/acre)	133.3					0				
Average Height (inches)	38.25					0				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Planted Woody Species
Forested Wetland Enhancement/Creation Area 1 (EC1)

Species	Fall Survey Plot #43					Fall Survey Plot #44 (NO WOODY PLANTS)				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
Acer rubrum										
<i>Nyssa sylvatica</i>	2		1	37.5	P					
<i>Quercus bicolor</i>										
<i>Fraxinus pennsylvanica</i>										
<i>Quercus palustris</i>	10		5	33.8	P					
Total Trees	12	0				0	0			
Rosa multiflora										
<i>Cornus amomum</i>	1		<1	32	P					
<i>Viburnum dentatum</i>										
Total Shrubs	1	0				0	0			
Total Woody Stems	13	0				0	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Includes Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	50%					0%				
Average Density (woody stem/acre)	433.3					0				
Average Height (inches)	34.23					0				

Calculations (Average Per Planting Area) **Includes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival	50%					0%				
Average Density (woody stem/acre)	433.3					0				
Average Height (inches)	34.23					0				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 1 (E1)

Species	Spring Survey Plot #15 (No Woody Plants)					Survey Plot #16 (No Woody Plants)				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Quercus palustris</i>										
Total Trees	0	0				0	0			
<i>Amporpha fruticosa</i>										
Total Shrubs	0	0				0	0			
Total Woody Stems	0	0				0	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Includes Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Includes Recruits										
Average Percent Survival	2%									
Average Density (woody stem/acre)	16.665									
Average Height (inches) ***not averaging in plots with none present	57.5									

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival	1%									
Average Density (woody stem/acre)	8.3325									
Average Height (inches) ***not averaging in plots with none present	38									

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 1 (E1)

Species	Fall Survey Plot #57					Fall Survey Plot #58				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Quercus palustris</i>						1		<1	38	P
Total Trees	0	0				1	0			
<i>Amporpha fruticosa</i>	1		1	77	F					
Total Shrubs	1	0				0	0			
Total Woody Stems	1	0				1	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Includes Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	4%					4%				
Average Density (woody stem/acre)	33.33					33.33				
Average Height (inches)	77					38				

Calculations (Average Per Planting Area) **Includes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					4%				
Average Density (woody stem/acre)	0					33.33				
Average Height (inches)	0					38				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 2 (E2)

Species	Spring Survey Plot #55					Spring Survey Plot #56				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer negundo</i>										
<i>Fraxinus pennsylvanica</i>						1		<1	48	P
Dead Stem										
Total Trees	0	0				1	0			
<i>Alnus serrulata</i>										
<i>Amorpha fruticosa</i>	12		5	60	P					
<i>Cephalanthus occidentalis</i>										
<i>Rosa multiflora</i>										
<i>Salix</i> sp.										
Total Shrubs	12	0				0	0			
Total Woody Stems	12	0				1	0			

Planting Zone Density

Original Planting Density 300 shrubs/acre

20' Radius Circular Plots = 0.03 acres

Density Per 20' Plot at Planting = 9 Shrubs per plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	133%					11%				
Average Density (woody stem/acre)	400					33.33				
Average Height (inches)	60					48				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival	40%									
Average Density (woody stem/acre)	120.83									
Average Height (inches) ***not averaging in plots with none present	67.606									

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival	7%									
Average Density (woody stem/acre)	20.833									
Average Height (inches) ***not averaging in plots with none present	45.625									

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 2 (E2)

Species	Spring Survey Plot #57					Spring Survey Plot #58				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer negundo</i>	1		<1	12	F					
<i>Fraxinus pennsylvanica</i>	1	1	1	96	F					
Dead Stem										
Total Trees	2	1				0	0			
<i>Alnus serrulata</i>	1		<1	36	G					
<i>Amorpha fruticosa</i>	1		<1	24	F	1		<1	40	P
<i>Cephalanthus occidentalis</i>										
<i>Rosa multiflora</i>	1		<1	40	G					
<i>Salix</i> sp.										
Total Shrubs	3	0				1	0			
Total Woody Stems	5	1				1	0			

Planting Zone Density

Original Planting Density 300 shrubs/acre

20' Radius Circular Plots = 0.03 acres

Density Per 20' Plot at Planting = 9 Shrubs per plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	56%					11%				
Average Density (woody stem/acre)	166.7					33.33				
Average Height (inches)	41.6					40				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	11%					0%				
Average Density (woody stem/acre)	33.33					0				
Average Height (inches)	36					0				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 2 (E2)

Species	Fall Survey Plot #53					Fall Survey Plot #54				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer negundo</i>										
<i>Fraxinus pennsylvanica</i>										
<i>Dead Stem</i>							1	<1	58	D
Total Trees	0	0				0	1			
<i>Alnus serrulata</i>						1		<1	46	P
<i>Amorpha fruticosa</i>	2		10	102	G	1		5	102	G
<i>Cephalanthus occidentalis</i>	2		1	52.5	F					
<i>Rosa multiflora</i>										
<i>Salix</i> sp.										
Total Shrubs	4	0				2	0			
Total Woody Stems	4	0				2	1			

Planting Zone Density

Original Planting Density 300 shrubs/acre

20' Radius Circular Plots = 0.03 acres

Density Per 20' Plot at Planting = 9 Shrubs per plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	44%					22%				
Average Density (woody stem/acre)	133.3					66.66				
Average Height (inches)	77.25					74				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	22%					11%				
Average Density (woody stem/acre)	66.67					33.33				
Average Height (inches)	52.5					46				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 2 (E2)

Species	Fall Survey Plot #55					Fall Survey Plot #56				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer negundo</i>										
<i>Fraxinus pennsylvanica</i>										
<i>Dead Stem</i>							1	<1	56	D
Total Trees	0	0				0	1			
<i>Alnus serrulata</i>										
<i>Amorpha fruticosa</i>	3		10	152	F					
<i>Cephalanthus occidentalis</i>										
<i>Rosa multiflora</i>										
<i>Salix sp.</i>						1		<1	48	F
Total Shrubs	3	3				1	1			
Total Woody Stems	3	3				1	1			

Planting Zone Density

Original Planting Density 300 shrubs/acre

20' Radius Circular Plots = 0.03 acres

Density Per 20' Plot at Planting = 9 Shrubs per plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	33%					11%				
Average Density (woody stem/acre)	100					33.33				
Average Height (inches)	152					48				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					11%				
Average Density (woody stem/acre)	0					33.33				
Average Height (inches)	0					48				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Herbaceous Species
Wetland Enhancement Area 3 (E3)

Species	Spring Survey Plot #32		Spring Survey Plot #33		Spring Survey Plot #34		Spring Survey Plot #35		Spring Survey Plot #36	
	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead
<u>Lysimachia nummularia</u>			49.0%		5.0%		10.0%			
<u>Lythrum salicaria</u>		15.0%		30.0%	10.0%		55.0%			8.0%
<u>Phalaris arundinacea</u>										
<u>Persicaria maculosa</u>					5.0%					
<u>Acer rubrum</u> (seedling)										
<u>Aster sp.</u>										8.0%
<u>Bidens coronata</u>	1.0%						1.0%			
<u>Bidens sp.</u>										
<u>Cardamine pensylvanica</u>							<1%			
<u>Carex sp.</u>										
<u>Cyperus esculentus</u>										
<u>Dulichium arundinaceum</u>			10.0%						5.0%	
<u>Echinochloa crus-galli</u>										
<u>Eleocharis sp.</u>	1.0%									
<u>Hypericum sp.</u>										
<u>Juncus effusus</u>			5.0%				30.0%		10.0%	
<u>Juncus tenuis</u>										
<u>Juncus sp.</u>									2.0%	
<u>Leersia oryzoides</u>	5.0%								5.0%	
<u>Ludwigia palustris</u>										
<u>Onoclea sensibilis</u>										2.0%
<u>Peltandra virginica</u>										
<u>Pericaria hydropiperoides</u>										
<u>Persicaria sagittata</u>	2.0%		5.0%				2.0%		55.0%	
<u>Polygonum pennsylvanicum</u>										
<u>Polygonum sp.</u>	75.0%		1.0%		80.0%		1.0%		5.0%	
<u>Solidago sp.</u>	1.0%									
<u>Stellaria sp.</u>										
<u>Symphyotrichum ericoides</u>										
<u>Vernonia noveboracensis</u>										
Unidentified herb										
Unidentified grass										
Bare ground										
Total Percent Cover Native/Target Hydrophytes	85%	0%	21%	0%	80%	0%	34%	0%	82%	10%
Total Percent Cover Invasive Species	0%	15%	49%	30%	20%	0%	65%	0%	0%	8%

Planting Zone Density

Emergent wetland species planted 3 foot on center.

4920 plants/acre

Underline indicates non-target or invasive species

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Herbaceous Species
Wetland Enhancement Area 3 (E3)

Species	Spring Survey Plot #37		Spring Survey Plot #38		Spring Survey Plot #39		Spring Survey Plot #40		Spring Survey Plot #41	
	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead
<u>Lysimachia nummularia</u>			58.0%		3.0%					
<u>Lythrum salicaria</u>			10.0%		5.0%		58.0%		2.0%	
<u>Phalaris arundinacea</u>					60.0%					
<u>Persicaria maculosa</u>							3.0%			
<u>Acer rubrum (seedling)</u>										
<u>Aster sp.</u>			5.0%							
<u>Bidens coronata</u>										
<u>Bidens sp.</u>			<1							
<u>Cardamine pensylvanica</u>										
<u>Carex sp.</u>										
<u>Cyperus esculentus</u>										
<u>Dulichium arundinaceum</u>			1.0%		12.0%					
<u>Echinochloa crus-galli</u>										
<u>Eleocharis sp.</u>										
<u>Hypericum sp.</u>										
<u>Juncus effusus</u>	35.0%		15.0%		5.0%		2.0%			
<u>Juncus tenuis</u>	1.0%									
<u>Juncus sp.</u>										
<u>Leersia oryzoides</u>										
<u>Ludwigia palustris</u>									20.0%	
<u>Onoclea sensibilis</u>										
<u>Peltandra virginica</u>									<1	
<u>Pericaria hydropiperoides</u>										
<u>Persicaria sagittata</u>	3.0%		10.0%				20.0%			
<u>Polygonum pennsylvanicum</u>										
<u>Polygonum sp.</u>	60.0%				5.0%		15.0%		1.0%	
<u>Solidago sp.</u>										
<u>Stellaria sp.</u>										
<u>Symphyotrichum ericoides</u>										
<u>Vernonia noveboracensis</u>	1.0%									
Unidentified herb							2.0%			
Unidentified grass									10.0%	
Bare ground										
Total Percent Cover Native/Target Hydrophytes	100%	0%	31%	0%	22%	0%	39%	0%	21%	0%
Total Percent Cover Invasive Species	0%	0%	68%	0%	68%	0%	61%	0%	2%	0%

Planting Zone Density

Emergent wetland species planted 3 foot on center.

4920 plants/acre

Underline indicates non-target or invasive species

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Herbaceous Species
Wetland Enhancement Area 3 (E3)

Species	Fall Survey Plot #18		Fall Survey Plot #19		Fall Survey Plot #20		Fall Survey Plot #21		Fall Survey Plot #22	
	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead
<i>Lysimachia nummularia</i>									20.0%	
<i>Lythrum salicaria</i>	89.0%		67.0%				78.0%		40.0%	
<i>Phalaris arundinacea</i>										
<i>Persicaria maculosa</i>										
<i>Acer rubrum</i> (seedling)							<1		1.0%	
<i>Aster</i> sp.	1.0%									
<i>Bidens coronata</i>										
<i>Bidens</i> sp.										
<i>Cardamine pensylvanica</i>										
<i>Carex</i> sp.									5.0%	
<i>Cyperus esculentus</i>					65.0%					
<i>Dulichium arundinaceum</i>										
<i>Echinochloa crus-galli</i>										
<i>Eleocharis</i> sp.										
<i>Hypericum</i> sp.							10.0%		3.0%	
<i>Juncus effusus</i>									5.0%	
<i>Juncus tenuis</i>										
<i>Juncus</i> sp.										
<i>Leersia oryzoides</i>										
<i>Ludwigia palustris</i>					15.0%					
<i>Onoclea sensibilis</i>										
<i>Peltandra virginica</i>										
<i>Pericaria hydropiperoides</i>										
<i>Persicaria sagittata</i>			30.0%				1.0%		2.0%	
<i>Polygonum pennsylvanicum</i>			3.0%							
<i>Polygonum</i> sp.									1.0%	
<i>Solidago</i> sp.							1.0%			
<i>Stellaria</i> sp.					20.0%					
<i>Symphyotrichum ericoides</i>									5.0%	
<i>Vernonia noveboracensis</i>										
Unidentified herb	10.0%						10.0%			
Unidentified grass										
Bare ground										
Total Percent Cover Native/Target Hydrophytes	11%	0%	33%	0%	100%	0%	22%	0%	21%	0%
Total Percent Cover Invasive Species	89%	0%	67%	0%	0%	0%	78%	0%	60%	0%

Planting Zone Density

Emergent wetland species planted 3 foot on center.

4920 plants/acre

Underline indicates non-target or invasive species

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Herbaceous Species
Wetland Enhancement Area 3 (E3)

Species	Fall Survey Plot #23		Fall Survey Plot #24		Fall Survey Plot #25		Fall Survey Plot #26		Fall Survey Plot #27		Total
	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead	Percent Cover or # Live	Percent Cover or # Dead	
<i>Lysimachia nummularia</i>									5.0%		150.0%
<i>Lythrum salicaria</i>							60.0%		20.0%		547.0%
<i>Phalaris arundinacea</i>	40.0%										100.0%
<i>Persicaria maculosa</i>											8.0%
<i>Acer rubrum</i> (seedling)											1.0%
<i>Aster</i> sp.											14.0%
<i>Bidens coronata</i>											2.0%
<i>Bidens</i> sp.											0.0%
<i>Cardamine pensylvanica</i>											0.0%
<i>Carex</i> sp.											5.0%
<i>Cyperus esculentus</i>			65.0%		40.0%						170.0%
<i>Dulichium arundinaceum</i>											28.0%
<i>Echinochloa crus-galli</i>					10.0%						10.0%
<i>Eleocharis</i> sp.											1.0%
<i>Hypericum</i> sp.					25.0%						38.0%
<i>Juncus effusus</i>	20.0%	29.0%					5.0%				161.0%
<i>Juncus tenuis</i>											1.0%
<i>Juncus</i> sp.											2.0%
<i>Leersia oryzoides</i>											10.0%
<i>Ludwigia palustris</i>			35.0%		25.0%						95.0%
<i>Onoclea sensibilis</i>											2.0%
<i>Peltandra virginica</i>											0.0%
<i>Pericaria hydropiperoides</i>	10.0%										10.0%
<i>Persicaria sagittata</i>	1.0%						25.0%		15.0%		171.0%
<i>Polygonum pennsylvanicum</i>											3.0%
<i>Polygonum</i> sp.											244.0%
<i>Solidago</i> sp.									<1		2.0%
<i>Stellaria</i> sp.											20.0%
<i>Symphotrichum ericoides</i>							10.0%		60.0%		75.0%
<i>Vernonia noveboracensis</i>											1.0%
Unidentified herb											22.0%
Unidentified grass											10.0%
Bare ground											0.0%
Total Percent Cover Native/Target Hydrophytes	31%	29%	100%	0%	100%	0%	40%	0%	75%	0%	1903.0%
Total Percent Cover Invasive Species	40%	0%	0%	0%	0%	0%	60%	0%	25%	0%	

Planting Zone Density

Emergent wetland species planted 3 foot on center.

4920 plants/acre

Underline indicates non-target or invasive species

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 4 (E4)

Species	Spring Survey Plot #13					Spring Survey Plot #14 (No Woody Plants)				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer negundo</i> (seedlings)	100		1	5	G					
Total Trees	100	0				0	0			
No Shrubs										
Total Shrubs	0	0				0	0			
Total Woody Stems	100	0				0	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival	381%					0%				
Average Density (woody stem/acre)	3333					0				
Average Height (inches)	5					0				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival	95%									
Average Density (woody stem/acre)	833.3									
Average Height (inches) ***not averaging in plots with none present	5									

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival	0%									
Average Density (woody stem/acre)	0									
Average Height (inches) ***not averaging in plots with none present	0									

Note - Mature (not planted) canopy cover of *Acer negundo* and *Salix* spp. not included in calculations. Trunks outside of plot.

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 4 (E4)

Species	Fall Survey Plot#49 (No Woody Plants)					Fall Survey Plot #50 (No Woody Plants)				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer negundo</i> (seedlings)										
Total Trees	0	0				0	0			
No Shrubs										
Total Shrubs	0	0				0	0			
Total Woody Stems	0	0				0	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/aci

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Note - Mature (not planted) canopy cover of *Acer negundo* and *Salix* spp. not

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moverately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 5 (E5)

Species	Spring Survey Plot #9					Spring Survey Plot #10				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Fraxinus pennsylvanica</i>	1		20	420	E	10		18.5	149	F
<i>Fraxinus pennsylvanica</i>						12		18.5	396	G
<i>Fraxinus pennsylvanica</i> (Seedlings)						14		1	20	G
<i>Amorpha fruticosa</i>	2		5	114	G					
<i>Betula nigra</i>						5		38	600	E
<i>Betula nigra</i> (Seedlings)						1		<1	12	G
<i>Ulmus</i> (Seedlings)										
<i>Quercus palustris</i>										
<i>Quercus palustris</i> (Seedlings)										
<i>Pyrus communis</i>										
Total Trees	3	0				42	0			
No Shrubs										
Total Shrubs	0	0				0	0			
Total Woody Stems	3	0				42	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	11%					160%				
Average Density (woody stem/acre)	100					1400				
Average Height (inches)	216					227				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival	103%									
Average Density (woody stem/acre)	900									
Average Height (inches) ***not averaging in plots with none present	190.43									

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					46%				
Average Density (woody stem/acre)	0					400				
Average Height (inches)	0					396				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival	12%									
Average Density (woody stem/acre)	108.33									
Average Height (inches) ***not averaging in plots with none present	204									

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 5 (E5)

Species	Fall Survey Plot #47					Fall Survey Plot #48				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Fraxinus pennsylvanica</i>						51		80	300	F
<i>Fraxinus pennsylvanica</i>	1		<1	12	F					
<i>Fraxinus pennsylvanica</i> (Seedlings)										
<i>Amorpha fruticosa</i>										
<i>Betula nigra</i>										
<i>Betula nigra</i> (Seedlings)	2		1	36	F					
<i>Ulmus</i> (Seedlings)	9		1	12.4	F					
<i>Quercus palustris</i>						2		1	33.5	G
<i>Quercus palustris</i> (Seedlings)						1		<1	9	F
<i>Pyrus communis</i>						1		<1	44	F
Total Trees	12	0				51	0			
No Shrubs										
Total Shrubs	0	0				0	0			
Total Woody Stems	12	0				51	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acr

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	46%					195%				
Average Density (woody stem/acre)	400					1700				
Average Height (inches)	16.3					302.4				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	4%					0%				
Average Density (woody stem/acre)	33.33					0				
Average Height (inches)	12					0				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 6 (E6)

Species	Spring Survey Plot #11 (No Woody Plants)					Spring Survey Plot #12 (No Woody Plants)				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
No Trees										
Total Trees	0	0				0	0			
No Shrubs										
Total Shrubs	0	0				0	0			
Total Woody Stems	0	0				0	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot)										
Average Percent Survival (Total observed stems per plot/Planting density per	0.00%					0				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area)										
Average Percent Survival	0.00%									
Average Density (woody stem/acre)	0									
Average Height (inches) ***not averaging in plots with none present	0									

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moverately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 6 (E6)

Species	Fall Survey Plot #51 (No Woody Plants)					Fall Survey Plot #52 (No Woody Plants)				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
No Trees										
Total Trees	0	0				0	0			
No Shrubs										
Total Shrubs	0	0				0	0			
Total Woody Stems	0	0				0	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stem:

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot)										
Average Percent Survival (Total observed stems per plot/Planting density per	0					0				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area)										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 7 (E7)

Species	Spring Survey Plot #1 (No Woody Plants)					Spring Survey Plot #2 (No Woody Plants)				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Quercus bicolor</i>										
<i>Dead Stem</i>										
<i>Quercus palustris</i>										
<i>Platanus occidentalis</i>										
<i>Acer rubrum</i> (seedlings)										
<i>Nyssa sylvatica</i>										
Total Trees	0	0				0	0			
<i>Cornus amomum</i>										
Total Shrubs	0	0				0	0			
Total Woody Stems	0	0				0	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival	7%									
Average Density (woody stem/acre)	62.50									
Average Height (inches) ***not averaging in plots with none present	21.28									

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival	4%									
Average Density (woody stem/acre)	37.50									
Average Height (inches) ***not averaging in plots with none present	26.1									

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 7 (E7)

Species	Spring Survey Plot #3 (No Woody Plants)					Spring Survey Plot #4 (No Woody Plants)				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Quercus bicolor</i>										
<i>Dead Stem</i>										
<i>Quercus palustris</i>										
<i>Platanus occidentalis</i>										
<i>Acer rubrum</i> (seedlings)										
<i>Nyssa sylvatica</i>										
Total Trees	0	0				0	0			
<i>Cornus amomum</i>										
Total Shrubs	0	0				0	0			
Total Woody Stems	0	0				0	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 7 (E7)

Species	Fall Survey Plot #1 (No Woody Plants)					Fall Survey Plot #2 (No Woody Plants)				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Quercus bicolor</i>										
<i>Dead Stem</i>										
<i>Quercus palustris</i>										
<i>Platanus occidentalis</i>										
<i>Acer rubrum</i> (seedlings)										
<i>Nyssa sylvatica</i>										
Total Trees	0	0				0	0			
<i>Cornus amomum</i>										
Total Shrubs	0	0				0	0			
Total Woody Stems	0	0				0	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 7 (E7)

Species	Fall Survey Plot #3					Fall Survey Plot # 39				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Quercus bicolor</i>	1		2	10	G					
Dead Stem		1	<1	48	D					
<i>Quercus palustris</i>						3		2	32.3	G
<i>Platanus occidentalis</i>						1		<1	65	P
<i>Acer rubrum</i> (seedlings)						6		1	12.8	P
<i>Nyssa sylvatica</i>						2		1	28	G
Total Trees	1	1				12	0			
<i>Cornus amomum</i>	1		<1	27	P	1		<1	18	P
Total Shrubs	1	0				1	0			
Total Woody Stems	2	1				13	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	8%					50%				
Average Density (woody stem/acre)	66.67					433.3				
Average Height (inches)	18.5					24.05				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excludes Recruits										
Average Percent Survival	8%					27%				
Average Density (woody stem/acre)	66.67					233.3				
Average Height (inches)	18.5					33.7				

Calculations (Average Per Planting Area) **Excludes Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 8 (E8)

Species	Spring Survey Plot #5 (No Woody Plants)					Spring Survey Plot #6				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer rubrum</i>						5		<1	12.6	F
<i>Salix sp.</i>						8		50	300	E
<i>Salix sp.</i>										
<i>Acer negundo</i>										
Total Woody Stems	0	0				13	0			

Planting Zone Density

Original Planting Density F2 4840 shrubs/acre

Original Planting Density K 1210 shrubs/acre

20' Radius Circular Plots (K)= 0.03 acres = 36.3 shrubs/plot

10' Radius Circular Plots (F2)= 0.007 acres = 33.9 shrubs/plot

20' Radius Circular Plots (F2)= 0.03 acres = 145.2 shrubs/plot

Calculations (Average Per Plot) **Including Recruits	K				K					
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%				36%					
Average Density (woody stem/acre)	0				433.33					
Average Height (inches)	0				189.4					

Calculations (Average Per Planting Area) **Including Recruits	F2	K	Total E8							
Average Percent Survival	81%	14%	31%							
Average Density (woody stem/acre)	3928.60	166.67	1107.1							
Average Height (inches) ***not averaging in plots with none present	40.83	122.80	90.01							

Calculations (Average Per Plot) **Excluding Recruits	K				K					
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%				0%					
Average Density (woody stem/acre)	0				0					
Average Height (inches)	0				0					

Calculations (Average Per Planting Area) **Excluding Recruits	F2	K	Total E8							
Average Percent Survival	75%	4%	22%							
Average Density (woody stem/acre)	3642.9	44.4	944.0							
Average Height (inches) ***not averaging in plots with none present	43.0	171.9	85.97							

Bold indicates Recruited or mature (non-planted) species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 8 (E8)

Species	Spring Survey Plot #7					Spring Survey Plot #8				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer rubrum</i>						1		<1	15	F
<i>Salix sp.</i>	4		20	68.5	F					
<i>Salix sp.</i>						21		77	38	G
<i>Acer negundo</i>										
Total Woody Stems	4	0				22	0			

