

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.

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
С	EC1, E1, C1, C2, C3, E4, E5, E6, E7	Palustrine forested wetland	35.25
		Total	62.28

Table 1 PLANTING ZONES, COVER TYPES AND ACREAGE SUMMARY

Table 2 PLANTING ZONE DENSITIES²

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

¹Live Stakes ²Plantings were completed in 2006.

Table	3
PLANTED TREES	AND SHRUBS

Planting Zone	Scientific Name	Common Name			
	Acer saccharinum	Silver maple			
	Betula nigra	River birch			
	Carya ovata	Shagbark hickory			
	Platanus occidentalis	American sycamore			
٨	Quercus palustris	Pin oak			
A	Cornus amomum	Silky dogwood			
	Lindera benzoin	Northern spicebush			
	Amelanchier canadensis	Canadian serviceberry			
	Sambucus canadensis	Common elderberry			
	Viburnum prunifolium	Blackhaw			
	Quercus bicolor	Swamp white oak			
	Quercus phellos	Willow oak			
	Fraxinus pennsylvanica	Green ash			
	Platanus occidentalis	American sycamore			
C	Quercus palustris	Pin oak			
C	Nyssa sylvatica	Black gum			
	Clethra alnifolia	Coastal sweet pepperbush			
	Cornus amomum	Silky dogwood			
	Vaccinium corymbosum	Highbush blueberry			
	Viburnum dentatum	Southern arrowwood			
	Alnus serrulata	Smooth alder			
P	Cephalanthus occidentalis	Common buttonbush			
D	Cornus stolonifera	Red-osier dogwood			
	Viburnum dentatum	Southern arrowwood			
	Pontederia cordata	Pickerelweed			
	Sparganium americanum	American bur-reed			
	Sagittaria latifolia	Broadlead arrowhead			
	Scirpus atrovirens	Softstem bulrush			
	Saururus cernuus	Lizard's tail			
	Penstemon digitalis	Talus slope penstemon			
E	Carex stipata	Owlfruit sedge			
	Carex lurida	Shallow sedge			
	Eupatorium coelestinum	Blue mistflower			
	Eupatorium maculatum	Spotted trumpetweed			
	Eupatorium perfoliatum	Common boneset			
	Eupatorium purpureum	Sweetscented joe-pye-weed			
	Spiraea tomentosa	Steeplebush			
F1, F2, K	Salix spp.	Willow sp.			
	Clethra alnifolia	Coastal sweet pepperbush			
	Cornus amomum	Silky dogwood			
1	Vaccinium corymbosum	Highbush blueberry			
	Viburnum dentatum	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 were 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 pensylvanica, 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 amonum, 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 amonum, 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 <i>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 hastate*), 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 three feet apart using triangular spacing. In Planting Zone K, live stakes of *Salix* spp. were installed approximately three 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 quadrate 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 quadrate plots were utilized in non-woody planting areas. Quadrate 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 umbellate, 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 4WETLAND ENHANCEMENT & CREATION AND RIPARIAN PLANTING AREASCORRESPONDING PLOTS(SPRING 2012 SURVEYS)

							Planti	ng Are	eas						
	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		
Plots	53		58	35				4	8	45	29	23			
	54			36						46	30	24			
				37						47	31	25			
				38											
				39											
				40											
				41											

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

							Plantir	ng Are	as						
	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			
Plots	44			22						32	11	17			
				23						33	12	34			
				24											
				25											
				26											
				27											

Planting Areas	AverageAverageIanting AreasPercentSurvival 1(woodySurvival 1stems/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 site ⁴ (enhancement)	9	223	412	54
C1	28	242	306	61
C2	23	203	228	79
C3	38	333	3106	52
Average for site ⁴ (creation)	30	259	1213	64
A5	17	150	1000	10
A1	8	67	67	78
Average for site ⁴ (riparian)	13	109	534	44

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

Notes:

Notes:
 ¹ Excludes recruits (species that were not planted but have begun to establish)
 ² Pre-existing mature canopy not included in density calculations
 ³ Average of F2 and K Planting Zone vegetation monitoring data
 ⁴ Average for overall enhancement, creation, or riparian areas are calculated using the averages shown above for each planting area.

⁵Average height was not included in total average when no woody plants were documented.

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 sagitatta* (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).

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	

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

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 dominant 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 japonicas* (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.

Planting	Re	doximorphic (inches belo	Features E w ground	Depth Rang surface)	Saturation (inches below ground surface)					
Alea	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	-	-	-	-

Table 8 SUMMARY OF SOIL OBSERVATIONS

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 redoxomprophic 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 9SOIL SATURATION AND GROUNDWATER LEVELSOBSERVED 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.

							Micronut	nutrients								
	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		

 Table 10

 HORTICULTURAL CHARACTERISTIC OF SOILS

		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	

	Micronutrients												
Location		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						

Table 10	
HORTICULTURAL CHARACTERISTIC OF SOILS (C	ONTINUED)

Location				рН				Organic Matter (%)						
Location	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

							Macronut	rients						
Location			Phos	phorus (lbs/a	ac)			Potassium (Ibs/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

 Table 10

 HORTICULTURAL CHARACTERISTIC OF SOILS (CONTINUED)

		Macronutrients													
Location			Magn	esium (Ibs/a	c)			Calcium (Ibs/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:

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						

Table 11 PLASTIC INDEX OF SOILS

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 onsite 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, Circium arvense, Brassica rappa, 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.