Planting Zone Density

Original Planting Density F2 4840 shrubs/acre

Original Planting Density K 1210 shrubs/acre

20' Radius Circular Plots (K)= 0.03 acres = 36.3 shrubs/plot

10' Radius Circular Plots (F2)= 0.007 acres = 33.9 shrubs/plot

20' Radius Circular Plots (F2)= 0.03 acres = 145.2 shrubs/plot

Calculations (Average Per Plot) **Including Recruits	K					F2				
Average Percent Survival (Total observed stems per plot/Planting density per plot)	11%					65%				
Average Density (woody stem/acre)	133.3					3142.9				
Average Height (inches)	68.5					36.95				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits	K					F2				
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					62%				
Average Density (woody stem/acre)	0					3000.0				
Average Height (inches)	0					38				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited or mature (non-planted) species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 8 (E8)

Species	Fall Survey Plot #35 (No Woody Plants)					Fall Survey Plot #36 (No Woody Plants)				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer rubrum</i>										
<i>Salix sp.</i>										
<i>Salix sp.</i>										
<i>Acer negundo</i>										
Total Woody Stems	0	0				0	0			

Planting Zone Density

Original Planting Density F2 4840 shrubs/acre

Original Planting Density K 1210 shrubs/acre

20' Radius Circular Plots (K)= 0.03 acres = 36.3 shrubs/plot

10' Radius Circular Plots (F2)= 0.007 acres = 33.9 shrubs/plot

20' Radius Circular Plots (F2)= 0.03 acres = 145.2 shrubs/plot

Calculations (Average Per Plot) **Including Recruits	K					K				
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits	K					K				
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					0%				
Average Density (woody stem/acre)	0					0				
Average Height (inches)	0					0				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited or mature (non-planted) species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 8 (E8)

Species	Fall Survey Plot #37					Fall Survey Plot #38				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
Acer rubrum	5		<1	12.4	F	3		<1	12	G
Salix sp.										
Salix sp.	7		50	195.4	G	30		48	48	G
Acer negundo	1		<1	7	F					
Total Woody Stems	13	0				33	0			

Planting Zone Density

Original Planting Density F2 4840 shrubs/acre

Original Planting Density K 1210 shrubs/acre

20' Radius Circular Plots (K)= 0.03 acres = 36.3 shrubs/plot

10' Radius Circular Plots (F2)= 0.007 acres = 33.9 shrubs/plot

20' Radius Circular Plots (F2)= 0.03 acres = 145.2 shrubs/plot

Calculations (Average Per Plot) **Including Recruits	K					F2				
Average Percent Survival (Total observed stems per plot/Planting density per plot)	36%					97%				
Average Density (woody stem/acre)	433.3					4714.3				
Average Height (inches)	110.5					44.7				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits	K					F2				
Average Percent Survival (Total observed stems per plot/Planting density per plot)	22%					89%				
Average Density (woody stem/acre)	266.7					4286				
Average Height (inches)	171.9					48				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited or mature (non-planted) species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moverately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 9 (E9)

Species	Spring Survey Plot #42					Spring Survey Plot #43				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
Acer rubrum (seedling)										
Ulmus (seedlings)										
Betula nigra										
<i>Salix spp.</i>	2	0	5	47	F	13	0	10	42	F
Rosa multiflora										
Acer negundo										
Total Woody Stems	2	0				13	0			

Planting Zone Density

F1 live stakes 2784 shrubs/acre

10' Radius Circular Plots = 0.007 acres = 19.5 shrubs/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival	10%					67%				
Average Density (woody stem/acre)	285.7					1857				
Average Height (inches)	47					42				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival	24%									
Average Density (woody stem/acre)	666.7									
Average Height (inches) ***not averaging in plots with none present	44.9									

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival	10%					67%				
Average Density (woody stem/acre)	285.7					1857				
Average Height (inches)	47					42				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival	21%									
Average Density (woody stem/acre)	571.4									
Average Height (inches) ***not averaging in plots with none present	48.7									

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 9 (E9)

Species	Spring Survey Plot #44					Spring Survey Plot #45				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
Acer rubrum (seedling)	1	0	<1	12	F					
Ulmus (seedlings)										
Betula nigra	1	0	<1	21	P					
<i>Salix spp.</i>	8	0	25	70	F	2	0	1	41	P
Rosa multiflora										
Acer negundo										
Total Woody Stems	10	0				2	0			

Planting Zone Density

F1 live stakes 2784 shrubs/acre

10' Radius Circular Plots = 0.007 acres = 19.5 shrubs/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival	51%					10%				
Average Density (woody stem/acre)	1429					285.7				
Average Height (inches)	59.3					41				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival	41%					10%				
Average Density (woody stem/acre)	1143					285.7				
Average Height (inches)	70					41				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 9 (E9)

Species	Spring Survey Plot #46					Spring Survey Plot #47				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
Acer rubrum (seedling)										
Ulmus (seedlings)										
Betula nigra										
<i>Salix spp.</i>	7	0	15	52	F	1	0	1%	48	F
Rosa multiflora										
Acer negundo										
Total Woody Stems	7	0				1	0			

Planting Zone Density

F1 live stakes 2784 shrubs/acre

10' Radius Circular Plots = 0.007 acres = 19.5 shrubs/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival	36%					5%				
Average Density (woody stem/acre)	1000					142.9				
Average Height (inches)	52					48				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival	36%					5%				
Average Density (woody stem/acre)	1000					142.9				
Average Height (inches)	52					48				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 9 (E9)

Species	Fall Survey Plot #28					Fall Survey Plot #29				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
Acer rubrum (seedling)						1		<1	12	P
Ulmus (seedlings)						2		<1	26.5	P
Betula nigra										
<i>Salix spp.</i>	2		10%	46.5	G	4		15%	44	P
Rosa multiflora										
Acer negundo										
Total Woody Stems	2	0				7	0			

Planting Zone Density

F1 live stakes 2784 shrubs/acre

10' Radius Circular Plots = 0.007 acres = 19.5 shrubs/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival	10%					36%				
Average Density (woody stem/acre)	285.7					1000				
Average Height (inches)	46.5					34.43				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival	10%					21%				
Average Density (woody stem/acre)	285.7					571.4				
Average Height (inches)	46.5					44				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 9 (E9)

Species	Fall Survey Plot #30					Fall Survey Plot #31				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
Acer rubrum (seedling)										
Ulmus (seedlings)										
Betula nigra										
<i>Salix spp.</i>	3		7%	47	F	1		<1	41	P
Rosa multiflora						1		2%	38	P
Acer negundo										
Total Woody Stems	3	0				2	0			

Planting Zone Density

F1 live stakes 2784 shrubs/acre

10' Radius Circular Plots = 0.007 acres = 19.5 shrubs/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival	15%					10%				
Average Density (woody stem/acre)	428.6					285.7				
Average Height (inches)	47					39.5				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival	15%					5%				
Average Density (woody stem/acre)	428.6					142.9				
Average Height (inches)	47					41				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Enhancement Area 9 (E9)

Species	Fall Survey Plot #32					Fall Survey Plot #33				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
Acer rubrum (seedling)										
Ulmus (seedlings)										
Betula nigra										
<i>Salix spp.</i>	4		10%	55.8	F	1		10%	50	E
Rosa multiflora										
Acer negundo	1		<1	18	F	1		<1	18	P
Total Woody Stems	5	0				2	0			

Planting Zone Density

F1 live stakes 2784 shrubs/acre

10' Radius Circular Plots = 0.007 acres = 19.5 shrubs/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival	26%					10%				
Average Density (woody stem/acre)	714.3					285.7				
Average Height (inches)	48.24					34				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival	21%					5%				
Average Density (woody stem/acre)	571.4					142.9				
Average Height (inches)	55.8					50				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 1 (C1)

Species	Spring Survey Plot #26					Spring Survey Plot #27				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer rubrum</i>										
<i>Betula nigra</i>										
<i>Fraxinus pennsylvanica</i>										
<i>Plantanus occidentalis</i>										
<i>Quercus bicolor</i>	2	0	<1	42	G/P	1	0	<1	96	G
<i>Quercus palustris</i>	3	11	1	37	G	1	0	<1	66	G
Dead Stem										
Total Trees	5	11				2	0			
<i>Amorpha fruticosa</i>										
<i>Clethra alnifolia</i>										
<i>Cornus amomum</i>	1	0	<1	60	G	1	0	<1	42	G
<i>Rosa multiflora</i>										
<i>Vaccinium corymbosum</i>										
<i>Viburnum dentatum</i>										
Total Shrubs	1	0				1	0			
Total Woody Stems	6	11				3	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	23%					11%				
Average Density (woody stem/acre)	200					100				
Average Height (inches)	42.5					68				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival	35%									
Average Density (woody stem/acre)	305.6									
Average Height (inches) ***not averaging in plots with none present	58.4									

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	23%					11%				
Average Density (woody stem/acre)	200					100				
Average Height (inches)	42.5					68				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival	28%									
Average Density (woody stem/acre)	241.7									
Average Height (inches) ***not averaging in plots with none present	61.0									

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 1 (C1)

Species	Spring Survey Plot #28					Spring Survey Plot #29				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer rubrum</i>	1	0	<1	6	G					
<i>Betula nigra</i>						1	0	<1	36	G
<i>Fraxinus pennsylvanica</i>	1	0	<1	36	G					
<i>Plantanus occidentalis</i>	4	0	1	42	G					
<i>Quercus bicolor</i>	3	0	1	84	G	3	0	1	94	G
<i>Quercus palustris</i>	8	0	2	99	G	4	3	2	103.5	G
Dead Stem										
Total Trees	17	0				8	3			
<i>Amorpha fruticosa</i>	1	0	<1	78	G					
<i>Clethra alnifolia</i>										
<i>Cornus amomum</i>	1	0	<1	24	G					
<i>Rosa multiflora</i>										
<i>Vaccinium corymbosum</i>	3	0	<1	16	G					
<i>Viburnum dentatum</i>										
Total Shrubs	5	0				0	0			
Total Woody Stems	22	0				8	3			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	84%					31%				
Average Density (woody stem/acre)	733.3					266.7				
Average Height (inches)	63.62					91.5				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	76%					31%				
Average Density (woody stem/acre)	666.7					266.7				
Average Height (inches)	61.8					91.5				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 1 (C1)

Species	Spring Survey Plot #30					Spring Survey Plot #31				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer rubrum</i>	2	0	<1	10	G					
<i>Betula nigra</i>										
<i>Fraxinus pennsylvanica</i>	1	0	<1	36	G	1	0	<1	48	G
<i>Plantanus occidentalis</i>	1	0	<1	12	G					
<i>Quercus bicolor</i>	7	0	2	109	G	1	0	<1	60	G
<i>Quercus palustris</i>	4	0	2	108	G	7	0	2	94	G
Dead Stem										
Total Trees	15	0				9	0			
<i>Amorpha fruticosa</i>						1		<1	78	G
<i>Clethra alnifolia</i>	3	0	<1	22	G	1		<1	24	G
<i>Cornus amomum</i>	2	0	<1	30	G					
<i>Rosa multiflora</i>	1	0	<1	12	G					
<i>Vaccinium corymbosum</i>	1	0	<1	24	G	2		<1	48	G
<i>Viburnum dentatum</i>						1		<1	60	G
Total Shrubs	7	0				5	0			
Total Woody Stems	22	0				14	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	84%					53%				
Average Density (woody stem/acre)	733.3					466.7				
Average Height (inches)	64.8					73.14				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	72%					50%				
Average Density (woody stem/acre)	633.3					433.3				
Average Height (inches)	73.3					72.8				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 1 (C1)

Species	Fall Survey Plot #7					Fall Survey Plot #8				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer rubrum</i>										
<i>Betula nigra</i>										
<i>Fraxinus pennsylvanica</i>	2		1	44.5	P	2		<1	32	P
<i>Plantanus occidentalis</i>										
<i>Quercus bicolor</i>	2		1	51.5	F	1		<1	53	F
<i>Quercus palustris</i>	4		3	60.3	F	3		2	41.3	P
Dead Stem										
Total Trees	8	0				6	0			
<i>Amorpha fruticosa</i>										
<i>Clethra alnifolia</i>										
<i>Cornus amomum</i>										
<i>Rosa multiflora</i>										
<i>Vaccinium corymbosum</i>										
<i>Viburnum dentatum</i>										
Total Shrubs	0	0				0	0			
Total Woody Stems	8	0				6	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	31%					23%				
Average Density (woody stem/acre)	266.7					200				
Average Height (inches)	54.2					40.2				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	15%					11%				
Average Density (woody stem/acre)	133.3					100				
Average Height (inches)	48					39				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 1 (C1)

Species	Fall Survey Plot #9					Fall Survey Plot #10 (No Woody Plants)				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer rubrum</i>										
<i>Betula nigra</i>										
<i>Fraxinus pennsylvanica</i>	1		<1	51	P					
<i>Plantanus occidentalis</i>										
<i>Quercus bicolor</i>	2		2	65.5	G					
<i>Quercus palustris</i>	5		6	49.2	E					
Dead Stem										
Total Trees	8	0				0	0			
<i>Amorpha fruticosa</i>										
<i>Clethra alnifolia</i>										
<i>Cornus amomum</i>	1		<1	37	F					
<i>Rosa multiflora</i>										
<i>Vaccinium corymbosum</i>										
<i>Viburnum dentatum</i>										
Total Shrubs	1	0				0	0			
Total Woody Stems	9	0				0	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	34.3%					0%				
Average Density (woody stem/acre)	300					0				
Average Height (inches)	51.7					0				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	15.3%					0%				
Average Density (woody stem/acre)	133.3					0				
Average Height (inches)	54.75					0				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 1 (C1)

Species	Fall Survey Plot #11					Fall Survey Plot #12				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer rubrum</i>										
<i>Betula nigra</i>										
<i>Fraxinus pennsylvanica</i>	2		<1	36	P	1		<1	69	P
<i>Plantanus occidentalis</i>	1		<1	18	P					
<i>Quercus bicolor</i>	2		3	94	F					
<i>Quercus palustris</i>	3		2	26.3	F	2		<1	40.5	P
Dead Stem							1	<1	51	P
Total Trees	8	0				3	1			
<i>Amorpha fruticosa</i>										
<i>Clethra alnifolia</i>	1		<1	27	P					
<i>Cornus amomum</i>										
<i>Rosa multiflora</i>										
<i>Vaccinium corymbosum</i>										
<i>Viburnum dentatum</i>										
Total Shrubs	1	0				0	0			
Total Woody Stems	9	0				3	1			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	34%					11%				
Average Density (woody stem/acre)	300					100				
Average Height (inches)	42.66					50				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	23%					4%				
Average Density (woody stem/acre)	200					33.33				
Average Height (inches)	50.83					69				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 2 (C2)

Species	Spring Survey Plot #20					Spring Survey Plot #21				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
Acer rubrum (seedling)										
<i>Fraxinus pennsylvanica</i>	1	0	<1	48	P					
Fraxinus pennsylvanica (seedlings)										
<i>Nyssa sylvatica</i>	1	0	<1	36	G					
<i>Quercus bicolor</i>						1		1	120	G
<i>Quercus palustris</i>	5	0	2	45.6	P	1	1	1	156	G
<i>Platanus occidentalis</i>										
Ulmus sp. (seedlings)										
Betula nigra										
Total Trees	7	0				2	1			
Amorpha fruticosa										
<i>Clethra alnifolia</i>										
<i>Cornus amomum</i>										
<i>Vaccinium corymbosum</i>										
Total Shrubs	0	0				0	0			
Total Woody Stems	7	0				2	1			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	27%					8%				
Average Density (woody stem/acre)	233.3					66.7				
Average Height (inches)	44.6					138.0				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival	26%									
Average Density (woody stem/acre)	227.8									
Average Height (inches) ***not averaging in plots with none present	75.5									

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	27%					8%				
Average Density (woody stem/acre)	233.3					66.7				
Average Height (inches)	44.6					138.0				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival	23%									
Average Density (woody stem/acre)	202.8									
Average Height (inches) ***not averaging in plots with none present	79.1									

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 2 (C2)

Species	Spring Survey Plot #22					Spring Survey Plot #23				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
Acer rubrum (seedling)										
<i>Fraxinus pennsylvanica</i>	2	0	1	96	F	2	1	1	48	P
Fraxinus pennsylvanica (seedlings)										
<i>Nyssa sylvatica</i>										
<i>Quercus bicolor</i>	4	1	1	72	G					
<i>Quercus palustris</i>	2	0	1	144	G	4	0	2	70.5	F
<i>Platanus occidentalis</i>										
Ulmus sp. (seedlings)										
<i>Betula nigra</i>										
Total Trees	8	1				6	1			
Amorpha fruticosa										
<i>Clethra alnifolia</i>										
<i>Cornus amomum</i>	1	0	<1	48	G					
<i>Vaccinium corymbosum</i>						1	0	<1	42	G
Total Shrubs	1	0				1	0			
Total Woody Stems	9	1				7	1			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	34%					27%				
Average Density (woody stem/acre)	300.0					233.3				
Average Height (inches)	90.7					60.0				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	34%					27%				
Average Density (woody stem/acre)	300.0					233.3				
Average Height (inches)	90.7					60.0				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 2 (C2)

Species	Spring Survey Plot #24					Spring Survey Plot #25				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer rubrum</i> (seedling)						1	0	<1	12	F
<i>Fraxinus pennsylvanica</i>						1	0	<1	60	P
<i>Fraxinus pennsylvanica</i> (seedlings)										
<i>Nyssa sylvatica</i>										
<i>Quercus bicolor</i>	0	1	<1	96	G					
<i>Quercus palustris</i>	0	1	<1	60	G	3	0	1	100	G
<i>Platanus occidentalis</i>										
<i>Ulmus sp.</i> (seedlings)										
<i>Betula nigra</i>										
Total Trees	0	2				5	0			
<i>Amorpha fruticosa</i>						1	0	<1	72	G
<i>Clethra alnifolia</i>						1	0	<1	3	P
<i>Cornus amomum</i>										
<i>Vaccinium corymbosum</i>										
Total Shrubs	0	0				2	0			
Total Woody Stems	0	2				7	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					27%				
Average Density (woody stem/acre)	0.0					233.3				
Average Height (inches)	0.0					63.9				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					19%				
Average Density (woody stem/acre)	0.0					166.7				
Average Height (inches)	0.0					72.6				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 2 (C2)

Species	Fall Survey Plot #13 (No Woody Plants)					Fall Survey Plot #14				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
Acer rubrum (seedling)										
<i>Fraxinus pennsylvanica</i>						2		<1	58	P
Fraxinus pennsylvanica (seedlings)										
<i>Nyssa sylvatica</i>										
<i>Quercus bicolor</i>						3		2	76	F
<i>Quercus palustris</i>						9		10	128.8	E
<i>Platanus occidentalis</i>										
Ulmus sp. (seedlings)										
<i>Betula nigra</i>										
Total Trees	0	0				14	0			
Amorpha fruticosa						1		<1	12	P
<i>Clethra alnifolia</i>										
<i>Cornus amomum</i>										
<i>Vaccinium corymbosum</i>										
Total Shrubs	0	0				1	0			
Total Woody Stems	0	0				15	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					57%				
Average Density (woody stem/acre)	0.0					500.0				
Average Height (inches)	0.0					101.0				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	0%					57%				
Average Density (woody stem/acre)	0.0					500.0				
Average Height (inches)	0.0					101.0				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 2 (C2)

Species	Fall Survey Plot #15					Fall Survey Plot #16				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer rubrum</i> (seedling)										
<i>Fraxinus pennsylvanica</i>										
<i>Fraxinus pennsylvanica</i> (seedlings)										
<i>Nyssa sylvatica</i>										
<i>Quercus bicolor</i>	4		4	78.5	F	5		3	52	F
<i>Quercus palustris</i>	1		2	14	E	5		4	55	F
<i>Platanus occidentalis</i>										
<i>Ulmus</i> sp. (seedlings)	1		<1	18	F					
<i>Betula nigra</i>	1		1	144	F					
Total Trees	7	0				10	0			
<i>Amorpha fruticosa</i>										
<i>Clethra alnifolia</i>										
<i>Cornus amomum</i>										
<i>Vaccinium corymbosum</i>										
Total Shrubs	0	0				0	0			
Total Woody Stems	7	0				10	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	27%					38%				
Average Density (woody stem/acre)	233.3					333.3				
Average Height (inches)	70.0					53.5				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	19%					38%				
Average Density (woody stem/acre)	166.7					333.3				
Average Height (inches)	65.6					53.5				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 2 (C2)

Species	Fall Survey Plot #17					Fall Survey Plot #34				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer rubrum</i> (seedling)						1		<1	22	P
<i>Fraxinus pennsylvanica</i>						1		<1	56	F
<i>Fraxinus pennsylvanica</i> (seedlings)						2		<1	24.5	P
<i>Nyssa sylvatica</i>										
<i>Quercus bicolor</i>	2		1	57.5	P	2		3	108	G
<i>Quercus palustris</i>	2		2	66	F	2		5	132	G
<i>Platanus occidentalis</i>						1		5	168	E
<i>Ulmus sp.</i> (seedlings)						2		<1	24	P
<i>Betula nigra</i>										
Total Trees	4	0				11	0			
<i>Amorpha fruticosa</i>						3		1	58.7	P
<i>Clethra alnifolia</i>										
<i>Cornus amomum</i>										
<i>Vaccinium corymbosum</i>										
Total Shrubs	0	0				3	0			
Total Woody Stems	4	0				14	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	15%					53%				
Average Density (woody stem/acre)	133.3					466.7				
Average Height (inches)	61.8					71.4				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	15%					34%				
Average Density (woody stem/acre)	133.3					300.0				
Average Height (inches)	61.8					103.1				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 3 (C3)

Species	Spring Survey Plot #17					Spring Survey Plot #18				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Betula nigra</i>										
<i>Betula nigra</i> (seedlings)										
<i>Ulmus sp. (seedlings)</i>						8	0	2	8.5	G
<i>Acer negundo</i>	1	0	<1	12	P					
<i>Fraxinus pennsylvanica</i>	1	0	<1	8	G	3	0	1	25	P
<i>Fraxinus pennsylvanica</i>										
<i>Platanus occidentalis</i>	1	0	<1	84	G	1	0	<1	96	F
<i>Quercus bicolor</i>										
<i>Quercus phellos</i>										
<i>Quercus palustris</i>	6	0	2	70	G	7	1	2	69	G
<i>Salix sp.</i>						3	0	1	28	G
<i>Salix sp.</i>										
Total Trees	9	0				22	1			
<i>Clethra alnifolia</i>	1	0	<1	24	F					
<i>Amorpha fruticosa</i>										
Total Shrubs	1	0				0	0			
Total Woody Stems	10	0				22	1			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	38%					84%				
Average Density (woody stem/acre)	333.33					733.33				
Average Height (inches)	54.8					36.6				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival	355%									
Average Density (woody stem/acre)	3105.56									
Average Height (inches) ***not averaging in plots with none present	30.34									

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	31%					42%				
Average Density (woody stem/acre)	266.7					366.7				
Average Height (inches)	66					60.3				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival	38%									
Average Density (woody stem/acre)	333.36									
Average Height (inches) ***not averaging in plots with none present	51.97									

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 3 (C3)

Species	Spring Survey Plot #19					Fall Survey Plot #4				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Betula nigra</i>	1	0	<1	36	G					
<i>Betula nigra</i> (seedlings)						3			18	G
<i>Ulmus sp.</i> (seedlings)	1	0	<1	12	G	200		12	10	G
<i>Acer negundo</i>										
<i>Fraxinus pennsylvanica</i>										
<i>Fraxinus pennsylvanica</i>	3	0	<1	32	F	2		1	40	P
<i>Platanus occidentalis</i>										
<i>Quercus bicolor</i>										
<i>Quercus phellos</i>										
<i>Quercus palustris</i>	3	0	1	52	G	5		8	71.2	G
<i>Salix sp.</i>										
<i>Salix sp.</i>										
Total Trees	8	0				210	0			
<i>Clethra alnifolia</i>										
<i>Amorpha fruticosa</i>	1	0	<1	72	F					
Total Shrubs	1	0				0	0			
Total Woody Stems	9	0				210	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	34%					801%				
Average Density (woody stem/acre)	300					7000				
Average Height (inches)	41.2					11.86				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	31%					38%				
Average Density (woody stem/acre)	266.7					333.33				
Average Height (inches)	45					62.3				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Wetland Creation Area 3 (C3)

Species	Fall Survey Plot #5					Fall Survey Plot #6				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Betula nigra</i>										
<i>Betula nigra</i> (seedlings)	60		36	13	G					
<i>Ulmus sp.</i> (seedlings)	200		10	10	G	15		3	12	G
<i>Acer negundo</i>										
<i>Fraxinus pennsylvanica</i>										
<i>Fraxinus pennsylvanica</i>						8		3	18.8	P
<i>Platanus occidentalis</i>						3		2	51	F
<i>Quercus bicolor</i>	2		1	48	G					
<i>Quercus phellos</i>						1		<1	43	G
<i>Quercus palustris</i>	3		1	44.3	G	4		3	48	F
<i>Salix sp.</i>										
<i>Salix sp.</i>	10		8	96.6	G					
Total Trees	275	0				31	0			
<i>Clethra alnifolia</i>						2		1	22	F
<i>Amorpha fruticosa</i>										
Total Shrubs	0	0				2	0			
Total Woody Stems	275	0				33	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	1049%					126%				
Average Density (woody stem/acre)	9166.67					1100				
Average Height (inches)	14.5					23.1				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	19%					69%				
Average Density (woody stem/acre)	166.7					600				
Average Height (inches)	45.8					32.4				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival										
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present										

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Riparian Area 5 (A5)

Species	Spring Survey Plot #48					Fall Survey Plot #46				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer negundo</i>	4		1	18	F	1		<1	18	P
<i>Acer saccharinum</i>	1		3	600	G					
<i>Amelanchier canadensis</i>	1		<1	18	P					
<i>Betula nigra</i>	8		1	21	F					
<i>Fraxinus pennsylvanica</i>	5		2	28	F					
<i>Gleditsia triacanthos</i>						2		<1	11	F
<i>Platanus occidentalis</i>	1		4	600	F					
<i>Pyrus communis</i> (seedlings)	8		4	35	P	19		2	22.9	F
<i>Quercus palustris</i> (seedlings)						3		<1	10.3	P
<i>Ulmus sp.</i> (seedlings)						3		1	23	F
Total Trees	28	0				28	0			
<i>Rosa multiflora</i>	2	0	2	26	F	2		2	40	P
Total Shrubs	2	0				2	0			
Total Woody Stems	30	0				30	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot) **Including Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	114.4%					114.4%				
Average Density (woody stem/acre)	1000.0					1000.0				
Average Height (inches)	64.3					21.8				

Calculations (Average Per Planting Area) **Including Recruits										
Average Percent Survival	114.42%									
Average Density (woody stem/acre)	1000.0									
Average Height (inches) ***not averaging in plots with none present	43.1									

Calculations (Average Per Plot) **Excluding Recruits										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	34%					0%				
Average Density (woody stem/acre)	300					0				
Average Height (inches)	20.7					0				

Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival	17%									
Average Density (woody stem/acre)	150.00									
Average Height (inches) ***not averaging in plots with none present	10.35									

Note - Mature (not planted) canopy cover of *Acer saccharinum*, and *Platanus occidentalis* included in calculations for recruited species because trunks were within plot 48. Mature canopy of *Acer saccharinum*, *Quercus palustris*, *Acer rubrum*, and *Quercus rubra* not included in calculation for recruited species because trunks were not within plot 49.

Bold indicates Recruited species

E= Excellent (Plant is thriving and has little to no signs of herbivory)

G= Good (Plant is healthy and may have some herbivory)

F= Fair (Plant is moderately healthy and may have some moderate herbivory)

P= Poor (Plant is dying and/or has heavy herbivory)

Finderne Farm Vegetation Monitoring - 2012
Summary of Observed Woody Species
Riparian Area 1 (A1)

Species	Spring Survey Plot #49					Fall Survey Plot #45				
	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
<i>Acer saccharinum</i>	1		3	120	E					
<i>Quercus palustris</i>						1		<1	38	F
Dead stump		1	<1	26						
Total Trees	1	1				1	0			
<i>Amelanchier canadensis</i>	1		2	74	G					
<i>Sambucus canadensis</i>						1		1	78	G
Total Shrubs	1	0				1	0			
Total Woody Stems	2	1				2	0			

Planting Zone Density

Trees 8 feet OC

Shrubs 15 feet OC

Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre

20' Radius Circular Plots = 0.03 acres

Density Per Plot = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot

Calculations (Average Per Plot)										
Average Percent Survival (Total observed stems per plot/Planting density per plot)	7.60%					7.60%				
Average Density (woody stem/acre)	66.67					66.67				
Average Height (inches)	97.00					58				

Calculations (Average Per Planting Area)										
Average Percent Survival	7.60%									
Average Density (woody stem/acre)	66.67									
Average Height (inches) ***not averaging in plots with none present	77.5									

E= Excellent (Plant is thriving and has little to no signs of herbivory)

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Spring 2014 Survey Data Sheets

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[illegible]

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Field Team: MSKS	Sample Plot Number: E7-P4	Weather: cloudy 60s	Percent Areal Coverage: bare = 1%					
Circular Plot or Quadrat Plot (Circle one)	Date: 5/22/12	Dominant Cover Type: reed canary grass						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
reed canary grass	H				40			
mustard sp.	H				7			
lady's thumb	H				8			
japanese hops	H				3			
smart weed	H				24			
lesser celandine	H				6			
field bind weed	H				<1			
purple loosestrife	H				<1			
curly dock	H				1			
great water dock	H				5			
giant burdock	H				1			
mugwort	H				<1			S. altissimum
timble mustard	H				1			
ragweed (common)	H				<1			
jewel weed	H				<1			
poison hemlock	H				1			
Total Woody Stems:								

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS/KS	E8-PG	cloudy 60s	WRACK debris = 34%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	5/22/12							
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
red maple	WS	N	5		<1	4' 10" 12'	G, G, F, F	volunteer
willow sp.	WS	N	8		—	25'	E	canopy cover 50%
smart weed (polygonum sp.)	H				45			
arrow arum	H				<1			
sedge sp.	H				<1			(nut sedge)
jewel weed	H				<1			
arrowleaf tearthumb	H				<1			
money wort					10			
mustard sp.	H				1			
purple loosestrife	H				2			
mugwort	H				2			
rice cut grass	H				1			
bidens coronata	H				<1			tickseed sunflower (narrow leaf)
lady thumb	H				1			
bidens frondosa	H				<1			(wide leaf)
unidentified herb	H				<1			
		Total Woody Stems:						

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS KS	E5-P9	cloudy 60s	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	5/22/12	reed canary grass						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
reed canary grass	H				98			
green ash	WS	N	1		—	35'	E	20% tree canopy
indigo bush	WS	N	2		—	10' 9"	E, G	5% tree canopy
jewel weed (polygonum sp.)	H				<1			
smart weed	H				2			

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Field Team: MS/KS	Sample Plot Number: ES-P10	Weather: cloudy 60°	Percent Areal Coverage: bare ground = 20%					
Circular Plot or Quadrat Plot (Circle one) 20'	Date: 5/22/12	Dominant Cover Type:						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
reed canary grass	H				62			
lesser celandine	H				8			
cyperus sp.	H				1			
jewel weed	H				2			
moneywort	H				2			
river birch	WS	N	5		—	50'	E	38% canopy
japanese hops	H				1			
green ash	WS	12-Planted 10-Not Planted	See below	below	—	see below		18.5-Planted } canopy 18.5-Not planted }
stinging nettle	H				2			
smart weed	H				<1			
river birch seedling	WS	N	1		<1	12"	G	
green ash seedlings	WS	N	14		1			see below
								75% canopy total
		Total Woody Stems:						

Notes:

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS/KS Circular Plot or Quadrat Plot (Circle one) 20'	E6-P1Z	cloudy 60s	bare ground = 3%					
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
great water dock	H				40			
canada thistle	H				7			
japanese hops	H				30			
lesser celandine	H				10			
poison hemlock	H				2			
bitter dock	H				2			
common cocklebur	H				5			
stinging nettle	H				<1			
field mustard	H				<1			
Total Woody Stems:								

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Field Team: NS/KS	Sample Plot Number: E4-P14	Weather: cloudy 60s	Percent Areal Coverage: bare ground = 3%					
Circular Plot or Quadrat Plot (Circle one) 20'	Date: 5/22/12	Dominant Cover Type: lesser celandine						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
japanese hops	H				8			
lesser celandine	H				61			in flower
curly dock	H				1			
reed canary grass	H				5			
great water dock	H				3			
jewel weed	H				2			
smart weed	H				10			
willow sp. (canopy)	W	N	—	—	—	—	—	canopy = 5% trunks outside of plot
broad leaf dock	H				1			
lady thumb	H				2			
clear weed	H				2			
box elder (canopy)	W	N	—	—	—	—	—	canopy = 20% trunks outside of plot
japanese knotweed	H				1			
box elder maple seedlings	WS	N	100+		1	4-6"	G	under mature tree
								total canopy = 25%
		Total Woody Stems:						

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
Jim Kian	C3-P17	overcast 70s	bare ground = 4%					
Circular Plot or Quadrat Plot (Circle one) 20'								
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
pin oak	WS	Y	6		2	7' 6" - 7' 9"	G	
sycamore	WS	Y	1		<1	7'	G	
sweet pepper bush	WS	Y	1		<1	2'	F	
box elder	WS	N	1		<1	1'	P	
ladies thumb	H				25			
panicum vergatum	H				10			
soft rush	H				10			
carex sp.	H				2			
mugwort	H				10			
celandine (less)	H				30			
green ash	WS	N	1		<1	8"	G	
queen annes lace	H				1		-	
polygonum hydropiperoides	H				5			

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
Jim/Kiran	C3-P18	Sunny 70's	bare earth = 5					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	5/23/12	water pepper						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
queen annes lace	H				10			
pin oak	WS	Y	7	1	2	5'2", 8' 9'3", 5"	G	
american elm	WS	N	8		2	1'6", 1'1" 6"6", 8"	G	
willow sp.	WS	Y	3		1	2'3", 2'	G, G, F	
green ash	WS	N	3		1	2'2", 3'	P	Recruitment
sycamore (P. hydrophoroides)	WS	Y	1		<1	8"	F	Planted
water pepper	H				49			
ladies thumb	H				10			
soft rush	H				5			
sedge sp.	H				2			
(panicum vergatum)	H				10			
grass sp.	H				2			
swamp milk weed	H				1			
jewel weed	H							

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
Sun/Kiran	C2-P22	Sunny 70s	100					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	5/23/12	panicum						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
Swamp white oak	WS	Y	3	1	1	2', 9", 6"	G	
green ash	WS	Y	2		1	5', 11"	F, G	
pin oak	WS	Y	2		1	12', 12"	G	
silky dogwood	WS	Y	1		<1	4'	G	
Swamp white oak	WS	Y	1		<1	7'	G	
jewel weed	H				1			
greater burdock	H				<1			
panicum vegetation	H				95			
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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:						
J.M./Kiran	C2-P23	70's sunny							
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:							
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations	
green ash	WS	Y	2	1	1	5'3"	F,P		
pin oak	NS	Y	4		2	10' 5.5' 4' 4'	G,F,P,P G		
highbush blueberry	NS	Y	1		41	35'	G		
jewel weed	H				2				
panicum virgatum	#				95				
		Total Woody Stems:							

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
Jim/Kiran	C1-P28	Sunny 80s	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	5/23/12	panicum						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
swamp white oak	WS	Y	3		1	6.8, 7	G, G, G	
pin oak	WS	Y	8		2	10, 5.5, 10 11, 8, 9.5, 10	G, G, G G, G, G, G	
silky dogwood	WS	Y	1		<1	2	G	
green ash	WS	Y	1		<1	3	G	
sycamore	WS	Y	4		1	2.5, 4, 4 1	G, G, G G	
wilow sp.	WS	Y	1		<1	3	G	
highbush blueberry	WS	Y	3		<1	1.5, 1.5	G, G, G	
indigo bush	WS	N	1		<1	6.5	G	
red maple recruits	WS	N	1		<1	6"	G	
panicum virgatum					71			
soft rush					10			
sedge sp.					5			
greater burdock					1			
path rush					2			
goldenrod sp.					1			
ladies thumb					1			
water pepper					1			
Total Woody Stems:								

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milk weed

queen anne's lace

<1

<1

Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
Jim / Kiran	C1-P29	Sunny 80s	100					
Circular Plots or Quadrat Plot (Circle one)	Date: 5/23/12	Dominant Cover Type: reed canary grass						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
Pin oak	WS	Y	4	3	2	12, 4, 7.5"	G, G, G	
Swamp white oak	WS	Y	3		1	11"	G	
river birch	WS	Y	7		<1	10, 6.5, 7"	G, G, G	
willow sp.	WS	Y	1		<1	3	G	
water pepper	H				<1	3	G	/
jewel weed	H				<1			
box elder maple	WS	Y	1		<1	1	G	
ladies thumb	H				10			
reed canary grass	H				85			

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
Jim Kivan	C1-P30	sunny 80s	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	5/23/12	panicum						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
highbush blueberry	WS	Y	1		<1	2	G	
swamp white oak	WS	Y	7		2	7.5, 8.9, 11, 10, 10.8	G	
pin oak	WS	Y	4		2	4, 12, 15, 5	G	
silky dogwood	WS	Y	2		<1	2, 3	G	
multiflora rose	WS	N	1		<1	1	G	
red maple recruits	WS	N	2		<1	10"	G	
green ash	WS	Y	1		<1	3	G	
sycamore	WS	Y	1		<1	1	G	
sweet pepper bush	WS	Y	3		<1	1, 2, 2.5	G	
sedge sp.	H				10			
soft rush	H				26			
jewel weed	H				1			
ladies thumb	H				1			
path rush	H				1			
water pepper	H				2			
queen annes lace	H				1			
panicum virgatum	H				57			
Total Woody Stems:								

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS/KS	E3 - P32	overcast 60s	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
	5/24/12	polygonum sp.						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
purple loosestrife	H				15			old + dead stems
polygonum sp.	H				75			
arrowleaf tear thumb	H				2			
spike rush	H				1			
rice cut grass	H				5			
bidens exoniata	H				1			
solidago sp.	H				1			

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS (KS)	E3 - P33	overcast 60s	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
	5/24/12	money wort						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
soft rush	H				5			
purple loose strife	H				30			dead stems too
arrowleaf tear-thumb	H				5			
money wort	H				49			
polygonum sp.	H				1			
sedge sp. (3-way)	H				10			
Total Woody Stems:								

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[illegible]

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS/KS Circular Plot or Quadrat Plots (Circle one)	E-3 - P40 Date: 5/24/12	overcast 60s Dominant Cover Type: purple loosestrife	100%					
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
purple loose strife	H				58			
arrow leaf tearthumb	H				20			
polygonum sp.	H				15-			
ladies thumb	H				3			
soft rush	H				2			
unknown herb	H				2			
Total Woody Stems:								

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS 1125	E9-P43	overcast, 70s	100% cover					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
10'	5/24/12	reed canopy grass						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
mugwort	H				15			
reed canary grass	H				69			
willow spp.	WS	Y	13		10	64, 36, 46, 37, 29, 39, 25, 35, 36	F, F, F, F, F, F, F, F, F	38 F, 48 F, 38 F, 38 F, 40 F (measured in inches)
purple loose strife	H				1			
jewel weed	H				1			
grass sp.	H				3			
giant ragweed	H				<1			
poisoned hemlock	H				<1			
bed straw	H				<1			

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS/KS	E9-P44	overcast 70s	bare ground = 7%, covered by willow canopy					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
	5/24/12	reed canopy grass						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
reed canopy grass	H				70			
giant ragweed	H				5			
jewel weed	H				1			
purple loosestrife	H				4			
eupatorium sp.	H				4			
New York ironweed	H				4			
polygonum sp.	H				4			
river birch	WS	Y	1			21"	P	
willow spp.	WS	Y	8			80" 24" 75" 40" 63" 66" 10" 23"	G P F G P F F P F	22" ligustrum w/ shoots canopy = 25%
curly dock	H				2			
yellow rocket	H				2			
goldenrod sp.	H				2			
red maple	WS	N	1			12	F	seedling
cocklebur (common)	H				5			
stinging nettle	H				2			
mustard sp.	H				1			
cacex crinita	H				2			
Total Woody Stems:								

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS IKS	E9-P46	overcast 70s	bare ground = 10%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
10'	5/24/12	reed canary						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
reed canary grass	H				46			
jewel weed	H				3			
great water dock	H				2			
polygonum sp	H				1			
mugwort	H				2			
giant ragweed	H				3			
poison hemlock	H				15			
scupatorium sp.	H				1			
willow sp.	WS	Y	7		15	36, 52, 64 24, 60, 104 64	P F P F P	(measured in inches)
ladies thumb	H				1			
curly dock	H				1			
			Total Woody Stems:					

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Field Team: MS/KS	Sample Plot Number: E9-P47	Weather: Overcast 70s	Percent Areal Coverage:					
Circular Plot or Quadrat Plot (Circle one) 10'	Date: 5/24/12	Dominant Cover Type: Mugwort	bare ground / water = 5%					
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
mugwort	H				61			
grass sp.	H				10			
wild mustard	H				1			
Timothy grass	H				<1			
six eye daisy	H				1			
Willow sp	WS	Y	1		1	48"	F	
bindweed	H				<1			
reed canary grass	H				-20			
		Total Woody Stems:						

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Field Team: MS/KS	Sample Plot Number: A5 - P48	Weather: overcast 70s	Percent Areal Coverage: bare earth = 1					
Circular Plot or Quadrat Plot (Circle one) 20'	Date: 5/24/12	Dominant Cover Type: ground ivy						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
ground ivy	H				62			
greater burdock	H				5			
stinging nettle	H				2			
mugwort	H				5			
poison hemlock	H				21			
pear tree	WS	N	8		4	36, 70, 55 21, 17, 26, 18 36	G, F, F, P, P, P	inches
green ash	WS	N	5		2	34, 27, 30 26, 23	G, P, F, P, G	inches
river birch	WS	Y	8		1	24, 22, 26 12, 24, 15, 18 18	F, F, F, P, G	inches
box elder maple	WS	N	4		1	22, 12, 18, 20	F, F, F, P	inches
multiflora rose	WS	N	2		2	16, 32	F, G	
sycamore (mature)	WS	N	1		4	50+	G	5' diameter
Amelanchier	WS	Y	1		21	18"	P	
canadensis	WS	N	1		3	50+	G	5' diameter
silver maple (mature)	WS	N	1		5	40-50"		
unknown herb	H				2			
grass sp.	H							30% total canopy cover
		Total Woody Stems:						

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
WS 1 KS	A1-P49	overcast 70s	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20	5/24/12	mugwort						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
mugwort	H				57			
a. canadensis	WS	Y			-	74"	G	Canopy ~ 2%
silver maple	WS	Y			-	10'	E	Canopy ~ 3%
unidentified herb	H				3			
poison hemlock	H				1			
polygonum sp.	H				1			
jewel weed	H				<1			
goldenrod	H				3			
solidago sp.	H				<1			
japanese knotweed	H				39			
reed canary grass	H				<1			
great water dock	H				<1			
ladies thumb	H				<1			
bind weed	H				<1			
curly dock	H				1			
greater burdock	H				<1			
wild mustard	H				<1			
dead stump	WS	Y		1	<1	20"		
Total Woody Stems:								

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85-110
90-110

Notes:

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS/KS	EC1-P53	overcast 70s	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	5/24/12	reed canopy / wild mustard						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
European stick seed	H				8			tiny purple/blue flowers
reed canopy grass	H				28			
soft rush	H				10			
ladies thumb	H				3			
giant ragweed	H				3			
Bidens coronata	H				2			
wild mustard	H				27			
polygonum sp.	H				10			
halbert leaf tear thumb	H				2			
arrow leaf tear thumb	H				3			
jewel weed	H				<1			
swamp milk weed	H				<1			
sedge sp (unknown)	H				1			
common bone set	H				<1			
path rush	H				2			
red maple	WS	N	1		<1	8"	P	
Total Woody Stems:								

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Fall 2014 Survey Data Sheets

[illegible]

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Field Team: MSKS	Sample Plot Number: E7-P3	Weather: Sunny 60	Percent Areal Coverage: 100%					
Circular Plot or Quadrat Plot (Circle one) 20	Date: 10/16/12	Dominant Cover Type: reed canary grass						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
reed canary grass	H				70			
polygonum hydropiperoides	H				5			
purple loosestrife	H				10			
gramineae	H				5			
polygonum pennsylvanicum	H				3			
pilewort	H				<1			
White heath aster	H				<1			
Swamp milkweed	H				1			herbivory?
dogwood (silky)	WS	Y			<1	24"	P	
solidago sp.	H				<1			
stinging nettle	H				2	10'	G	
swamp white oak	WS	Y			2			
dead stem (dogwood?)	WS	Y		1	<1	48"	P	
Total Woody Stems:								

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Field Team: MSLKS	Sample Plot Number: C3-P4	Weather: Sunny 60s	Percent Areal Coverage: 100%.					
Circular Plot or Quadrat Plot (Circle one) 20'	Date: 10/16/12	Dominant Cover Type: mugwort						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
mugwort	H				30			
white heath aster	H				12			
purple loosestrife	H				21			
bidens coronata	H				5			
(setaria faberii)	H				21			
fox tail grass	H				1			
reed canary grass	H				2			
panicum virgatum	H							
pin oak	WS	Y	5		8	10' 30" 6' 6" 70"	F G G	
setaria glauca	H				1			
barnyard grass	H				21			
solidago rugosa	H				1			
carex spp.	H				2			
polygonum sp.	H				2			
river birch seedlings	WS	N	3		1	18"	G	
elm seedlings	WS	N	200+		12	10"	G	
fragaria (strawberry)	H				2			
common cocklebur	H				1			
agrostis sp.	H				5			
soft rush	H				1			
Total Woody Stems:								

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green ash WS Y 2
black eyed susan H
horse nettle H
swamp milk weed H
40" 40" P P

Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
ms / ks	C3 - P5	Sunny 60s	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20	10/16/12	river birch / mugwort						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
mugwort	H				20			
setaria faberii	H				1			
river birch	WS	N	1st till (out of camp) ~60		36	12.5' 25" 20" 48" 80" 9"	G	ave 13'
willow sp.	WS	N	1st till 10		8	3.7' 12' 8" 60" 75' 11" 75" 9' 7.5"	G	
gramineae	H				2			
purple loosestrife	H				2			
white heath aster	H				10			
elm seedlings	WS	N	200+		10	10"	G	
solidago rigida	H				1			
barnyard grass	H				4			
pin oak	WS	Y	" (3)		1	58" 40" 33"	G G	
swamp white oak	WS	Y	" (2)		1	58" 38"	G G	
bidens sp.	H				2			
reed canary grass	H				2			

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS/KS	C3 - PG	Sunny 60s	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	10/16/12	mugwort						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
mugwort	H				42			
white heath aster	H				20			
bidens coronata	H				4			
panicum virginicum	H				8			
polygonum sp (dead)	H				2			
soft rush	H				2			juncus effusus
swamp milkweed	H				1			
barnyard grass	H				<1			
solidago rigosa	H				1			
purple loosestrife	H				1			
horse nettle	H				1			
black eyed Susan (dead)	H				<1			
pin oak	WS	Y	4		3	30" 40" 50" 60"	G F F G	some herbivory
arrowleaf tearthumb	H				<1			
carex lupulina	H				2			
carex sp	H				2			
green ash	WS	Y	8		3	18" 22" 18" 30" 14" 15" 15" 18"	P P P F P P P	
elm sp.	WS	N	15		3	12"	G	
Total Woody Stems:								

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Sycamore

Sweet pepper bush

Willow oak

2 30" 78" 39" F, G, F
1 24" 20" F, F, P
1 43" G

Y Y Y
WS WS WS
3 2 1

Field Team: MSKS	Sample Plot Number: C1 - P7	Weather: sunny 60	Percent Areal Coverage: 100%					
Circular Plot or Quadrat Plot (Circle one)	Date: 10/16/12	Dominant Cover Type: reed canopy grass						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
reed canary grass	H				67			
mugwort	H				20			
green ash	WS	Y	2		1	53" 36"	VP, P	
purple loosestrife	H				1			
pin oak	WS	Y	4		3	8' 60" 48" 37"	F + F F	
gramineae	H				5			
Swamp white oak	WS	Y	2		1	55" 48"	F F	
Solidago gigantea	H				<1			
white heath aster	H				<1			
carex lurida	H				<1			
blue vervain	H				<1			

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G+ = Excellent (Plant is thriving and has little to no signs of herbivory)

G = Good (Plant is healthy and may have some herbivory)
F = Fair (Plant is moderately healthy and may have moderate herbivory)

F = Fall (Flatt is moderately healthy and may have)
P = Poor (Plant is dying and/or has heavy herbivory)

[illegible]

Notes:

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS ILS	C1-P11	Sunny 60	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	10/16/12	reed canary grass						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
panicum virgatum	H				20			
reed canary grass	H				66			
swamp milkweed	H				3			
white heath aster	H				1			
carex sp.	H				<1	18"	P	(stump)
sycamore	WS	Y	1		<1	13' 34" 27"	E P F	
pin oak	WS	Y	3		2	32" 40"	P P	(nearly dead)
green ash	WS	Y	2		<1			
stinging nettle	H				2			
carex lurida	H				<1	27"	P	
sweet pepper bush	WS	Y	1		<1	56" 11'	P E	herbivory
swamp white oak	WS	Y	2		3			
soft rush	H				1			

Notes:

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back rub observed on tree sp. near plot

[illegible]

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[illegible]

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[illegible]

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS/KS	E3-P20	sunny 60	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
	10/17/12	cynops esculentes						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
Cynops esculentes	H				65			
water parascene	H				15			
stellaria sp.	H				20			
Total Woody Stems:								

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Field Team: MS KS	Sample Plot Number: E9 - P28	Weather: sunny 60s	Percent Areal Coverage: 100%					
Circular Plot or Quadrat Plot (Circle one) 10'	Date: 10/17/12	Dominant Cover Type: reed canary grass						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
reed canary grass	H				46			
mugwort	H				30			
stinging nettle	H				8			
black mustard	H				<1			DEAD
giant ragweed	H				<1			
willow	WS	Y	2		16	152 31	DE	
white heath aster	H				5			

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Field Team: MS/KS	Sample Plot Number: E9-P32	Weather: Sunny 60s	Percent Areal Coverage: 100					
Circular Plot or Quadrat Plot (Circle one) 10	Date: 10/17/12	Dominant Cover Type: mugwort / reed canary grass						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
mugwort	H				30			
reed canary grass	H				30			
poison hemlock	H				2			
willow spp.	WS	Y	4		10	64" 56" 48"	F P P	Sim other root w/ haps
japanese hops	H				20			
polygonum pennsylvanicum	H				2			
white heath astor	H				2			
polygonum hydropiperoides	H				2			
box elder maple seedling	WS	N	1		<1	18"	F	
black mustard	H				<1			
bidens coronata	H				<1			
violet sp.	H				<1			

Notes:

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS KS	C2-P34	sunny 60s	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20	10/17/12	panicum						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
indigo bush (A. latifolia)	WS	N	3		1	43" 67"	P P	
swamp white oak	WS	Y	2		3	60" 13'	F E	
NY ironweed	H				<1			
arthroxan hispidus	H				2			
stinging nettle	H				2			
reed canary grass	H				5			
panicum virginicum	H				70			
polygonum sp.	H				1			
sycamore	WS	Y	1		5	14'	E	
swamp milk weed	H				1			
elm seedling	WS	N	2		<1	24" 24"	P P	
green ash seedlings	WS	N	2		<1	17" 32"	P P	
Carex vulpina	H				<1			
deer tongue grass	H				1			
path rush	H				1			herbivory
red maple seedling	WS	N	1		<1	22"	P	
green ash	WS	Y	1		<1	50"	F	
Total Woody Stems:								

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pin oak WS Y 2
 5 84" 15' G E

[illegible]

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[illegible]

Field Team: MS KS	Sample Plot Number: E8-P38	Weather: sunny 60s	Percent Areal Coverage: 100%					
Circular Plot or Quadrat Plot (Circle one) 10'	Date: 10/17/12	Dominant Cover Type: willow						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
willow	WS	Y	30		48	48"	G	
solidago altissima	H				25			
astor sp.	H				10			
purple loosestrife	H				<1			
joe pye weed (sweet)	H				3			eupatorium purpureum
carex intumescens	H				3			
carex spp.	H				5			(3 way sedge?)
soft rush	H				5			
red maple seedlings	WS	N	3		<1	12"	G	
NY aster	H				<1			
	</							

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS KS	E7-P39	Sunny 60s	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	10/17/12	mugwort						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
mugwort	H				69			
panicum virginicum	H				10			
white heath aster	H				5			
pin oak	WS	Y	3		2	8' 5"	P F	
ground ivy	H				3			
black gum	WS	Y	2		1	32" 24"	P P	
goldenrod (altissima)	H				5			
red maple seedling	WS	N	6		1	18" 14" 12" 14"	P P P P	
plantago lanceolata	H				<1	18"	P	/
silly dog wood	WS	Y	1		<1			
sycamore	WS	Y	1		<1	65"	P	

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P = Poor (Plant is dying and/or has heavy herbivory)

[illegible]

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MSLKs	ECL-P41	sunny 60%	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	10/18/12	reed canary grass / white bristle aster						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
reed canary grass	H				40			
white bristle aster	H				39			
NY ironweed	H				5			
purple loosestrife	H				1			
swamp white oak	WS	Y	1		<1			newbery
hemp dogbane	H				<1			
sneeze weed	H				3			
pin oak	WS	Y	2		<1	29" wood	P F	
northern bugleweed	H				1			
wild mint	H				1			
solidago sp.	H				2			
soft rush	H				1			
green ash	WS	Y	1		<1	40"	F	
Carex vulpanoidea					5			

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS 1KS	EC1-P42	Sunny 60s	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	10/18/12	reed canopy grass						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
reed canopy grass	H				86			
polygonum pennsylvanicum	H				2			
NY ironweed	H				2			
white heath aster	H				2			
arrowleaf tearthumb	H				1			
gramineae sp.	H				2			
eupatorium purpureum	H				41			
polygonum hydropiperoides	H				5			

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS 1K5	EC1 - p44	Sunny 60's	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	10/18/12	reed canopy grass						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
<i>polygonum pennsylvanicum</i>	H				5			
<i>bidens coronata</i>	H				10			
reed canopy grass	H				59			
arrow leaf tear thumb	H				1			
purple loosestrife	H				20			
<i>arthrum hispidus</i>	H				1			
soft rush	H				2			
<i>polygonum hydropiperoides</i>	H				1			
blue vervain	H				1			
swamp milk weed	H				21			
Total Woody Stems:								

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS (KS)	A1-P45	Sunny 60s	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	10/18/12	mugwort						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
mugwort	H				89			
japanese hops	H				5			
polygonum pennsylvanicum	H				2			
sambucas canadensis	NS	Y	1		1	6.5'	G	
stinging nettle	H				1			
black mustard	H				1			
pin oak	WS	Y	1		<1	38"	F	covered by mugwort
unidentified seedling #2	H				1			

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MSKS	A5-P46	Sunny 60s	bare earth = 15%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20	10/18/12	ground ivy						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
stinging nettle	H				20			
giant burdock	H				5			
ground ivy	H				30			
polygonum hydropiper	H				5			
polygonum hydropiperoides	H				5			
stilt grass (japanese)	H				1			
giant rag weed	H				2			
poison hemlock	H				1			
bidens frondosa	H				<1			
pin oak	WS	N	3		<1	9"	P	
box elder maple	WS	N	1		<1	11"	P	
white snake root	H				1	18"		
elm sp	WS	N	3		1	20"		
pear seedlings	WS	N	19		2	24"		
white vervain	H				1	24"		
multiflora rose	WS	N	2		2	24"		
carex intemgens	H				1	24"		
aster cordifolius	H				1	24"		
Total Woody Stems:		2		canopy		11"		F

Notes: locust none

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silver maple

pin oak

red maple

red oak

mature canopy cover of 80%.

Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS/KS	E5-P47	sunny 60s	100%					
Circular Plots Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	10/18/12	Polygonum spp.						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
Polygonum spp.	H				73			dead: appears to be dominated by pencilvine.cwm
purple loosestrife	H				10			
horse nettle	H				3			
elm seedling	WS	N	9		1	19" 12" 6" 13" 15" 14" 10" 9" 14"	F	
reed canary grass	H				5			
river birch	WS	N	2		1	36" 36"	F	
green ash	WS	N	1		<1	12"	F	
pile wort	H				1			
common cocklebur	H				1			
black mustard	H				1			
bidens coronata	H				1			
mugwort	H				2			

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Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS KS	E5 - P48	Sunny 60s	bare ground = 35%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	10/18/12	reed canopy / green ash						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
green ash	WS	N	(51)		80%	25'	F	
pear	WS	N	1		<1	44"	F	
pin oak	WS	N	1		<1	9"	F	
pin oak	WS	Y	2		1	30" 31"	G	
reed canopy grass	H				35			
Carex sp.	H				1			
Polygonum spp.	H				3			

Notes:

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 F = Fair (Plant is moderately healthy and may have moderate herbivory)
 P = Poor (Plant is dying and/or has heavy herbivory)

Canopy = 80% green ash

[illegible]

Notes:

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G = Good (Plant is healthy and may have some herbivory)
F = Fair (Plant is moderately healthy and may have moderate herbivory)
P = Poor (Plant is dying and/or has heavy herbivory)

Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS/KS	F4-PSO	sunny 60,	100					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	10/18/12	japanese hops						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
japanese hops	H				61			
Weed canary grass	H				10			
polygonum hydropiperoides	H				5			
poison hemlock	H				5			
bidens coronata	H				1			
stinging nettle	H				10			
polygonum pennsylvanicum	H				5			
giant burdock	H				2			
white snake root	H				1			
							</	

Notes:

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[illegible]

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[illegible]

Notes:

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 P = Poor (Plant is dying and/or has heavy herbivory)

Field Team: MS/KS		Sample Plot Number: E2-P53	Weather: Sunny 70		Percent Areal Coverage: 100%			
Circular Plot or Quadrat Plot (Circle one)		Date: 10/18/12	Dominant Cover Type:					
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
indigo bush <i>A. foetida</i>	WS	N	2		10	8' 9"	G	
reed canary grass	H				27			
white heath aster	H				20			
purple loosestrife	H				20			
pile wort	H				1			
arthraen hypsoidis	H				1			
N7 ironweed	H				1			
polygonum pennsylvanicum	H				3			
arrowleaf tear thumb	H				2			
wild mint	H				1			
northern bugleweed	H				1			
solidago rugosa	H				2			
soft rush	H				2			
button bush	WS	Y	2		1	57" 48"	F, G	
blue vervain	H				1			
carex vulpinoidea	H				5			
timothy grass	H				2			
		Total Woody Stems:						

Notes:

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F = Fair (Plant is moderately healthy and may have moderate herbivory)

P = Poor (Plant is dying and/or has heavy herbivory)

Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MS/KS	E2-P54	Sunny 70s	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	10/18/12	reed canary						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
speckled alder	WS	Y	1		<1	46"	P	
indigo bush	WS	N	1		5	8.5'	G	
purple loosestrife	H				10			
reed canary grass	H				66			
pile wort	H				3			
polygonum pennsylvanicum	H				2			
arrowleaf tearthumb	H				2			
polygonum hydropiper	H				2			
swamp milkweed	H				<1			
arthraen hysopidis	H				5			
soft rush	H				2			
blue vervain	H				<1			
white heath aster	H				2			
dead stem (unk)	WS	?		1	<1	58"		
Total Woody Stems:								

Notes:

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F = Fair (Plant is moderately healthy and may have moderate herbivory)

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[illegible]

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F = Fair (Plant is moderately healthy and may have moderate herbivory)
P = Poor (Plant is dying and/or has heavy herbivory)

Field Team:	Sample Plot Number:	Weather:	Percent Areal Coverage:					
MSTKS	E2-PS6	Sunny 70's	100%					
Circular Plot or Quadrat Plot (Circle one)	Date:	Dominant Cover Type:						
20'	10/18/12	reed canary grass						
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
reed canary grass	H				68			
purple loosestrife	H				7-			
arrow leaf tear thumb	H				5-			
butter bush	WS	Y	2		1	69" 78"	P F	buck rub buck rub
polygonum pennsylvanicum	H				5			
narrowleaf cattail	H				5			
althaea hispida	H				5			
Carex sp.	H				2			
soft rush	H				1			
willow sp	WS	Y	1		<1	48"	F	
dead stem	WS	Y	1		<1	52"		

Notes:

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[illegible]

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[illegible]

Notes:

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E = Excellent (Plant is thriving and has little to no signs of stress)
G = Good (Plant is healthy and may have some herbivory)

F = Fair (Plant is moderately healthy and may have moderate herbivory)

P = Poor (Plant is dying and/or has heavy herbivory)

Appendix D

Photograph Logs (Spring, Fall, and Coordinates)

2012 Spring Photo Log



Photo 1 facing north (N) of planting area E7 plot P1.



Photo 2 facing north (N) of planting area E7 plot P2.



Photo 3 facing north (N) of planting area E7 plot P3.



Photo 4 facing south (S) of planting area E7 plot P4.



Photo 5 facing south (S) of planting area E8 plot P5.



Photo 6 facing south (S) of planting area E8 plot P6



Photo 7 facing north (N) of planting area E8 plot P7.



Photo 8 facing northeast (NE) of planting area E5 plot P9.



Photo 9 facing west (W) of planting area E5 plot P10.



Photo 10 facing northwest (NW) of planting area E6 plot P11.



Photo 11 facing northwest (NW) of planting area E6 plot P12.



Photo 12 facing southwest (SW) of planting area E4 plot P13.



Photo 13 facing north (N) of planting area E4 plot P14.



Photo 14 facing north (N) of planting area E8 plot P8.



Photo 15 facing west (W) of planting area E1 plot P15.



Photo 16 facing southwest (SW) of planting area E1 plot P16.



Photo 17 facing south (S) of planting area C3 plot P17.



Photo 18 facing west (W) of planting area C3 plot P18.



Photo 19 facing west (W) of planting area C3 plot P19.



Photo 20 facing east (E) of planting area C2 plot P20.



Photo 21 facing northeast (NE) of planting area C2 plot P21.



Photo 22 facing south (S) of planting area C2 plot P22.



Photo 23 facing northwest (NW) of planting area C2 plot P23.



Photo 24 facing northeast (NE) of planting area C2 plot P24.



Photo 25 facing north (N) of planting area C2 plot P25.



Photo 26 facing southeast (SE) of planting area C1 plot P26.



Photo 27 facing northeast (NE) of planting area C1 plot P27.



Photo 28 facing northwest (NW) of planting area C1 plot P28.



Photo 29 facing southwest (SW) of planting area C1 plot P29.



Photo 30 facing north (N) of planting area C1 plot P30.



Photo 31 facing east (E) of planting area C1 plot P31.



Photo 32 facing southeast (SE) of planting area E3 plot P32.



Photo 33 facing southeast (SE) of planting area E3 plot P33.



Photo 34 facing north northeast (NNE) of planting area E3 plot P34.



Photo 35 facing northwest (NW) of planting area E3 plot P35.

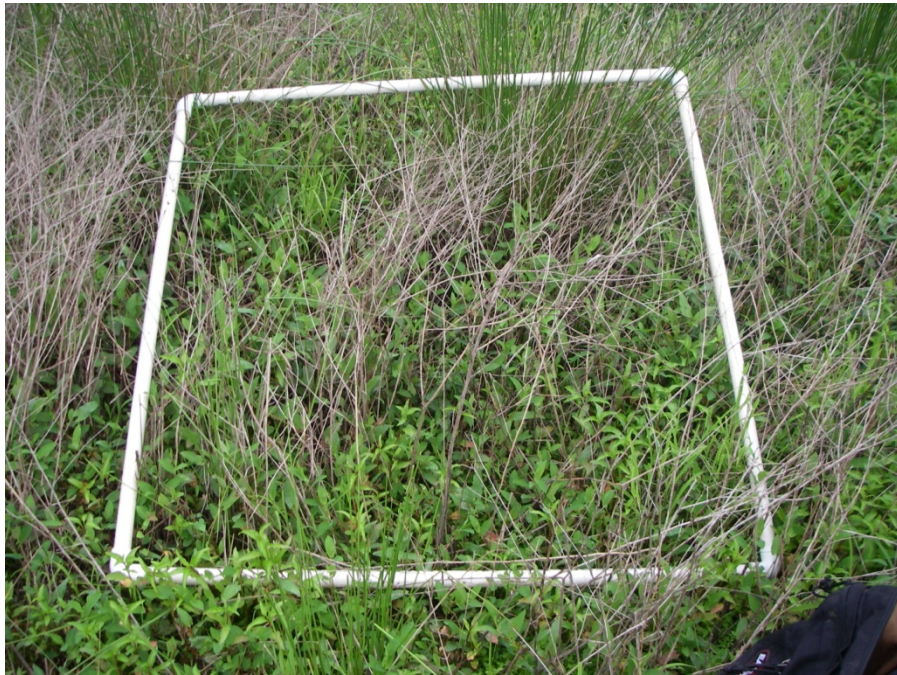


Photo 36 facing north (N) of planting area E3 plot P36.



Photo 37 facing northwest (NW) of planting area E3 plot P37.



Photo 38 facing south (S) of planting area E3 plot P38.



Photo 39 facing west (W) of planting area E3 plot P39.



Photo 40 facing south (S) of planting area E3 plot P40.



Photo 41 facing east (E) of planting area E3 plot P41.



Photo 42 facing south (S) of planting area E9 plot P42.



Photo 43 facing south (S) of planting area E9 plot P43.



Photo 44 facing north (N) of planting area E9 plot P44.



Photo 45 facing northwest (NW) of planting area E9 plot P45.



Photo 46 facing south (S) of planting area E9 plot P46.



Photo 47 facing south (S) of planting area E9 plot P47.



Photo 48 facing west (W) of planting area A5 plot P48.



Photo 49 facing southeast (SE) of planting area A1 plot P49.



Photo 50 facing west (W) of planting area EC1 plot P50.



Photo 51 facing west (W) of planting area EC1 plot P51.



Photo 52 facing northeast (NE) of planting area EC1 plot P52.



Photo 53 facing southeast (SE) of planting area EC1 plot P53.



Photo 54 facing northeast (NE) of planting area EC1 plot P54.



Photo 55 facing northeast (NE) of planting area E2 plot P55.



Photo 56 facing northeast (NE) of planting area E2 plot P56.



Photo 57 facing west (W) of planting area E2 plot P57.



Photo 58 facing east southeast (ESE) of planting area E2 plot P58.

2012 Fall Photo Log



Photo 1 facing southwest (SW) of planting area E3 plot P18.



Photo 2 facing east northeast (ENE) of planting area E3 plot P19.



Photo 3 facing north (N) of planting area E3 plot P20.



Photo 4 facing west (W) of planting area E3 plot P21.



Photo 5 facing north (N) of planting area E3 plot P22.

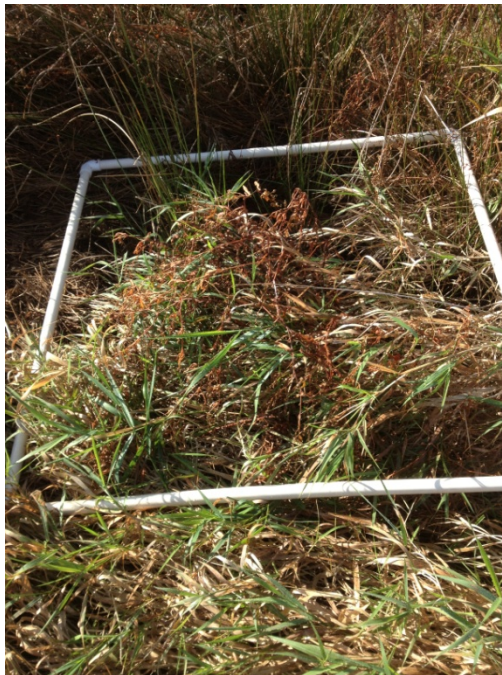


Photo 6 facing southwest (SW) of planting area E3 plot P23.



Photo 7 facing north northeast (NNE) of planting area E3 plot P24.



Photo 8 facing west (W) of planting area E3 plot P25.



Photo 9 facing southeast (SE) of planting area E3 plot P26.



Photo 10 facing southeast (SE) of planting area E3 plot P27.



Photo 11 facing southwest (SW) of planting area E9 plot P28.



Photo 12 facing southwest (SW) of planting area E9 plot P29.



Photo 13 facing east (E) of planting area E9 plot P30.



Photo 14 facing southwest (SW) of planting area E9 plot P31.



Photo 15 facing northeast (NE) of planting area E9 plot P32.



Photo 16 facing northeast (NE) of planting area E9 plot P33.



Photo 17 facing south (S) of planting area C2 plot P34.



Photo 18 facing north northeast (NNE) of planting area E8 plot P35.



Photo 19 facing north (N) of planting area E8 of plot P36.



Photo 20 facing southwest (SW) of planting area E8 plot P37.



Photo 21 facing south (S) of planting area E8 plot P38.



Photo 22 facing northeast (NE) of planting area E7 plot P39.



Photo 23 facing northeast of planting area EC1 plot P40.



Photo 24 facing southwest (SW) of planting area EC1 plot P41.



Photo 25 facing east (E) of planting area EC1 plot P42.



Photo 26 facing northeast (NE) of planting area EC1 plot P43.



Photo 27 facing east (E) of planting area EC1 plot P44.



Photo 28 facing south (S) of planting area A1 plot P45.



Photo 29 facing northeast (NE) of planting area A5 plot P46.



Photo 30 facing east (E) of planting area E5 plot P47.



Photo 31 facing north (N) of planting area E5 plot P48.



Photo 32 facing north (N) of planting area E4 plot P49.



Photo 33 facing northwest (NW) of planting area E4 plot P50.



Photo 34 facing west (W) of planting area E6 plot P51.



Photo 35 facing southwest (SW) of planting area E6 plot P52.



Photo 36 facing northeast (NE) of planting area E2 plot P53.



Photo 37 facing north (N) of planting area E2 plot P54.



Photo 38 facing northeast (NE) of planting area E2 plot P55.



Photo 39 facing north (N) of planting area E2 plot P56.



Photo 40 facing west northwest (WNW) of planting area E1 plot P57.



Photo 41 facing west northwest (WNW) of planting area E1 plot P58.



Photo 42 facing northwest (NW) of planting area C1 plot P12.



Photo 43 facing east (E) of planting area C1 plot P11.



Photo 44 facing southeast (SE) of planting area C1 plot P10.



Photo 45 facing east southeast (ESE) of planting area C1 plot P9.



Photo 46 facing north (N) of planting area C1 plot P8.



Photo 47 facing northwest (NW) of planting area C1 plot P7.



Photo 48 facing north (N) of planting area E7 plot P1.



Photo 49 facing southeast (SE) of planting area E7 plot P2.



Photo 50 facing east (E) of planting area E7 plot P3.



Photo 51 facing northeast (NE) of planting area C3 plot P6.



Photo 52 facing south (S) of planting area C3 plot P5.



Photo 53 facing northeast (NE) of planting area C3 plot P4.



Photo 54 facing northeast (NE) of planting area C2 plot P13.



Photo 55 facing east (E) of planting area C2 plot P14.



Photo 56 facing north (N) of planting area C2 plot P15.



Photo 57 facing east (E) of planting area C2 plot P16.



Photo 58 facing south (S) of planting area C2 plot P17.

Photo Coordinates

2012 Vegetation Plot/Photo Locations

2012 Spring Survey		
Location Description	Easting	Northing
E7-P1	468102.405	626068.629
E7-P2	468164.678	625995.32
E7-P3	467938.652	626205.743
E7-P4	467951.704	626150.573
E8-P5	468027.55	626426.868
E8-P6	467900.395	626482.031
E8-P7	467858.814	626358.22
E8-P8	467862.918	626640.242
E5-P9	467609.854	625951.909
E5-P10	467629.371	625886.086
E6-P11	467891.418	625767.876
E6-P12	467790.086	625709.669
E4-P13	467307.21	625592.377
E4-P14	467407.056	625590.036
E1-P15	465767.364	628175.753
E1-P16	465639.846	628230.159
C3-P17	467659.693	626493.288
C3-P18	467660.854	626337.293
C3-P19	467519.857	626181.937
C2-P20	466464.954	625995.55
C2-P21	466298.576	626141.49
C2-P22	466324.553	626295.144
C2-P23	466406.611	626528.654
C2-P24	466190.012	626971.464
C2-P25	466101.624	626807.481
C1-P26	465728.816	628005.008
C1-P27	465969.168	627880.447
C1-P28	466123.814	627612.558
C1-P29	466376.912	627682.888
C1-P30	466619.159	627713.385
C1-P31	466917.528	627717.533
E3-P32	467548.881	627439.059
E3-P33	467522.951	627323.504
E3-P34	467481.863	627136.252
E3-P35	467440.338	626836.578
E3-P36	467081.15	626439.288
E3-P37	467127.884	626606.713
E3-P38	467338.196	626969.492
E3-P39	467372.071	627173.871
E3-P40	467417.731	627371.761
E3-P41	467414.841	627503.231
E9-P42	465453.696	628539.771
E9-P43	465347.349	628359.894
E9-P44	465262.14	628281.761
E9-P45	465107.941	628050.077
E9-P46	465184.655	628178.652
E9-P47	465238.93	628198.432
A5-P48	465626.402	627214.395
A1-P49	464593.727	628286.36
EC1-P50	464678.114	628719.323
EC1-P51	464795.903	628634.482
EC1-P52	464980.144	628529.814
EC1-P53	465306.312	628618.549
EC1-P54	465259.316	628519.556
E2-P55	465880.106	628220.866
E2-P56	466131.932	628085.488
E2-P57	466698.918	627981.799
E2-P58	467012.898	627964.515

2012 Fall Survey		
Location Description	Easting	Northing
E7-P1	468161.482	626085.069
E7-P2	467982.22	626124.041
E7-P3	467817.375	626186.582
C3-P4	467569.142	626197.944
C3-P5	467643.819	626147.557
C3-P6	467641.609	626432.817
C1-P7	467014.226	627723.961
C1-P8	466878.436	627740.228
C1-P9	466634.82	627766.4
C1-P10	466277.072	627631.984
C1-P11	466113.722	627665.097
C1-P12	465757.272	627949.15
C2-P13	466407.854	626133.428
C2-P14	466197.015	626402.869
C2-P15	466114.193	626748.559
C2-P16	466295.534	626908.668
C2-P17	466164.108	626995.851
E3-P18	467534.588	627452.645
E3-P19	467489.607	627320.073
E3-P20	467436.324	627128.676
E3-P21	467285.397	626669.766
E3-P22	467061.877	626427.896
E3-P23	467103.712	626603.656
E3-P24	467271.924	626733.453
E3-P25	467351.392	626866.804
E3-P26	467379.853	627106.469
E3-P27	467411.505	627448.761
E9-P28	465455.598	628537.449
E9-P29	465483.407	628617.785
E9-P30	465349.576	628419.462
E9-P31	465301.367	628300.241
E9-P32	465155.798	628066.449
E9-P33	465105.565	628034.686
C2-P34	466230.531	626613.156
E8-P35	468111.127	626308.539
E8-P36	468030.547	626417.511
E8-P37	467889.667	626442.532
E8-P38	467869.959	626694.243
E7-P39	467910.585	626921.033
EC1-P40	464687.162	628683.407
EC1-P41	464819.548	628649.131
EC1-P42	465006.951	628528.566
EC1-P43	465124.309	628574.386
EC1-P44	465392.999	628620.989
A1-P45	464760.114	628218.52
A5-P46	465742.447	627097.607
E5-P47	467522.599	625982.419
E5-P48	467403.667	625810.151
E4-P49	467384.156	625602.173
E4-P50	467208.321	625556.23
E4-P51	467812.421	625714.877
E4-P52	467914.848	625755.791
E2-P53	467237.547	627841.892
E2-P54	467028.46	627925.994
E2-P55	466900.95	628044.929
E2-P56	466637.758	628015.674
E1-P57	465838.758	628173.658
E1-P58	465710.334	628340.443

2012 Soil Profile Locations

Location Description	Easting	Northing
C1	465821.5122	627971.9016
C2	466411.3001	626047.8492
C3	467597.9623	626221.4887
E1	465621.7288	628216.1883
E3	467521.222	627277.9925
E6	467858.7717	625835.0868

2012 Geotechnical Boring Locations

Location Description	Easting	Northing
C1	466381.1187	627723.3501
C2	466226.1998	626547.5554
C3	467546.8546	626247.159
E1	465745.554	628275.497
E2 West	466627.4	628025.2434
E2 East	467259.6836	627891.9253
E3 North	467461.5787	627306.2608
E3 South	467127.9072	626519.7494
E4	467314.4988	625596.218
E5	467588.6917	625888.157
E6	467834.973	625705.4322
E7	467974.0028	626225.8008
EC1	464986.8486	628585.3348

Appendix E

Soil Investigation Report

Soil Investigation Report

Finderne Farms Wetland Mitigation Site, Bound Brook, NJ



Prepared for the U.S. Army Engineer District, New York
(CENAN) under Contract IDIQ- W91236-09-D-0075

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1 Introduction

In April 2012, the United States Army Corps of Engineers, New York District (CENAN) contracted services to provide continuing wetland monitoring services and develop an adaptive management plan for the Finderne Farms Mitigation Site (the site), as part of the Green Brook Flood Control Project located in Somerset County, NJ. As part of these services, scientists collected soil borings for laboratory analyses to determine the geotechnical and plant productivity properties of the soils on site. The results of the study are provided within this document.

2 Background

The site is located within a floodplain along the Raritan River in Bound Brook, Somerset County, New Jersey. The northern portion of the site is bordered by a steep slope that is 10-30 feet (ft) in height. Within the slope, outcrops of Triassic age, red, sedimentary rocks are visible. The site itself is nearly flat and is bordered by the river on the east, south and west sides.

The U.S. Department of Agriculture (USDA), Soil Conservation Service (now called the Natural Resources Conservation Service [NRCS]), Soil Survey of Somerset County, New Jersey (USDA-SCS, 1989) was reviewed prior to the design and construction of the wetland mitigation site. Soils within the mitigation site primarily consist of Rowland silt loam, 0 to 2 percent slopes, frequently flooded (RorAt).

NRCS describes the Rowland soils as deep, moderately well drained to somewhat poorly drained soils located on floodplains along major streams. The typical Rowland silt loam soil type is generally nearly level, but there are minor hummocky areas and slopes of more than 2 percent. This soil series includes sandy loam, loam, and gravelly loam soils. These soils are located approximately 3 to 8 ft above normal stream levels and are subject to frequent flooding from the Raritan River. The seasonal high water table for the Rowland series, as described by the NRCS, is 1 to 3 ft below the surface. Some areas of well-drained Rowland soils are found nearer to streams and at slightly higher elevations. Bowmansville soils, a minor component of the series, are included in mapping of Rowland silt loam and are sometimes found in depression areas.

3 Soils Investigation

In order to better understand the site's soils, two sets of soil borings were collected:

- Geotechnical Borings - a set of 13 individual soil borings to a depth of three ft; and
- Wetland/Agricultural Borings - a set six borings to a depth of two ft.

The purpose of the borings were to determine if there are any significant soil structure differences between the areas that are successfully ponding water and the mitigation areas that are experiencing failure in retaining the required hydrology. Also, the borings would help determine the suitability of soils to support plant material.

3.1 Geotechnical Borings

Borings were collected as per *Engineering Manual 1110-1-1804* and documented the locations of the soil borings with a WAAS-enabled GPS unit. Within the various creation and enhancement areas on site (Figure 1), scientists collected 13 borings. Table 1 identifies the location of the geotechnical borings that were collected.

Table 1 Geotechnical Boring Locations

Location	Easting	Northing
C1	466381.118715	627723.350117
C2	466226.199817	626547.555403
C3	467546.854596	626247.158993
E1*	465745.554005	628275.496958
E2 West	466627.400040	628025.243354
E2 East	467259.68357	627891.925286
E3 North	467461.578722	627306.260776
E3 South	467127.907249	626519.749447
E4	467314.498839	625596.218027
E5	467588.691664	625888.157017
E6	467834.972989	625705.432162
E7	467974.002769	626225.800769
EC1	464986.848632	628585.334754
Notes:		
* Location E1 was an additional boring that was collected that was not identified in the original scope.		
Coordinates reported according to New Jersey State Plane NAD 1983, Zone 2900.		

Samples were collected on May 22 and May 24. On May 24, the weather was overcast with occasional drizzle. Geotechnical borings were collected to a maximum depth of 3 ft with a manual, continuous coring device (Photo 1). The continuous manual corer is a stainless steel device that collects a core approximately 40 inches long and 4 inches in diameter. The corer is driven into the ground with a slide hammer. The hammer is then removed, and a handle is placed on top of the coring device and manually removed from the ground. Due to the dense clays on site, in some instances the core device had to be dug out of the ground with a shovel. Once removed from the ground, the core was photographed (Photo 2) and the soil strata analyzed in the field for soil color, hue, chroma, and value using a Munsell color chart. Soil texture was estimated in the field using the U.S. Department of Agriculture (USDA) classification system. The core was also analyzed for other features (e.g., mottling, presence of anthropogenic material, etc.) and groundwater levels and depth of saturation were also recorded.

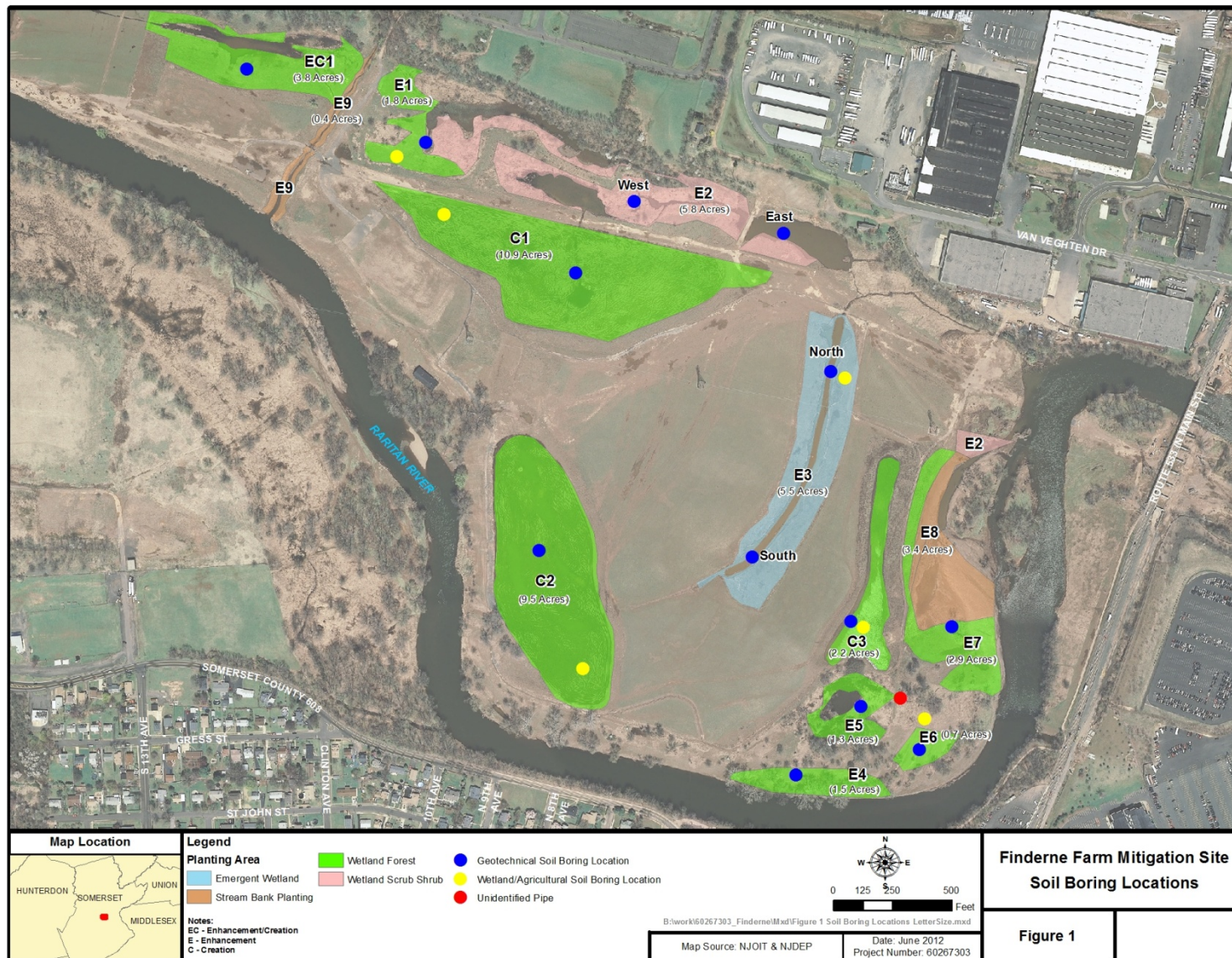


Figure 1 Soil Boring Locations

After documenting the core's characteristics, the cored material was set aside and protected from potential damage and desiccation during transport (Photo 3) for later laboratory analyses at a certified laboratory. The samples were analyzed for the following:

- **Sieve/Hydrometer Analysis** – This test analyzes the percentage of different grain sizes contained within a soil.
- **Liquid and Plastic Limit** – When analyzed with other soil properties, liquid and plastic limits are used to correlate with engineering behavior such as compressibility, permeability, compatibility, shrink-swell and shear strength.
- **Unit Weight/Specific Gravity** – This test calculates the density of solids divided by the density of water in an undisturbed soil sample.

All sampling locations were accessed on foot. For locations that occurred in ponded areas, scientists constructed crude bridges from available flotsam and jetsam. These bridges were used to disperse the scientist's weight in order to prevent sinking into the sediments (Photo 4).

3.2 Wetland/Agricultural Borings

Soil profiles in each creation and enhancement area were collected on May 21, 2012. On May 21, a steady rain fell throughout the day. A representative soil profile was described at each of the three wetland creation areas (C1, C2 and C3), and at each of the three wetland enhancement areas (E1, E3 and E6) (Figure 1). Each profile was completed to a depth of 24 inches below the ground surface using a hand-operated soil auger with a 4-inch diameter bucket. Soil characteristics, including texture, color, and structure, were recorded for each of the six sample locations and summarized on datasheets, presented as Attachment B. Soil texture was estimated in the field using the USDA soil classification system. Characteristics such as redoximorphic features, relative moisture content, structure and, if encountered, groundwater level, were estimated in the field and recorded. Soil color was described using Munsell color charts.

The geographic coordinates at each location were recorded by a handheld WAAS-enabled Global Positioning System (GPS) unit. The soil profile locations were randomly selected within each area. Table 2 lists the New Jersey State Plane NAD 1983 geographic coordinates of the sample locations.

Table 2 Soil Profile Locations

Location Description	Easting	Northing
C1	465821.512230	627971.901599
C2	466411.300131	626047.849185
C3	467597.962328	626221.488677
E1	465621.728762	628216.188284
E3	467521.221976	627277.992509
E6	467858.771689	625835.086753
Notes: Coordinates reported according to New Jersey State Plane NAD 1983, Zone 2900. Coordinates measured using WAAS-enabled GPS unit with +/- 3 meter accuracy.		

From each of the three wetland creation areas (C1, C2 and C3), 15 subsamples were collected randomly throughout each area. Each subsample was collected at approximately 6-inches below the ground surface,

and then the subsamples from a given wetland creation area were homogenized together in a clean plastic container to create a separate composite sample for each of the three wetland creation areas. After the three composite samples were obtained, the samples were submitted to the analytical laboratory for analysis of pH, organic content, and agricultural tests, including Phosphorus (P), Potassium (K), Magnesium (Mg), Calcium (Ca), Zinc (Zn), Copper (Cu), Manganese (Mn), Iron (Fe) and Boron (B)], soil pH, and soil organic matter.

4 Results

This section provides the results of the field and laboratory data for the geotechnical and plant productivity borings.

4.1 Field Data

4.1.1 Geotechnical Borings

Table 3 identifies the results of the field data of the geotechnical cores. Table 4 describes the conditions pertaining to soil saturation and groundwater encountered in the boreholes. The cored soils were generally consistent with the NRCS description of the Rowland silt loam soils. Red parent material was encountered in the soils throughout the site. As is identified in Table 4, soils on site are generally silty clays and clay loams. In areas where there was standing water (E2 East, both E3 Locations), a 4- to 6-inch layer of loose silty material overlaid dense clays (Photo 5). In most locations throughout the site, the upper half of the soil cores was generally clay loams and the lower half denser clay materials.

In the Creation Areas, C1 and C2 have similar profiles. Area C3 was unusual in that a 26-inch dense clay layer overlaid a layer of wet, silty sand. It is likely that the sand layer is part of a remnant geomorphological feature related to alluvial deposition. All three locations had very faint mottling in the upper part of the profiles; however, due to large amount of red parent material, it is unclear if the mottling was a result of redoximorphic conditions. Other redoximorphic features common to wetlands (e.g., sulphidic odor, concretions, etc.) were not identified in the soil cores.

In the Enhancement Areas that are sometimes ponded (E1 and EC1), redoximorphic features were observed in the upper part of the soil. In the Enhancement Areas in the southeast portion of the site (E4, E5, E6, and E7), there were several interesting findings. Location E4 consisted of almost uniform soils throughout the profile. This is likely due to its location near the river and constant alluvial deposition. Location E5, located further inland, consisted of a silt clay loam and clay loam in the upper part and very dense clay in the lower part of the profile. In the area near location E6, previous anthropogenic disturbance have occurred. Near location E6, there is evidence of prior disturbance: large surface tanks (estimated at greater than 1,000 gallons), remnants of earthmoving activities/structures, and a drainage pipe of unknown origin (Photo 6). At 12 inches in depth within the profile, anthropogenic debris (e.g., plastic lid, pen cap, etc.) was found in the borehole. The soils in location E7 were saturated to the surface. At approximately 20 inches below the ground surface, organic material was encountered, also throughout the profile coarser grained material was encountered.

Table 3 Geotechnical Boring Field Analyses

Depth in inches	Locations																		
	C1	C2	C3	EC1	E1	E2 East	E2 West	E3 North	E3 South	E4	E5	E6	E7						
1	5YR 3/3 clay loam w/ very faint 5YR ¾ mottles	5YR 4/2 silt, dense root material	5YR 4/3 silt clay loam w/ root material	5YR 4/2 clay loam w/ 5YR 4/4 mottles	7.5YR 4/3 silt (w/ large amount of root matter)	5YR 3/2 silt	5YR 3/2 clay loam, numerous rhizomes	5YR 3/2 fine silt	5YR 3/2 fine silt	5YR 3/2 silt clay loam	5YR 3/2 silt clay loam, numerou s roots	5YR 3/2 silt clay loam w/ trace sand	5YR 3/2 silt clay loam						
2																			
3		2.5 YR 3/2 silt clay loam w/ very faint 5YR ¾ mottles	5YR 4/3 silt clay loam w/ faint 5YR 4/4 mottles			5YR 4/2 silt		5YR 3/2 silt clay	5YR 3/2 silt clay w/ faint 5YR 4/4 mottles			5YR 3/2 silt clay w/ faint 5YR 4/4 mottles		5YR 3/2 silt clay w/ faint 5YR 4/4 mottles	5YR 3/3 silt clay w/ trace sand	5YR 3/3 silt clay loam	5YR 4/3 silt clay loam	5YR 3/3 silt clay loam w/ sand	5YR 3/3 Silt sand
4																			
5																			
6																			
7		5YR 4/3 silt clay loam w/ faint 5YR 4/4 mottles	5YR 4/3 silt clay loam w/ faint 5YR 4/4 mottles	5YR 4/2 silt	5YR 3/2 silt clay	5YR 3/2 silt clay w/ faint 5YR 4/4 mottles	5YR 3/2 silt clay w/ faint 5YR 4/4 mottles	5YR 3/2 silt clay w/ faint 5YR 4/4 mottles	5YR 3/2 silt clay w/ faint 5YR 4/4 mottles	5YR 3/3 silt clay loam	5YR 4/3 silt clay loam	5YR 3/3 silt clay loam w/ sand	5YR 3/3 Silt sand						
8																			
9																			
10																			
11	5YR 3/3 clay loam w/ abundant 5YR ¾ mottles	2.5 YR clay loam w/ very faint 2.5YR ¾ mottles	5YR 4/3 silt clay loam w/ very faint 5YR 4/4 mottles	5YR 4/2 silt	5YR 3/2 silt clay	5YR 3/2 silt clay w/ faint 5YR 4/4 mottles	5YR 3/2 silt clay w/ faint 5YR 4/4 mottles	5YR 3/2 silt clay w/ faint 5YR 4/4 mottles	5YR 3/3 silt clay w/ trace sand	5YR 3/3 silt clay loam	5YR 4/3 silt clay loam	5YR 3/3 silt clay loam w/ sand	5YR 3/3 Silt sand						
12																			
13																			
14																			
15																			
16	5YR 4/3 clay loam w/ very faint 5YR 4/4 mottles	5YR ¾ silt clay loam	5YR 4/3 dense silt clay	5YR 4/2 clay loam w/ 15% 5YR 4/4 Mottles	5YR 2.5/1 silt clay	5YR 4/3 silt clay loam w/ very faint 5YR ¾ mottles	5YR 4/3 silt clay	5YR 3/3 silt clay	5YR 3/3 silt clay	5YR 3/3 silt clay	5YR 3/3 silt clay	5YR 3/3 Silt sand	5YR 3/3 sandy loam						
17																			
18																			
19																			

Depth in inches	Locations												
	C1	C2	C3	EC1	E1	E2 East	E2 West	E3 North	E3 South	E4	E5	E6	E7
20	5YR 4/3 clay loam			clay w/ 10% 5YR 4/4 mottles	5YR 4/3 silt clay w/ abundant 5YR 4/4 mottles	5YR 3/2 silt clay	5yr 3/3 silt clay loam w/ 50 percent 5YR4/4 mottles	5YR 4/3 silt clay with faint 5YR 4/4 mottles and trace sand	5YR 3/1 silt clay – 50% 5YR 3/4 mottles	5YR3/3 silt clay loam w/ faint 5YR 3/4 and 10YR 5/2 mottles	5YR 4/4 silt clay	5YR 3/3 silt clay loam w/ faint 5YR 3/3 and 10YR 5/2 mottles	5YR 3/2 loam with 10YR 2.5/1 organic material
21													
22													
23													
24													
25													
26													
27													
28													
29	5YR 4/4 silt clay w/ 30 percent 5YR 4/6 mottles	5YR 4/4 silt clay loam	26-36 5YR 3/3 silt sand	5YR 3/1 silt clay w/ 25% 5YR 3/4 mottles	5/46 4/2 silt clay loam w/ abundant 5YR 3/4 mottles w/ trace angular sand	5YR 4/3 clay loam	5YR 3/3 silt clay loam w/60 % 5YR 4/4 mottles	5YR 3/1 silt clay		5YR3/3 silt clay loam w/ faint 5YR 3/4 and 10YR 5/2 mottles	5YR 4/4 silt clay	7.5 YR 4/2 with 2.5YR 3/6 abundant mottles. silt clay w/ trace sand depth of refusal at 34"	5YR 3/2 silt clay loam
30													
31													
32													
33													
34													
35	5YR 4/4 w/30% 5YR 4/6 mottles. silt clay – very dense and crumbly	5YR 4/4 silt clay loam w/ 20% 5YR 5/1 mottles. Soil very dense and crumbly											
36													

Table 4 Soil Saturation and Groundwater Levels Observed at Geotechnical Boring Locations

Location	Description
C1	Soils dry, no water observed on bore hole
C2	Soils dry, no water observed on bore hole
C3	Soils in the upper part were dry. Sand layer was saturated
EC1	Soils saturated at 18 inches
E1	Slight saturation of soils throughout the profiles, water collected in bottom 4 inches of bore hole
E2 East	Six inches of standing water above ground surface
E2 West	Soil saturated to surface, approximately 2 inches of water in bore hole
E3 North	Ten inches of standing water above ground surface
E3 South	Eight inches of standing water above ground surface
E4	Soil damp throughout profile, no water observed on bore hole
E5	Soils very dry throughout profile, no water observed on bore hole
E6	Soils dry, no water observed on bore hole
E7	Saturated to surface

4.1.2 Wetland/Agricultural Borings

Soil profiles were described in the field and recorded on data forms (Attachment B). Typical profiles included a silt clay layer found at variable depths. The soils examined were generally consistent with the NRCS description of the Rowland silt loam soils. This layer was sometimes overlaid by a layer of slightly redder soil of varying texture. However, in most cases the color and texture remained relatively consistent throughout depths of 0 to 24 inches.

Redoximorphic features such as concentrations, mottles and oxidized root channels were observed in two of the six soil profiles. Soil was not saturated at any location. The water table was greater than 24 inches below the ground surface in each of the borings. A summary of the soil observations is presented below in Table 5.

Table 5 Soil Profiles Wetland/Agricultural Borings

Area	Redoximorphic Features			Saturation
	Depth Range (inches)	Percentage	Munsell Color	
C1	None Observed	--	--	> 24"
C2	None Observed	--	--	> 24"
C3	6 - 24"	1%	5 YR 5/8	> 24"
E1	6 - 12"	5%	5 YR 4/6	> 24"
	12 - 18"	1%	5 YR 4/6	
E3	None Observed	--	--	> 24"
E6*	None Observed	--	--	> 24"

Notes: * Due to prior disturbances near location E6, several other borings were collected within and adjacent to E6. The findings were similar (i.e., no redoximorphic features, saturation greater than 24 inches).

Members of the soil sampling team are also certified arborists. cursory observations of the plants growing throughout the site showed no signs of nutrient deficiencies. The site is densely vegetated with herbaceous vegetation.

4.2 Laboratory Data

4.2.1 Geotechnical Borings

Laboratory data for the geotechnical borings are provided in Appendix B. Six geotechnical boring were selected (i.e., C1, C2, C3, EC1, E2W, and E3S) for laboratory analyses. For each boring, except location C3, the 0-18 inch layer and 18-36 inch layer were treated as two separate samples. For location C3, due to the distinct change between dense clays and silt sands at 26 inches in depth, the 0-26 inch layer was treated as one sample and the material below 26 inches was treated as another sample. On the data sheets in Attachment B, the modifier UP and LOW for each sample corresponds to sampled soils position within the core. UP is the 0-18 inch layer (0-26 for Location C3) and LOW are the soils below the UP sample.

Laboratory findings confirmed the field analyses with respect to soil composition. All samples, except for C2 UP and C3 LOW, were comprised of over 88 percent fine particles (silts and clays). C2 UP was only comprised of 71.4 percent fine materials and 28.6 percent sand material; however, a closer look at the data shows that almost the entire amount of sand is fine sand, which is close in grain size to silts. The slightly larger grain sizes at C2 may be a result of the prior disturbances to the soil profile associated with excavation and habitat creation activities. As anticipated, dramatic differences in grain size were observed when comparing Locations C3 UP and C3 LOW. The percent sand composition in C3 UP and C3 LOW is 9.7 and 61.3 percent, respectively. The grain size of C3 UP is similar to grain size in other UP samples that were analyzed throughout the site.

The plastic index (PI) of soil is identified in Table 6, below:

Table 6 Plastic Index of Soils

Plastic Index	Description
0	Non-plastic
1-5	Slightly plastic
5-10	Low plasticity
10-20	Medium plasticity
20-40	High plasticity
>40	Very high plasticity
Table adapted from Das, 2010	

Review of the soil data indicates that Sample C3 LOW would be classified as a slightly plastic soil. Sample E2W LOW soils would be classified as a soil with high plasticity. Samples C1 LOW and E2W UP each with a PI of 20, would classify them at the low range of high plasticity soils or the high range of medium plasticity soils. The PI of all other samples ranged from 10-19 which would be classified as soils of medium plasticity.

4.2.2 Wetland/Agricultural Cores

Laboratory data for the wetland/agricultural cores are provided in Appendix B. Three sites (C1, C2, and C3) were selected for laboratory analyses. Results of the wetland/agricultural cores show that the soils in the creation areas are acidic, with the pH of 5.6 to 6.1. Also the laboratory analyzed macro nutrients (phosphorous, potassium, magnesium, and calcium) and micronutrients (zinc, copper, manganese, boron, and iron). Table 7 identifies the optimum range of macronutrients and micronutrients (pounds per acre) and the laboratory results.

Table 7 Macronutrient and Micronutrient of On Site Soils

Soil Test	Optimum Range of Nutrients*	C1	C2	C3
Macronutrients – values below presented in pounds per acre**				
Phosphorus	0-71 (Below); 72-137 (Optimum); >137 (Above/Excessive)	141	51	94
Potassium	0-145 (Below); 146-277 (Optimum); >277 (Above/Excessive)	87	128	141
Magnesium	0-143 (Below); 144-295 (Optimum); >295 (Above/Excessive)	318	386	489
Calcium	0-1,400 (Below); 1,401-1,790 (Optimum); >1,790 (Above)	2,211	2,362	3,165
Micronutrients – values below presented in parts per million**				
Zinc	Critical Level 1.0; High >50	7.25	7.12	9.96
Copper	Critical Level 0.5; High >20	6.17	4.89	6.33
Manganese	Critical Level 25; High >100	92.15	186.10	197.10
Boron	Critical Level 0.5; High >20	0.86	0.73	0.89
Iron	Critical Level 1.0; High >100	553.9	467.1	371.40
Notes:				
* Values based on Rutgers, 2012.				
** Optimum refers to optimum fertility.				
**Micronutrient categories are less well defined than macronutrient categories. Values below the "critical level" should be considered deficient; values above "high" should be considered a warning. Certain micronutrients can be toxic to plants at excessive levels.				

Based on the results presented in Table 7, all samples had excessive values of magnesium and calcium, and below optimum values of potassium. The phosphorous results yielded some interesting findings. The phosphorous in C1 was excessive, location C2 was below optimum, and location C3 had optimum levels. The varying levels of phosphorous in the three parcels may be attributed to their geographic position. Location C1 is closest to the ball fields and other public areas. It could be that fertilizer, waste products, and potential runoff from area just north of the site are contributing to the increased phosphorous levels.

The micronutrients zinc and copper were adequate for all sites. Manganese and iron were generally high for all sites (for C1, manganese was 92 ppm which is only 8 ppm below the high classification). Boron was low for all three sites. Scientists who traversed the site did not see any evidence of plant stress, attributed to nutrient deficiencies (e.g., leaf discoloration, leaves curling at the tip, etc), throughout the site.

Table 8 identifies the percent of organic matter, organic carbon, inorganic nitrogen-nitrate and ammonium identified in sites C1, C2, and C3.

Table 8 Organic Matter, Organic Carbon, Inorganic Nitrogen-nitrate and Ammonium of On Site Soils

Soil Constituents	C1	C2	C3
Organic matter (percent)	4.2	3.7	3.8
Organic carbon (percent)	2.4	2.2	2.2
Inorganic Nitrogen - nitrate (ppm)	5	4	6
Ammonium (ppm)	3	6	2

The amount of organic matter in the soils would be considered as a ‘medium’ amount for silt loam soils¹. Organic carbon in all three sites is similar.

Nitrogen is an essential nutrient for plants as it is an important component of plant cell compounds. Plants take up and use two forms of soil nitrogen: ammonium and nitrate. Plants on site exhibited no signs of nitrogen deficiencies.

5 Conclusions

The top three ft of soils on site are generally fine grained materials (clay loams and silt clays). The soil material is of alluvial origin. Areas of ponded and occasionally ponded water typically had high clay content in the soil profile.

Rainwater is the chief source of hydrology for much of the site. Due to the composition of the soil material, it is likely that there is a high degree of runoff from the site to the Raritan River as opposed to vertical infiltration through the soil.

Laboratory data indicated that the soils generally have sufficient nutrients for plant growth; although, there were some deficiencies and exceedences for macro and micronutrients. The differences in nutrients for the three creation areas may be a result of geographical position to nutrient producing sources (e.g., urban runoff, ball fields, etc.) and depth of excavation. Regardless, both the wetland plantings and species growing on site showed no signs of nutrient deficiencies.

6 References

Das, Braja, J. 2010. Principles of Geotechnical Engineering. Cengage Learning. Stamford, CT 06902, USA

Rutgers, 2012. Website accessed in June 2012 to obtain data ranges of soil test results. <http://njaes.rutgers.edu/soiltestinglab/results.asp>

United States Department of Agriculture, Soil Conservation Service. 1989. Soil Survey of Somerset County, New Jersey

¹ Note: While organic matter is a valuable soil component for chemical, physical, and biological reasons, amending soils to organic matter content greater than 10% is not recommended for general use as plant growth media (Rutgers, 2012).

ATTACHMENT A

PHOTOGRAPHS

PHOTOGRAPHIC LOG


Photo No. 1	Date: 5/24/2012	
Direction Taken: N/A	Photo	
Description: Scientist operating the manual coring device		

Photo No. 2	Date: 5/24/2012	
Direction Taken: N/A	Photo	
Description: Photo of the removed soil core. Note how the core soil remains intact upon removal.		

PHOTOGRAPHIC LOG		
Photo No. 3	Date: 5/34/2012	
Direction Taken: n/a	Photo Taken:	
Description: Scientists subsampled cored soil material. Core material was wrapped in aluminum foil and placed in a plastic bucket for travel.		

Photo No. 4	Date: 5/24/2012	
Direction Taken: Northeast	Photo	
Description: Salvaged debris within the wetland was used to gain access to ponded areas.		

PHOTOGRAPHIC LOG		
Photo No. 5	Date: 5/14/2012	
Direction Taken: n/a	Photo Taken:	
Description:		
Core taken from ponded area. Note, dark silty material in the upper part of the core (left side) and dense clay material below.		

Photo No. 6	Date: 4/24/2012	
Direction Taken: North	Photo Taken:	
Description: Pipe of unknown origin located near E6 sampling location		

ATTACHMENT B

DATA SHEETS AND LABORATORY DATA

Sampling Location:		Date:	Weather:	Time:					
Creation area C3		05/21/12	RAIN	10:00					
Pedon Description									
Descriptor:		Landscape Position:							
Depth to Saturation or Free Water:		Hydric Soil:							
Parent Material:		Hydric Soil Indicator:							
Soil Classification (subgroup taxon):		HGM Wetland Class:							
Horizon		Depth	Matrix Color/Colors	Redox Concentrations	Redox Depletions	Texture	Structure	Horizon Boundary	Roots
				Percent/size/color/location/type	Percent/size/color/location	% Rock frags & size	Grade/size/shape	Distinctness & topog	Size & abundance
	0-6	5YR 4/3		N/A		5YR 4/3	granular		MEDIUM/MANY
	6-24	5YR 3/4		1% 5YR 5/8		5YR 1/1	blocky		few to fine root

Pedon Description									
Sampling Location:		Date:		Weather:		Time:			
EJ		5/21/12		rain 70s		14:00			
Describer:		Landscape Position:							
KBS/LAM		flat							
Depth to Saturation or Free Water:		Vegetative Cover:							
Ø		rush unk.							
Parent Material:		Hydric Soil:		Yes		No		Hydric Soil Indicator:	
Red and brown fine loamy alluvium									
Soil Classification (subgroup taxon):		HGM Wetland Class:							
Rowland silt loam									
Horizon	Depth	Matrix Color/Colors	Redox Concentrations	Redox Depletions	Texture	Structure	Horizon Boundary	Roots	Size & abundance
		Percent/size/color/location/type	Percent/size/color/location	Percent/size/color/location	% Rock frags & size	Grade/size/shape	Distinctness & topo		
	0-6	5yr 3/4	Ø		sand	granular		few	fine
	6-12	5yr 3/4	5yr 4/6 ~5%		sand + clay	blocky		none	
	12-18	5yr 3/4	5yr 4/6 ~1% (also ~5% black nothing - charcoal specs or ash?)		sand + clay w/ trace sand	blocky		none	
	18-24	5yr 3/4	Ø			blocky		none	

GPS 40.55807 (116)
74.59539

GPS 11° 20.3355
W 74.58855

Pedon Description

Sampling Location: E3		Date: 05/21/12	Weather: RAIN, 60-65°F		Time: 0900			
Describer: LISA MONTANA / KRS		Landscape Position: FLAT						
Depth to Saturation or Free Water:		Vegetative Cover: MONEY WOOD / PURPLE LOOSESTRIFE / LADYS THUMB						
Parent Material: BED AND BROWN FINE LOAMY ALLUVIUM		Hydric Soil: Yes No		Hydric Soil Indicator:				
Soil Classification (subgroup taxon): BROWN AND SILT LOAM		HGM Wetland Class:						
Horizon	Depth	Matrix Color/Colors	Redox Concentrations	Redox Depletions	Texture	Structure	Horizon Boundary	Roots
			Percent/size/color/location/type	Percent/size/color/location	% Rock frags & size	Grade/size/shape	Distinctness & topo	Size & abundance
	0-6	5YR 3/4	N/A		N/A	GRANULAR		SOME / MEDIUM
	6-24	5YR 3/4	N/A		N/A	GRANULAR		NONE

Pedon Description									
Sampling Location: E-6		Date: 5/21/12	Weather: rain 60s		Time: 11.00				
Describer: KBS/LAM		Landscape Position: flat							
Depth to Saturation or Free Water: 0		Vegetative Cover: japanese hops							
Parent Material: Red and brown fine loamy alluvium		Hydric Soil: Yes <input checked="" type="checkbox"/> NO <input type="checkbox"/>		Hydric Soil Indicator:					
Soil Classification (subgroup taxon): KOW and silt 10am		HGM Wetland Class:							
Horizon	Depth	Matrix Color/Colors	Redox Concentrations	Percent/size/color/location/type	Redox Depletions	Texture	Structure	Horizon Boundary	Roots
						% Rock frags & size	Grade/size/shape	Distinctness & topo	Size & abundance
	0-6	7.5yr ³ /h ₅				silt + fine sand	granular		some fine
	6-12	7.5yr ³ /2.5				silt + fine sand	granular		none
	12-18	7.5yr ³ /4				sand	blocky		none
	18-24	7.5yr ³ /4				sand	blocky		none

GIBS 40.55-154 (113)
74.88733

AECOM
Finderne, NJ
LABORATORY TESTING DATA SUMMARY

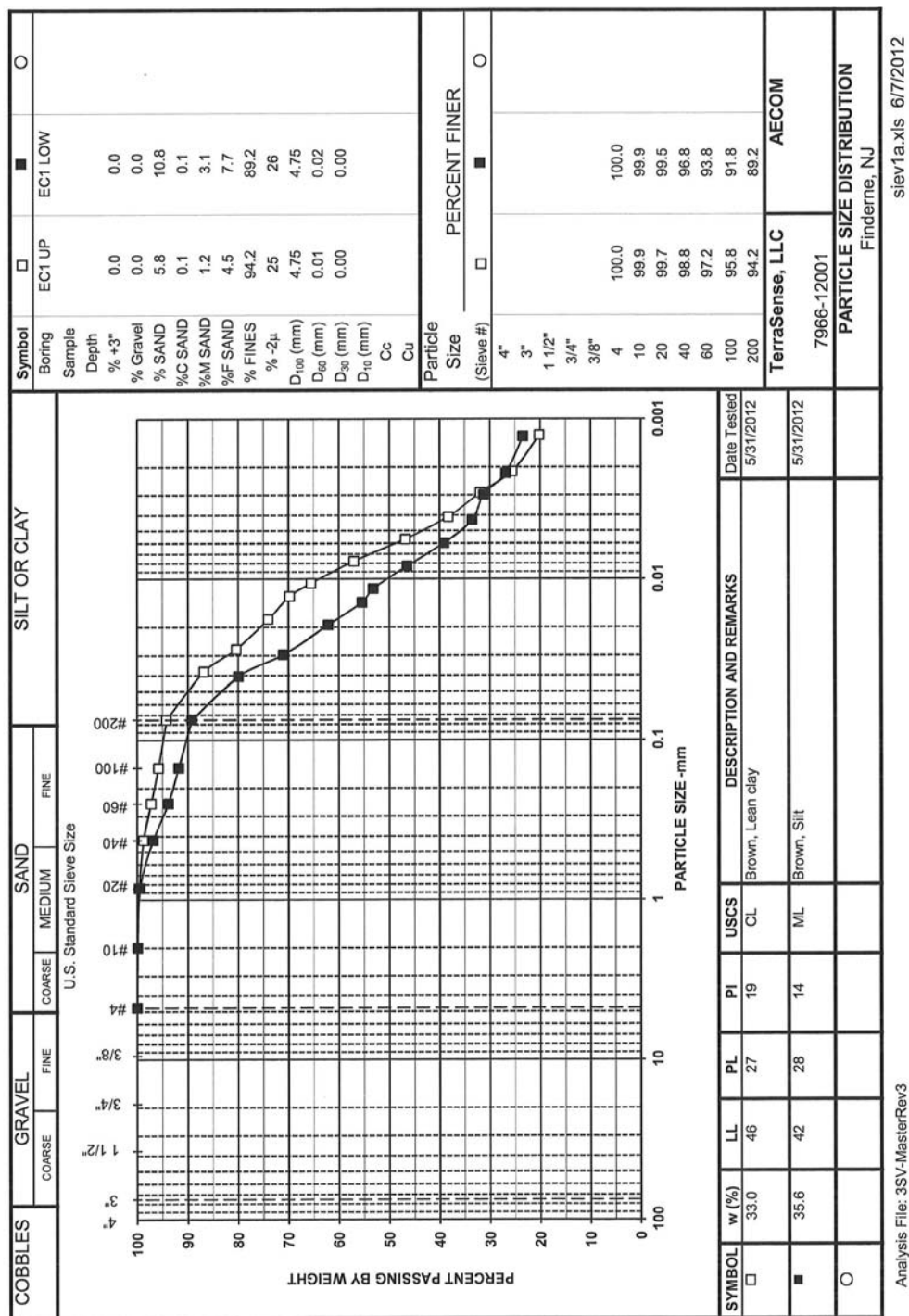
BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS										REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDRO. % MINUS 2 µm (%)	TOTAL UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (pcf)	SPECIFIC GRAVITY (-)	
EC 1 UP			33.0	46	27	19	CL	94.2	25	115.8	87.1	2.761	
EC 1 LOW			35.6	42	28	14	ML	89.2	26	116.4	85.8	2.673	
C1 UP			39.0	40	30	16	ML	94.8	21	109.6	78.9	2.660	
C1 LOW			31.8	47	27	20	CL	92.8	25	116.5	88.4	2.695	
C2 UP			20.4	31	20	11	CL	71.4	18	125.4	104.2	2.727	
C2 LOW			26.1	33	23	10	CL	88.2	20	125.0	99.1	2.716	
C3 UP			26.4	39	23	16	CL	90.3	21			2.664	
C3 LOW			23.4	20	17	3	SM	38.7	9			2.712	
E2W UP			44.0	50	30	20	MH	93.4	19	110.5	76.7	2.626	
E2W LOW			31.8	52	27	25	CH	91.4	24	117.1	88.8	2.657	
E3S UP			33.9	38	25	13	ML	96.0	24	121.8	91.0	2.663	
E3S LOW			38.4	44	26	18	CL	95.6	30	115.0	83.1	2.589	

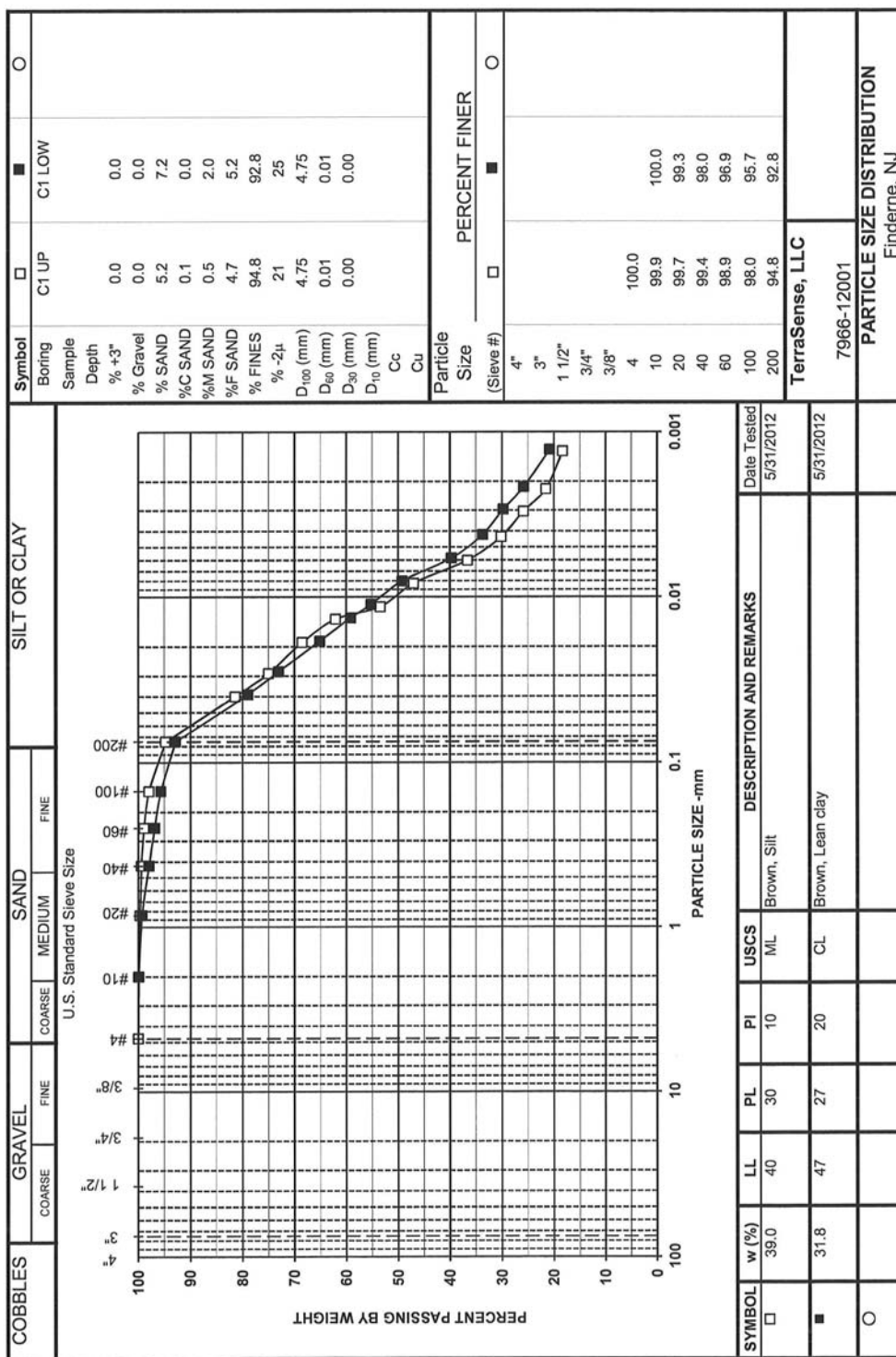
Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.

Prepared by: JR
Reviewed by: CMJ
Date: 6/7/2012

TerraSense, LLC
45H Commerce Way
Totowa, NJ 07512

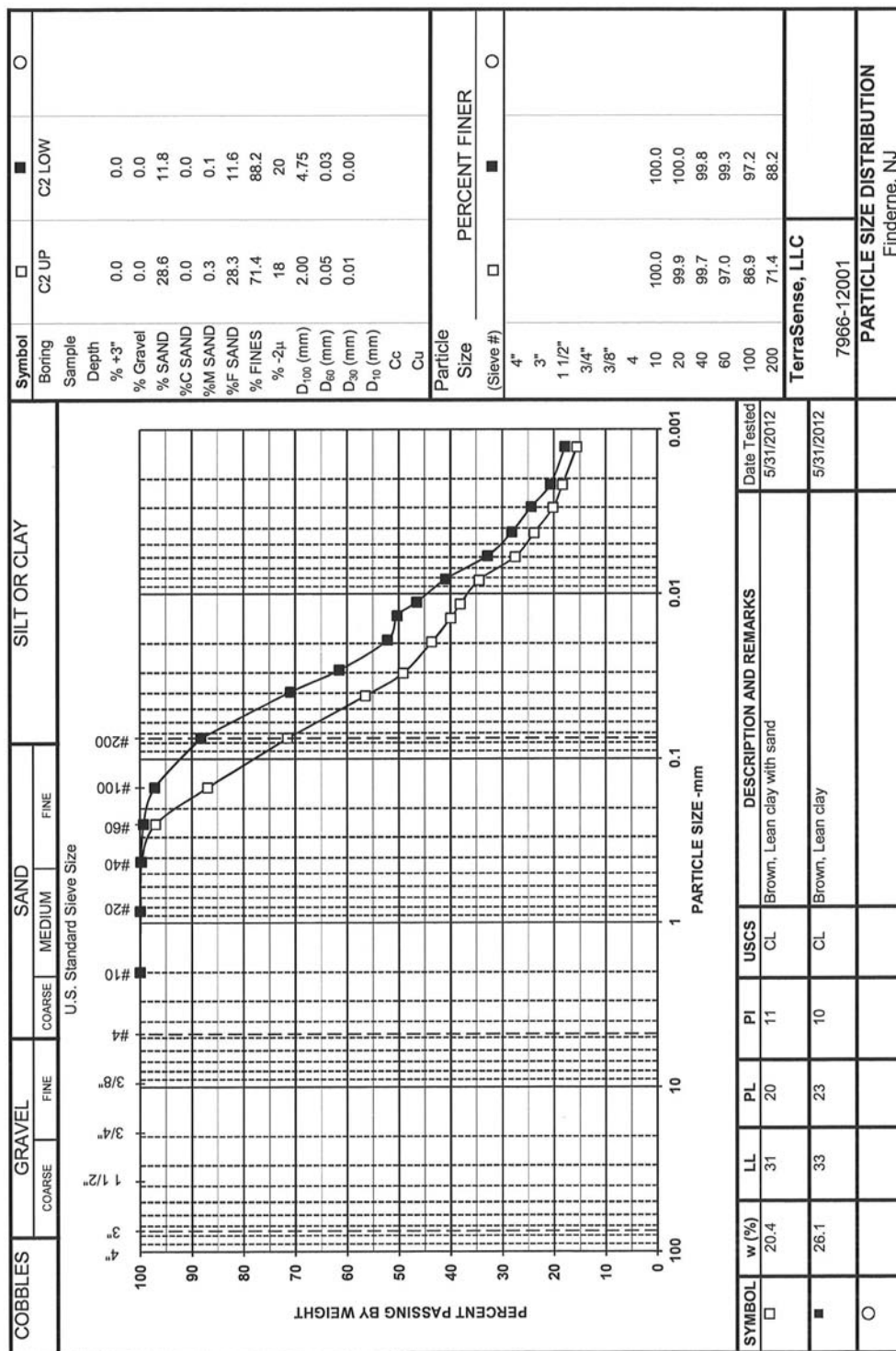
Project No.: 7966-12001
File: Indx1.xls
Page 1 of 1





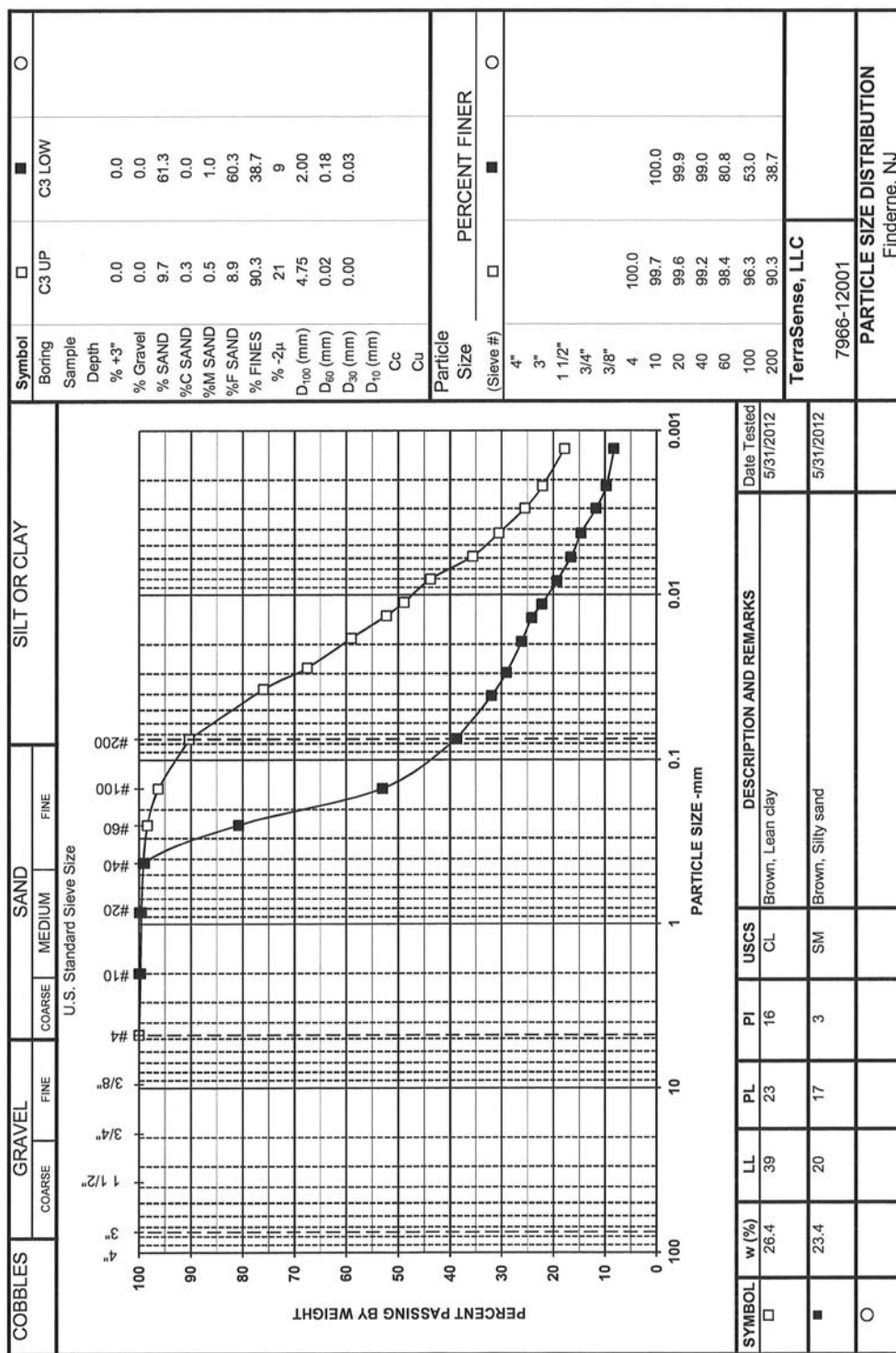
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Analysis File: 3SV-MasterRev3



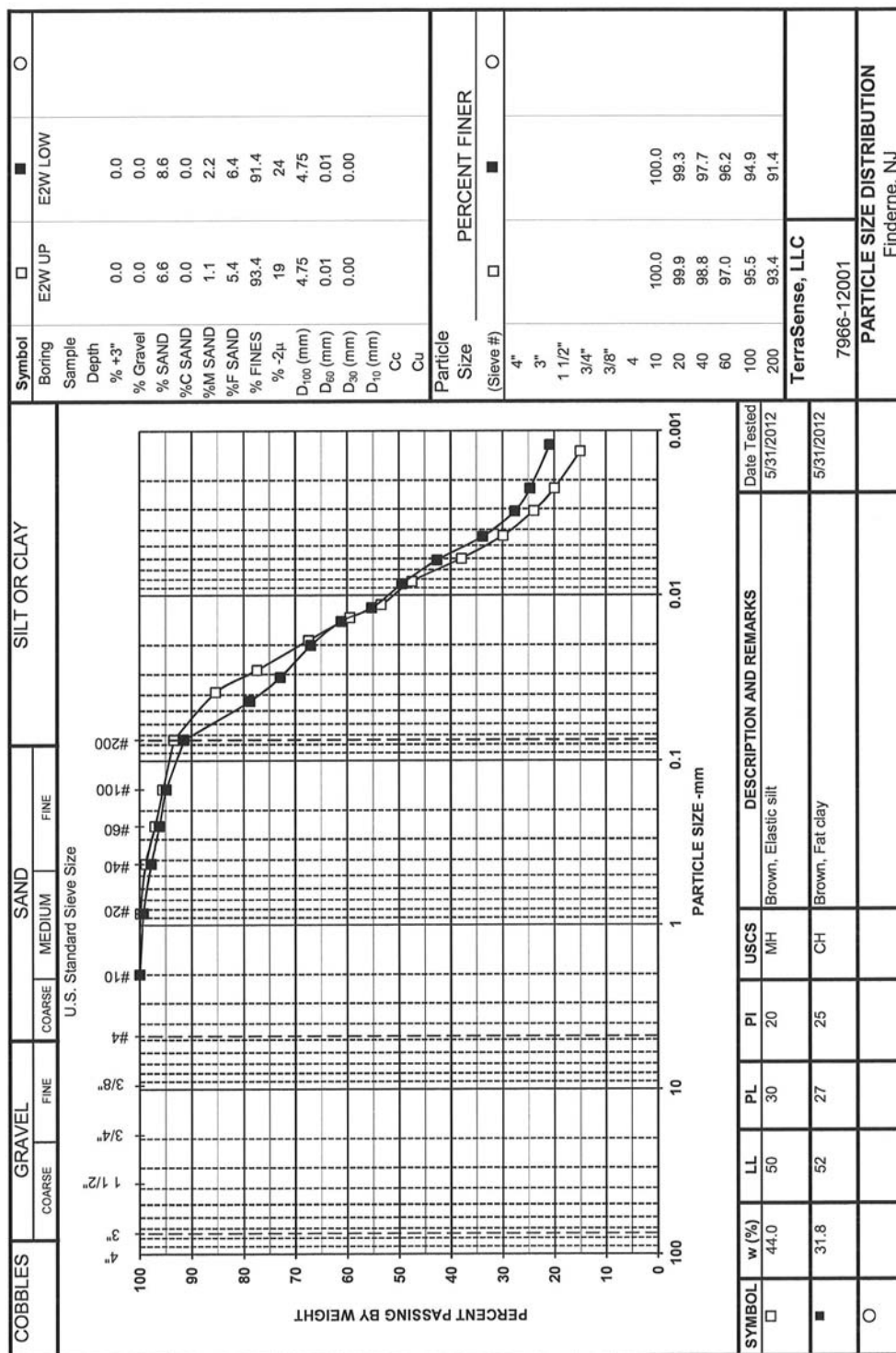
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Analysis File: 3SV-MasterRev3



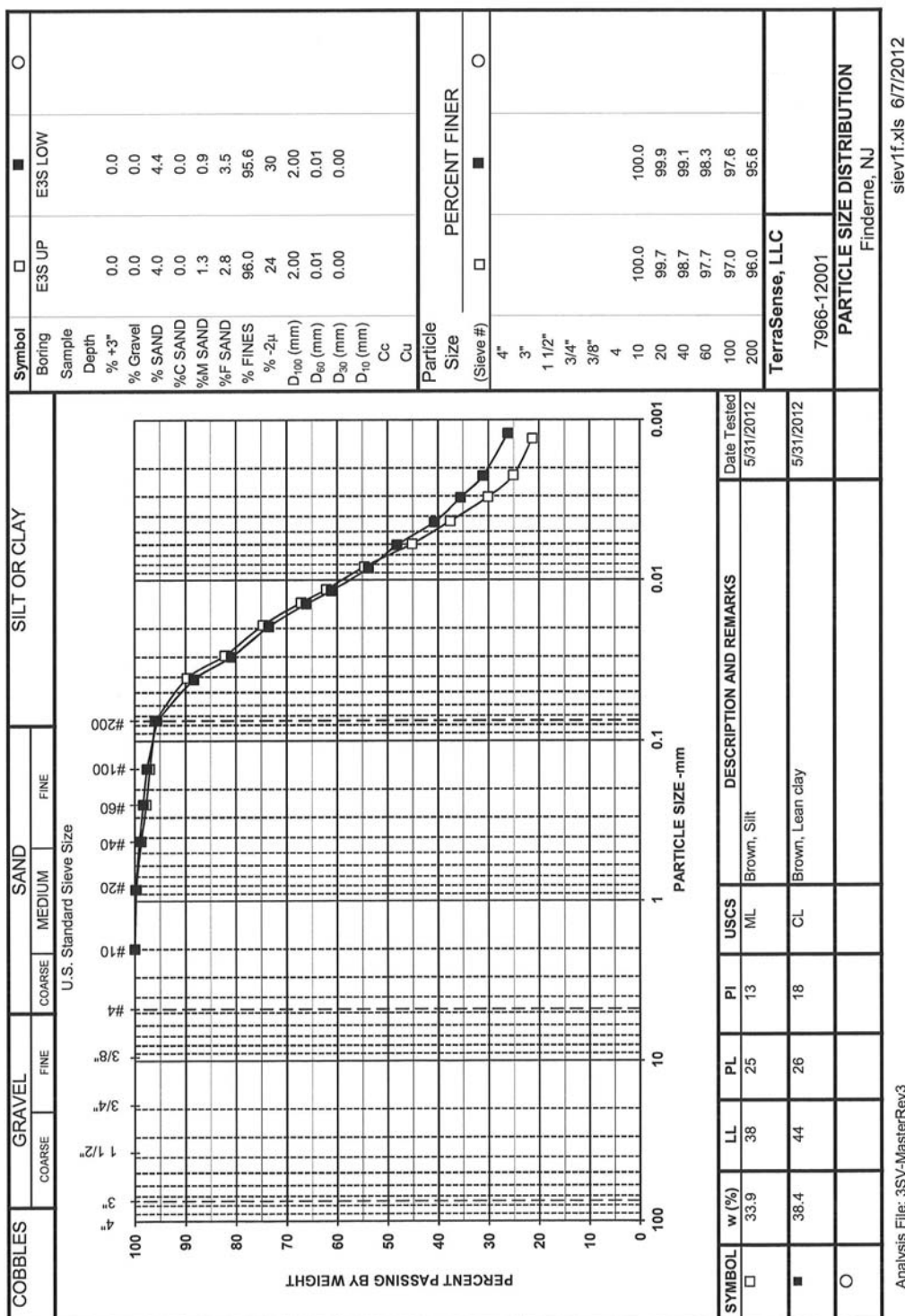
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siev1e.xls 6/7/2012

Analysis File: 3SV-MasterRev3



slev1f.xls 6/7/2012

Analysis File: 3SV-MasterRev3



Soil Testing Laboratory
Rutgers, The State University
ASB II
57 US Highway 1 South
New Brunswick, NJ 08901-8554

Soil Test Report
 Lab #: 2012-19111

TerraSense, LLC
 Greg Thomas
 45 H Commerce Way
 Totowa, NJ 07512

Date Received: 2012-05-29
Date Reported: 2012-06-19

g_thomas@terrasenselab.com
 (973)812-1818
 (973)812-8640(fax)
Sample ID: 7966-12001 C1 S/22

Results and Interpretations

pH: 5.98 Moderately acidic; below optimum for many plants but tolerated by acid-loving species.

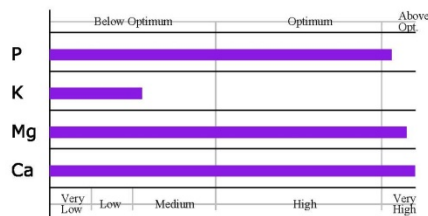
Lime Requirement Index: 7.70

The Lime Requirement Index (LRI) is a measure of the buffering capacity of the soil, its resistance to pH change, and is used to determine the appropriate amount of limestone, when necessary. LRI value near 8.0 indicates low buffering capacity of soil and a lower rate of limestone amendment compared to soil with high buffering capacity (LRI near 7.0).

Macronutrients (pounds per acre)

Phosphorous: 141 (Above Optimum)
Potassium: 87 (Below Optimum)
Magnesium: 318 (Above Optimum)
Calcium: 2211 (Above Optimum)

by Mehlich 3 extraction



Micronutrients (parts per million)

Zinc(Zn)	Copper(Cu)	Manganese(Mn)	Boron(B)	Iron(Fe)
7.25 (Adequate)	6.17 (Adequate)	92.15 (High)	0.86 (Adequate)	553.90 (High)

Special Tests Results

Organic matter by dichromate oxidation- Organic Matter= 4.2% Organic Carbon= 2.4%
 Interpretation depends on soil texture for
 Inorganic Nitrogen- Nitrate-N: 5 ppm Ammonium-N: 3 ppm



New Jersey Agricultural
Experiment Station

Soil Testing Laboratory
Rutgers, The State University
ASB II
57 US Highway 1 South
New Brunswick, NJ 08901-8554

Soil Test Report

Lab #: 2012-19112

TerraSense, LLC
Greg Thomas
45 H Commerce Way
Totowa, NJ 07512

Date Received: 2012-05-29
Date Reported: 2012-06-19

g_thomas@terrasenselab.com
(973)812-1818
(973)812-8640(fax)
Sample ID: 7966-12001 C2 S/22

Results and Interpretations

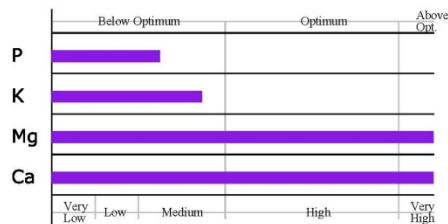
pH: 5.60 Strongly acidic, suitable for the growth of blueberry or potato crops and acid-loving ornamentals such as rhododendron, holly, and spruce, but too acidic for most other plants.

Lime Requirement Index: 7.71

The Lime Requirement Index (LRI) is a measure of the buffering capacity of the soil, its resistance to pH change, and is used to determine the appropriate amount of limestone, when necessary. LRI value near 8.0 indicates low buffering capacity of soil and a lower rate of limestone amendment compared to soil with high buffering capacity (LRI near 7.0).

Macronutrients (pounds per acre)

Phosphorous: 51 (Below Optimum)
Potassium: 128 (Below Optimum)
Magnesium: 386 (Above Optimum)
Calcium: 2362 (Above Optimum)



by Mehlich 3 extraction

Micronutrients (parts per million)

Zinc(Zn)	Copper(Cu)	Manganese(Mn)	Boron(B)	Iron(Fe)
7.12 (Adequate)	4.89 (Adequate)	186.10 (High)	0.73 (Low)	467.10 (High)

Special Tests Results

Organic matter by dichromate oxidation- Organic Matter= 3.7% Organic Carbon= 2.2%

Interpretation depends on soil texture for

Inorganic Nitrogen- Nitrate-N: 4 ppm Ammonium-N: 6 ppm



Soil Testing Laboratory
Rutgers, The State University
ASB II
57 US Highway 1 South
New Brunswick, NJ 08901-8554

Soil Test Report
 Lab #: 2012-19113

TerraSense, LLC
 Greg Thomas
 45 H Commerce Way
 Totowa, NJ 07512

Date Received: 2012-05-29
Date Reported: 2012-06-19

g_thomas@terrasenselab.com
 (973)812-1818
 (973)812-8640(fax)
Sample ID: 7966-12001 C3 S/22

Results and Interpretations

pH: 6.09 Slightly acidic; optimum pH range of many plants except acid-loving species.

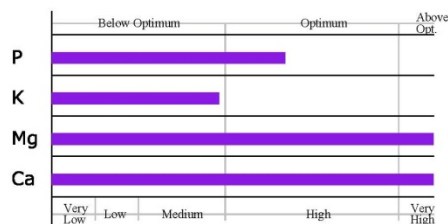
Lime Requirement Index: 7.77

The Lime Requirement Index (LRI) is a measure of the buffering capacity of the soil, its resistance to pH change, and is used to determine the appropriate amount of limestone, when necessary. LRI value near 8.0 indicates low buffering capacity of soil and a lower rate of limestone amendment compared to soil with high buffering capacity (LRI near 7.0).

Macronutrients (pounds per acre)

Phosphorous: 94 (Optimum)
Potassium: 141 (Below Optimum)
Magnesium: 489 (Above Optimum)
Calcium: 3165 (Above Optimum)

by Mehlich 3 extraction



Micronutrients (parts per million)

Zinc(Zn)	Copper(Cu)	Manganese(Mn)	Boron(B)	Iron(Fe)
9.96 (Adequate)	6.33 (Adequate)	197.10 (High)	0.89 (Adequate)	371.40 (High)

Special Tests Results

Organic matter by dichromate oxidation- Organic Matter= 3.8% Organic Carbon= 2.2%

Interpretation depends on soil texture for

Inorganic Nitrogen- Nitrate-N: 6 ppm Ammonium-N: 2 ppm

Appendix F

Qualifications of Preparers

James Mansky

Senior Project Director

Education

MS, Zoology/Botany, State
University of New York at
Brockport
BS, Biology, University of Miami,
FL

Professional Associations

National Association of
Environmental Professionals
Association of State Wetland
Managers

Years Experience

AECOM 24

Mr. Mansky has more than 25 years of experience as a principal ecologist. He is responsible for project management including: contract management, environmental impact analyses, alternatives evaluations, natural resource surveys, mitigation concepts and designs, water quality studies, federal and state permit applications, and regulatory coordination.

Experience

Public Service Electric and Gas Company, Forested Wetlands Mitigation, Hillsborough Township, New Jersey. Project Manager for the wetland enhancement mitigation plan constructed on the Duke Farm Estate to compensate for impacts to wetlands associated with improvements to a transmission line. The wetland mitigation area comprised 8.2 acres adjacent to a small tributary creek of the Raritan River; the site was vegetated with a monoculture of reed canary grass. The mitigation area was designed and planted with 1,400 trees of 20 species and 600 shrubs. Monitoring of the survival of the trees is being conducted for five years.

US Army Corps of Engineers, NEPA Environmental Impact Statement for Surface Coal Mine, Harrisburg, Illinois. Principal ecologist for the preparation of the NEPA EIS under a third-party contract to the Corps for a surface coal mine application. The proposed mine would impact approximately 500 acres of wetlands and mitigation was designed to reintroduce native wetland species and expansion of forest habitat with the relocation of a stream on approximately 1,000 acres of existing farmland.

The Mills Corp., Meadowlands Mills (US Army Corps of Engineers Permit Application and NEPA EIS), Secaucus, New Jersey. Project manager for the preparation of the preliminary NEPA EIS for a 600-acre mixed-use development involving the placement of more than 200 acres of fill material in wetlands. Prepared the Draft EIS under a third-party contract to the Corps. The evaluation of existing habitat quality included a four-season avian survey and monitoring of the site's hydraulics and hydrology. Wetlands mitigation included the conceptual design of a 206-acre freshwater marsh and a 129-acre brackish marsh. Water resource planning was conducted to determine the hydrology and hydraulics of the marsh systems to ensure adequate supply for the diverse vegetation proposed.

Public Service Electric and Gas Company, Delaware Estuary Wetland Mitigation Studies, Delaware Bay, New Jersey and Delaware. Project manager for the identification of natural and degraded wetlands suitable for mitigation in the Delaware Bay Estuary. Using aerial photography and mapping, identified more than 150,000 acres of existing and former tidal wetlands. Prepared conceptual design for the restoration of tidal flow to 4,500 acres of salt hay farms as part of estuarine habitat restoration. Investigated the feasibility of the restoration of tidal flow and establishment of smooth cordgrass (*Spartina alterniflora*) to areas colonized by common reed (*Phragmites australis*). Identified and evaluated impoundments for the installation of fish ladders to restore anadromous fish breeding habitat.

New Jersey Meadowlands Commission, Ecological Studies at the Secaucus High School Site, Secaucus, New Jersey. Deputy project manager responsible for baseline ecological studies on a 38-acre site including birds, mammals, and benthic invertebrates. A testing program that evaluated the physical and chemical properties of the sediment and was also conducted. Evaluated design alternatives to enhance the ecological value of the existing wetlands.

New Jersey Meadowlands Commission, Wetland Mitigation Design of Secaucus High School Site, Secaucus, New Jersey. Principal ecologist for the ecological enhancement of a 38-acre common reed (*Phragmites australis*) dominated site along the Hackensack River. Assisted in the preparation of a qualitative analysis of the water quality, wildlife habitat, and social benefits of the project.

New Jersey Meadowlands Commission, Riverbend Wetlands Mitigation, Secaucus, New Jersey. Deputy project manager for an analysis of the wetland mitigation on a 50-acre site. Field studies including sediment sampling were conducted to determine feasible methods of future wetland mitigation.

Lafarge Building Materials, Compliance with Endangered Species Act, Ravena, New York. Prepared a document as part of the permit application to the US Army Corps of Engineers to demonstrate the proposed dredging of a 10.5-acre area in the Hudson River would not have direct, indirect, or cumulative impacts to the endangered shortnose sturgeon (*Acipenser brevirostrum*).

Town of Bethlehem, Delineation of Submerged Aquatic Vegetation, Bethlehem, New York. Task manager responsible for delineation of submerged aquatic vegetation in the Hudson River in the vicinity of proposed water intake structures. Aerial mapping was obtained and interpreted. Mapping of the areas of submerged aquatic vegetation (SAV) protected by New York State were prepared.

New York State Department of Transportation, Environmental Assessment for Wantagh Parkway Bridge over Sloop Channel, Nassau County, New York. Project manager for preparation of the environmental assessment for the proposed replacement bridge. Conducted field investigations to prepare habitat/vegetative coverage maps and determine use of the area by threatened and endangered species. Prepared essential fish habitat assessment and applications for US Army Corps of Engineers and New York State permits.

General Services Administration, Expansion of the Land Port of Entry, Town of Champlain, New York. Task manager for obtaining the US Army Corps of Engineers permit and New York State Department of Environmental Conservation Water Quality certification for the placement of fill into 1.2 acres of freshwater wetlands associated with the expansion of the Border Station. Activities included; preparation of wetland delineation report and permit application, design of freshwater wetlands mitigation and compliance with New York State stormwater regulations.

Melissa A. Smith

Wildlife Biologist

Education

BS, Natural Resource Management,
Cook College, Rutgers University,
2002

Years of Experience

With AECOM: 7

With Other Firms: 4

Training and Certifications

40-hour HAZWOPER

CPR and First Aid

Intermittent and Perennial Stream
Identification for Regulatory
Applications

Endangered and Threatened
Species of Northern New Jersey

Endangered and Threatened
Species of Southern New Jersey –
Field Training

Environmental Permitting and
Construction Compliance Workshop

The Rutgers University Wetland
Delineator Series

Advanced Problems in Hydric Soil
Evaluation

NJDEP New Flood Hazard Control
Act Rules

FERC Environmental Compliance
Seminar

Impingement and Entrainment
Sampling

NJDEP Landscape Project Training

Ms. Smith has 11 years of experience as a wildlife biologist. She has experience conducting environmental surveys and preparing environmental assessments and permit applications. Ms. Smith has conducted, designed, and managed numerous field studies including wildlife management studies, wetland delineations, wetland mitigation monitoring, threatened and endangered species investigations, and vegetation surveys. Her experience in state and federal environmental permitting includes, but is not limited to, US Army Corps of Engineers Section 404 permits, New Jersey Department of Environmental Protection (NJDEP) Freshwater Wetlands general and individual permits, and NJDEP Flood Hazard Control Act individual permits.

Project Experience

Permitting/Compliance

Tennessee Gas Pipeline Company, Northeast Upgrade, Sussex, Bergen, and Passaic Counties, Tennessee. Prepared applications for New Jersey Department of Environmental Protection Freshwater Wetlands letter of interpretation (LOI) line verifications for two looping segments of a proposed natural gas pipeline facility.

New Jersey Turnpike Authority Interchange 6 to 9 Widening Program, New Jersey Pollution Discharge Elimination System (NJPDES) Stormwater Discharges Associated with Construction Activity (N.J.A.C. 7:14A), General Permit NJ0088323. Reviewed weekly inspection reports and prepared Annual Stormwater Inspection Summary Reports summarizing compliance issues for eleven construction contracts.

Williams - Transcontinental Gas Pipeline, Sentinel Expansion State and Federal Environmental Permitting, New Jersey and Pennsylvania. Project includes Federal Energy Regulatory Commission (FERC) environmental resource reports, informal threatened and endangered species agency consultation, Pennsylvania Water Obstruction and Encroachment permit, US Army Corps of Engineers Section 404 permits, New Jersey Flood Hazard Area individual permit, New Jersey Freshwater Wetlands Individual permits, and a New Jersey Tidelands one-fee license.

New Jersey Department of Transportation, Wilderness Fiber Installation, Northeastern ITS County and Municipal Permitting, Warren, Hunterdon, Somerset, and Middlesex Counties, New Jersey. Permitting included NJDOT utility opening permits, various county and local highway opening (or equivalent) permits for an approximately 60-mile proposed underground fiber optic cable installation.

South Jersey Transportation Authority, Atlantic City Expressway Westbound Widening, Atlantic and Camden Counties, New Jersey. New Jersey Flood Hazard Area individual permit application preparation for one-lane inside widening of the westbound lanes of the Atlantic City Expressway between milepost 8 and 31.

US Army Corps of Engineers and New Jersey Department of Military and Veteran's Affairs, Proposed Wind Turbine Biological Assessment, New Jersey. Prepared a biological assessment for compliance with US Fish and Wildlife Service (USFWS) Section 7(c) of the Endangered Species Act (ESA) of 1973. Biological assessment addressed piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), and sea beach amaranth (*Amaranthus pumilus*).

New Jersey Department of Military and Veteran's Affairs (NJDMAVA) Sea Girt National Guard Joint Training Center (NGJTC), Sea Girt, New Jersey, INRMP Services. Integrated Natural Resources Management Plan (INRMP) Support Services to New Jersey Army National Guard. Subcontracted on the 2010-2014 INRMP contract to supply threatened and endangered species/predator survey support to the Prime Contractor to implement the Facility's INRMP at the 170 acre NGJTC in Sea Girt, New Jersey.

New Jersey Department of Military and Veteran's Affairs (NJDMAVA) Sea Girt National Guard Joint Training Center (NGJTC), Sea Girt, New Jersey, Revised INRMP. Preparation of a revised Integrated Natural Resources Management Plan (INRMP) and associated NEPA support that guides activities from 2013 through 2017 for the New Jersey Army National Guard (NJARNG) NGJTC, Sea Girt, New Jersey.

Wetlands/Vegetation

Constitution Pipeline Company, LLC - Constitution Pipeline Project.

Conducted wetland delineations along portions of a proposed approximately 120-mile pipeline spanning from Susquehanna County, Pennsylvania to Schoharie County, New York.

Columbia Gas Transmission, NiSource Line 1570 Replacement, Washington and Allegheny County, Pennsylvania. Conducted wetland delineation and prepared follow-up summary report.

US Army Corps of Engineers, Finderne Farm Wetland Mitigation,

Bridgewater, New Jersey. Task manager/lead field biologist for ongoing vegetation monitoring of a 185-acre wetland and stream creation/enhancement project.

Columbia Gas Transmission, NiSource Line 1528 16-inch Replacement, Greene and Washington Counties, Pennsylvania and Marshall County, West Virginia. Conducted a rare plant survey and follow up report for wild senna (*Senna marilandica*), Curtis' golden-rod (*Solidago curtisii*), and leaf-cup (*Polymnia uvedalia*). Also conducted a wetland delineation and stream assessment along the 6-mile gas pipeline.

Columbia Gas Transmission, NiSource Line 773 4-inch Replacement, Greene County, Pennsylvania. Conducted a rare plant survey and follow-up report for leaf-cup.

Spitfire Airport, Layout Plan, Salem County, New Jersey. Conducted a wetland delineation and stream assessment on a 43-acre airport.

New York State Electric and Gas, Geneva – Border City Former Manufactured Gas Plant, Seneca County, New York. Conducted a wetland delineation and stream assessment on the 15-acre site.

Liberty Natural Gas Pipeline, Excalibur Expansion Wetland Delineations, Union and Middlesex Counties, New Jersey. Conducted a wetland delineation survey along a 12-mile proposed natural gas pipeline.

Williams - Transcontinental Gas Pipeline Corporation, Sentinel Expansion Wetland Delineation, New Jersey and Pennsylvania. Conducted wetland delineations along portions of a proposed 23-mile natural gas pipeline. Project location included portions of Union County, New Jersey and Luzerne County, Pennsylvania.

Williams - Transcontinental Gas Pipeline Corporation, Potomac Expansion Wetland Delineation, Pittsylvania, Campbell, and Fairfax Counties, Virginia. Conducted a wetland delineation for approximately 20-miles of proposed replacement pipeline.

Wildlife Studies

US Army Corps of Engineers and New Jersey Department of Military and Veteran's Affairs, New Jersey Army National Guard Training Center

Proposed Wind Turbine Preconstruction Avian Surveys, Sea Girt, New Jersey. Participated in development of avian survey protocol and in conducting breeding bird point counts, behavioral studies, and raptor, songbird, and wintering bird area search surveys over the period of one-year to assess potential impacts due to the construction of a proposed wind turbine. Also prepared follow-up behavioral study report.

Tennessee Gas Pipeline Company, Northeast Upgrade, Bald Eagle Survey, Westfall and Milford Townships, Pike County, Pennsylvania. Developed survey protocol in coordination with Pennsylvania Game Commission for ground and aerial-based surveys for bald eagles along approximately three miles of a proposed natural gas pipeline looping facility. Conducted transect surveys and nest monitoring in accordance with established protocol and prepared follow-up

summary report submitted to Pennsylvania Game Commission and US Fish and Wildlife Service.

Liberty Natural Gas Pipeline, Excalibur Expansion Endangered Species Habitat Assessment, Union and Middlesex Counties, New Jersey. Conducted habitat assessment for black-crowned night-heron (*Nycticorax nycticorax*), least tern (*Sternula antillarum*), northern harrier (*Circus cyaneus*), osprey (*Pandion haliaetus*), peregrine falcon (*Falco peregrinus*), pied-billed grebe (*Podilymbus podiceps*), and yellow-crowned night-heron (*Nyctanassa violacea*).

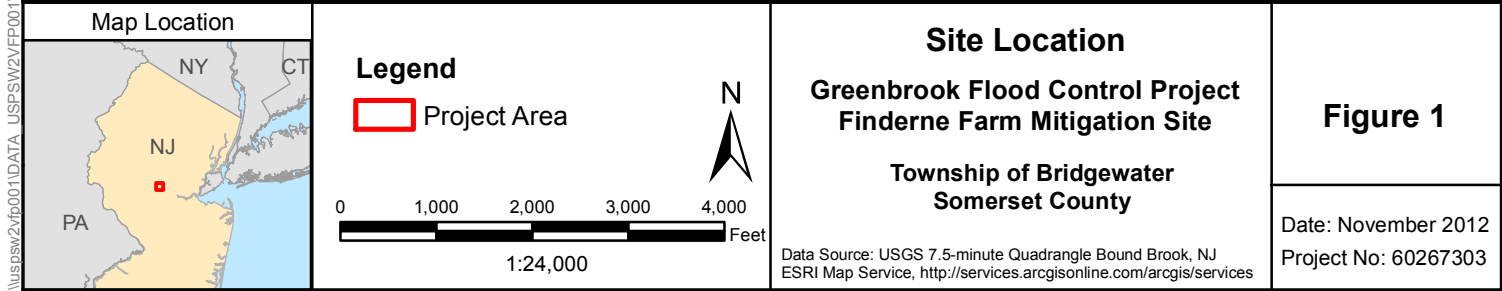
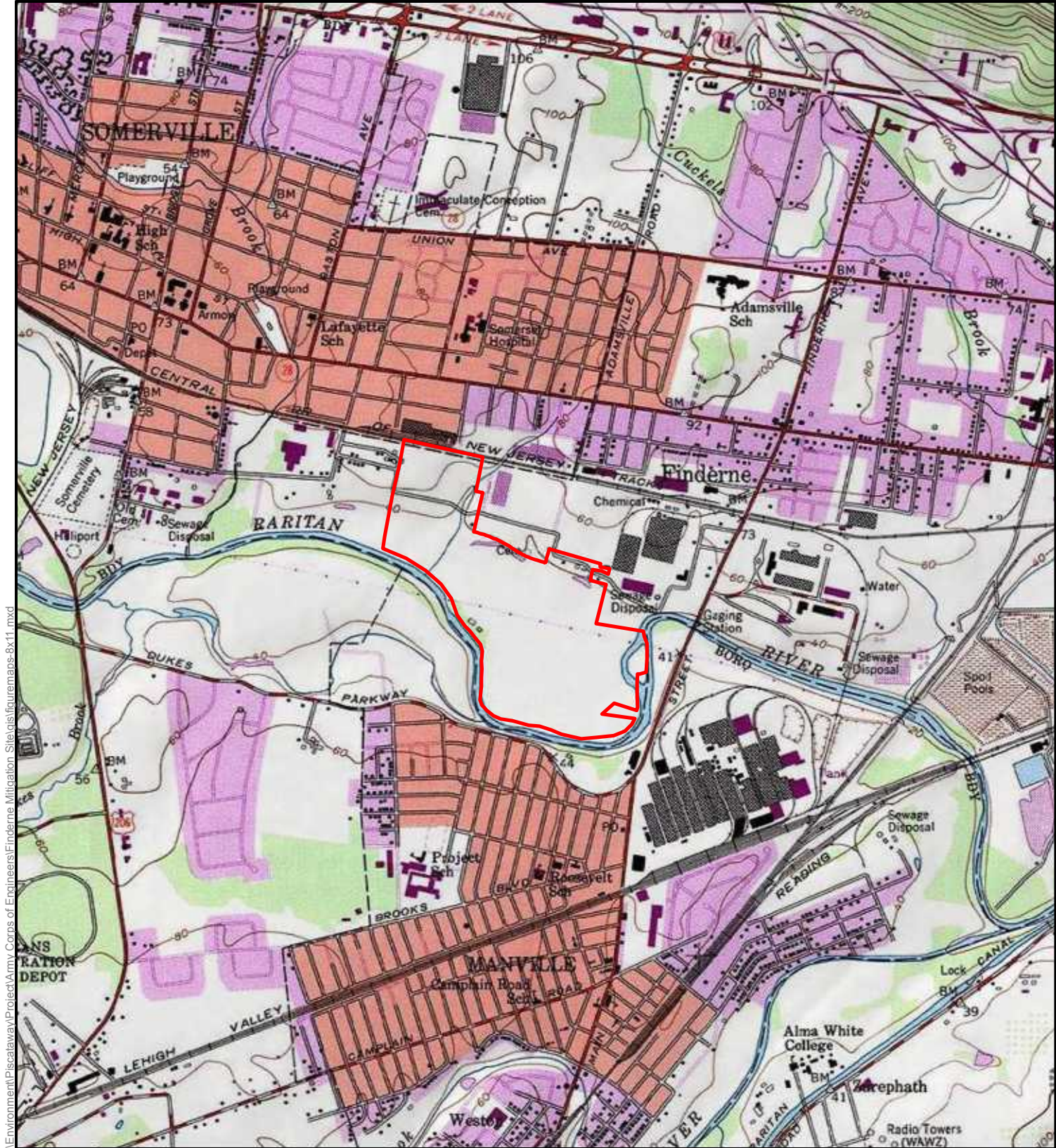
New Jersey Division of Fish and Wildlife, Beach-nesting Bird Surveys and Daily Monitoring, Monmouth County, New Jersey. Field biologist that participated in several avian surveys and daily monitoring programs for nesting piping plover, least tern, common tern (*Sterna hirundo*), and American oystercatcher (*Haematopus palliatus*). Responsibilities also included monitoring a federally listed plant species, seabeach amaranth.

New Jersey Bureau of Coastal Engineering, Wreck Pond River Herring Field Monitoring and Assessment, Monmouth County, New Jersey. Scheduled and conducted 2006 and 2007 surveys for river herring to assess the effects to passage rates due to the extension of an existing outfall pipe.

Williams - Transcontinental Gas Pipeline Corporation, Night-Heron Survey, Sentinel Expansion, Turnpike Loop, Union County, New Jersey. Designed and conducted a study using flight-line counts to document black-crowned and yellow-crowned night-heron use of potentially suitable habitat within the proposed project area.

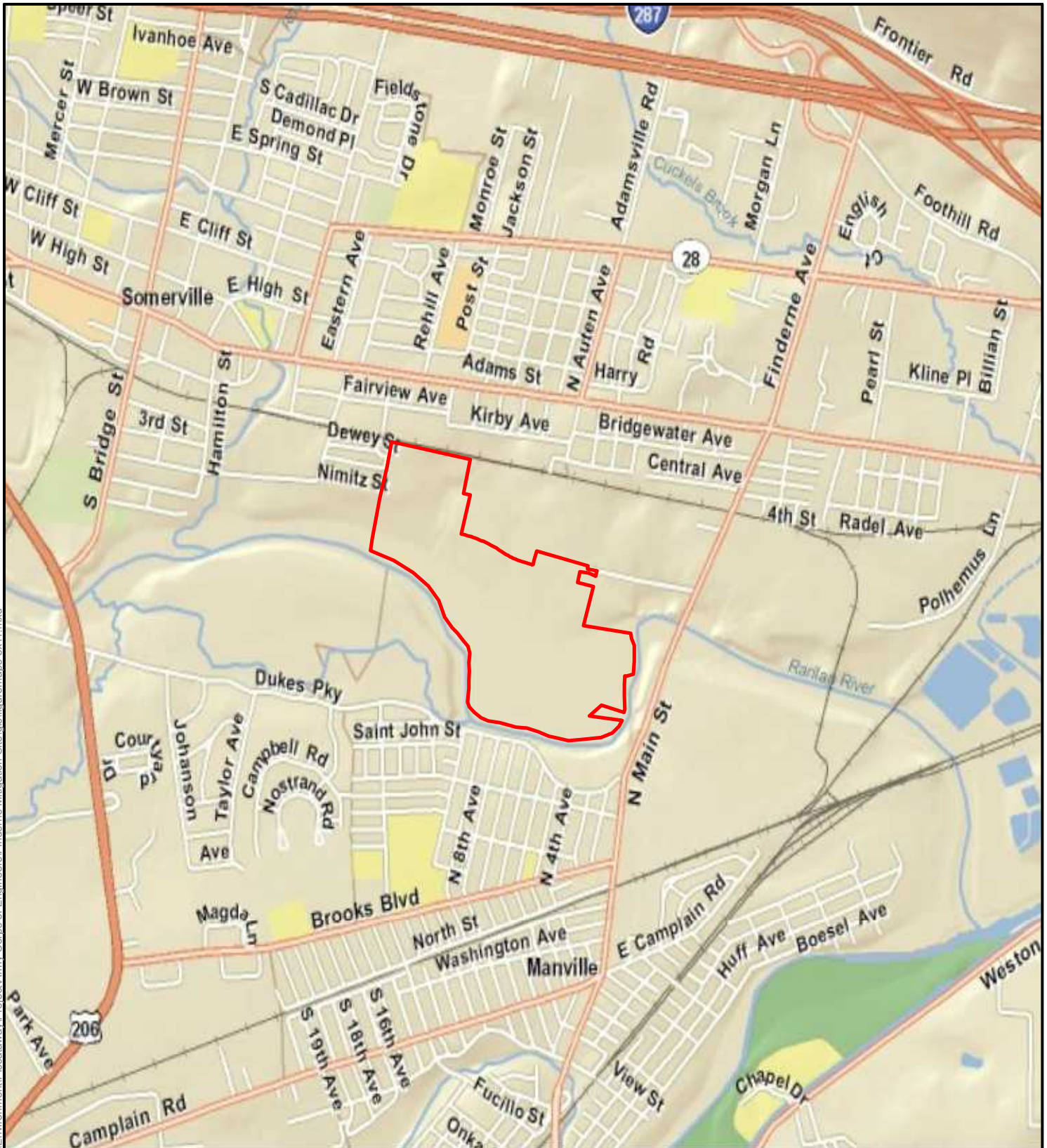
Williams - Transcontinental Gas Pipeline Corporation, Black-Crowned Night-Heron and Indiana Bat Surveys, Leidy to Long Island Expansion Morgan Replacement, Middlesex County, New Jersey. Designed and conducted a study using flight-line counts to document black-crowned night-heron use of potentially suitable habitat within the proposed natural gas project area. Also conducted a habitat assessment for Indiana bat (*Myotis sodalist*).

Figure 1 USGS Site Location Map



I:\uspsw2\p001\DATA_USP\SW2\FP001\Environment\Piscataway\Project\Army Corps of Engineers\Finnerne Mitigation_Site\figuremaps-8x11.mxd

Figure 2 County Road Map



Map Location



Legend

Project Area



0 1,000 2,000 3,000 4,000 Feet
1:24,000

County Road Map

**Greenbrook Flood Control Project
Finnerne Farm Mitigation Site**

**Township of Bridgewater
Somerset County**

Figure 2

Date: November 2012
Project No: 60267303

Data Source: ESRI Street Map World 2D
ESRI Map Service, <http://services.arcgis.com/arcgis/services>

Figure 3 Aerial Planting Zone Location Map

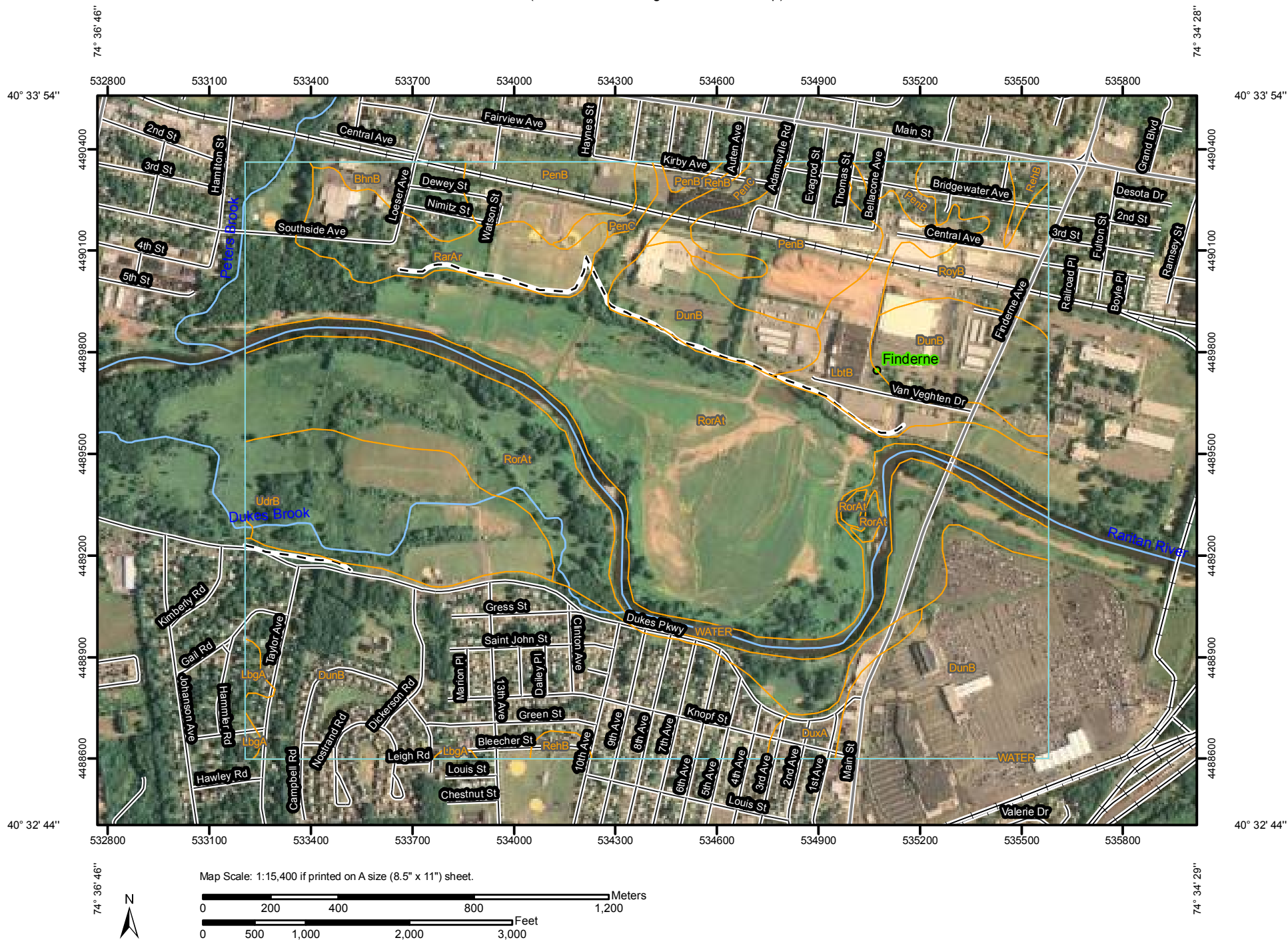


Map Location 	Legend <table border="0"><tr><td> Emergent Wetland</td><td> Wetland Forest</td><td> Wetland Scrub Shrub</td></tr><tr><td> Stream Bank Planting</td><td> Riparian Forest (Boundary Estimated)</td><td></td></tr></table> <div style="text-align: right;"> </div>	Emergent Wetland	Wetland Forest	Wetland Scrub Shrub	Stream Bank Planting	Riparian Forest (Boundary Estimated)		Aerial Planting Zones Finderne Farm Mitigation Site	
		Emergent Wetland	Wetland Forest	Wetland Scrub Shrub					
Stream Bank Planting	Riparian Forest (Boundary Estimated)								
Date: November 2012 Project Number: 60267303	Figure 3								

\\uspsv2\fp001\DATA_USPSV2\FP001\Environment\Piscataway\Project\Army_Corps of Engineers\Finderne Mitigation Site\gis\2012_planting_areas.mxd

Figure 4 Soils Map


Soil Map—Somerset County, New Jersey
(Finderne Farm Mitigation Site Soil Map)



Soil Map—Somerset County, New Jersey
(Finderne Farm Mitigation Site Soil Map)

MAP LEGEND






















Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Special Point Features

-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot
-  Spoil Area
-  Stony Spot



Very Stony Spot



Wet Spot



Other

Special Line Features



Gully



Short Steep Slope



Other

Political Features



Cities

Water Features



Oceans



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

MAP INFORMATION

Map Scale: 1:15,400 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>

Coordinate System: UTM Zone 18N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Somerset County, New Jersey

Survey Area Data: Version 9, Aug 18, 2008

Date(s) aerial images were photographed: 8/13/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



Map Unit Legend

Somerset County, New Jersey (NJ035)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BhnB	Birdsboro silt loam, 2 to 6 percent slopes	14.8	1.4%
DunB	Dunellen sandy loam, 3 to 8 percent slopes	318.6	30.8%
DuxA	Dunellen moderately well drained sandy loam, 0 to 2 percent slopes	10.6	1.0%
LbgA	Lamington silt loam, 0 to 2 percent slopes	3.9	0.4%
LbtB	Lansdowne silt loam, 2 to 6 percent slopes	37.3	3.6%
PenB	Penn silt loam, 2 to 6 percent slopes	72.7	7.0%
PenC	Penn silt loam, 6 to 12 percent slopes	15.1	1.5%
RarAr	Raritan silt loam, 0 to 3 percent slopes, rarely flooded	38.7	3.7%
RehB	Reaville silt loam, 2 to 6 percent slopes	7.4	0.7%
RorAt	Rowland silt loam, 0 to 2 percent slopes, frequently flooded	362.9	35.1%
RoyB	Royce silt loam, 2 to 6 percent slopes	37.2	3.6%
UdrB	Udorthents, refuse substratum, 0 to 8 percent slopes	71.9	6.9%
WATER	Water	43.9	4.2%
Totals for Area of Interest		1,035.1	100.0%

**Figure 5 Vegetation Monitoring Finderne Farm Mitigation Site
(includes Soil Boring Locations and Site Photo Locations)**



J:\Project\Army Corps of Engineers\Finderne Mitigation Site\2012 monitoring locations.mxd

<p>Map Location</p>	<p>Legend</p> <div><div><div>●</div>Fall 2012 Vegetation Plot Location</div><div><div>●</div>Spring 2012 Vegetation Plot Location</div><div><div>▲</div>2012 Soil Boring Location</div><div><div>▲</div>2012 Soil Profile Location</div></div> <div><p>Planting Area</p><div><div>■</div>Emergent Wetland</div><div><div>■</div>Stream Bank Planting</div><div><div>■</div>Wetland Forest</div><div><div>■</div>Riparian Forest (Boundary Estimated)</div><div><div>■</div>Wetland Scrub Shrub</div></div> <div><div>0200400800</div><div>Feet</div></div> <div></div>
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