Lysmachia 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. *Ranuncus 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.

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	-	

Table 12 SUMMARY OF AVERAGE PERCENT SURVIVAL AND NATIVE PLANT COVERAGE

Notes:

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 creations 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.

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	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 Areas ²	-	-	-	-	8	13	-	-	-	-	26	46

 Table 13

 COMPARISON OF VEGETATION MONITORING RESULTS

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).
- 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).
- 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).

 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.

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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

August 5, 2005

Bradley M. Campbe

Commissioner

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

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.

Richard J. Codey Acting Governor 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,

Virginia KopKash

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*



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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.

		Application No.	
Permit No.		180	14-00-0005 2-FWTP
1804-00-0005.2-FWI	LL	1	
Issuance Date	Effective Date	2001	Expiration Date
	<u>OCT 19</u>	LOUI	
Name and Address of Applicant	Name and Addre	ess of Owner	Name and Address of Operator
State of New Jersey	N/A		
DEP/ Division of Engineering	and		
Construction			
Attn: Charles Defendorf			
Location of Activity/Facility (Street Add	lress) Issuing Division		Statute(s)
Portions of Areas adjacent to E	Billian		NJSA 13:9B
Legion Park E. Main Street, East S	Street. Land Use Reg	gulation Progra	am NJSA 58:10A
Bound Brook Borough Sor	merset		
Doullo Diook Dolough, Dor			
County			
	<u> </u>		A analysis of Capacity
Type of Permit Individual Permit		Maximum A	Approved Capacity,
Water Quality Certi	ificate	n application	~

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 B Andfew Clark Environmental Specialist

(See page 8 for manager's signature.)

Revised Date	Approved by the Department of Envi	ronmental Protection		
	Name (Print or Type)	Title		
	Cignoture	~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 was 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 MORTAGES 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		
5	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

4.

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

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 preconstruction 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

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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).

1) 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), Phragmities australis (Common reed grass), Pueraria montana (Kudzu), Typha latifloia (Broad-leaved cattail), Typha angustifolia (Narrowed leaved cattail), Lythrum salicaria (Purple loosestrife), Ailanthus altissima (Tree-of-heaven), Berberis thunbergi (Japanese barberry), Berberis vulgaris (Common barberry), Elaeagnus angustifloia (Russian olive), Elaeagnus umbellata (Autumn olive), Ligustrum obtusifolium (Japanese privet), Ligustrum vulgare.(Common privet) and Rosa multiforia (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:

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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;

The site has an 85 percent survival and 85 percent areal coverage of the mitigation ii. plantings or target hydrophytes which are species native to the area and similar to ones identified on the mitigation planting plan;

The site is less than 10 percent occupied by invasive or noxious species such as but iii. not limited to Phalaris arundinacea (Reed canary grass), Phragmities australis (Common reed grass), Pueraria montana (Kudzu), Typha latifloia (Broad-leaved cattail), Typha angustifolia (Narrowed leaved cattail), Lythrum salicaria (Purple loosestrife), Ailanthus altissima (Tree-of-heaven), Berberis thunbergi (Japanese barberry), Berberis vulgaris (Common barberry), Elaeagnus angustifloia (Russian olive), Elaeagnus umbellata (Autumn olive), Ligustrum obtusifolium (Japanese privet), Ligustrum vulgare (Common privet) and Rosa multiforia (Multiflora rose);

The site contains hydric soils or there is evidence of reduction occurring in the soil; iv. and,

That the proposed hydrologic regime as specified in the mitigation proposal, which v. 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:

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 offsite 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.

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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 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





N \mathbf{O} SHEE. 111 SEE Ш И CH



	5	4	3	2	1
	AREA (AC): TOTAL AC PER ZONE:	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	A 8-2 A 8-3 A 8-4 C 1 C 2 C 3 C 4 C 5 C 6 C 7 0.9 0.4 3.3 3.4 10.7 9.5 2.4 3.75 1.6 0.6 1 35.25	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	F 2 G 1 H 1 H 2 H 3 H 4 I 1 J 1 0.8 39.3 3.7 2.37 5.4 0.8 0.4 0.3 39.3 12.27 0.4 0.3
	Total				
A	Spacing Quantity Acer Saccharinium 8 feet O.C. 3,650	492 68 4 80 94 823 195 815 12	20 54 447 458		
A A	Betula Nigra 8 feet O.C. 3850 Carya Ovata (sub. for cordoformis) 8 feet O.C. 3850	492 68 4 80 94 823 195 815 12 492 68 4 80 94 823 195 815 12 492 68 4 80 94 823 195 815 12 492 68 4 80 94 823 195 815 12	20 54 447 458 20 54 447 458 20 54 447 458		
A A	Platanus Occidentais 8 feet O.C. 3650 Quercus Palustris 8 feet O.C. 3650	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	20 54 447 458 20 54 447 458 13 19 160 164		
A	Lindera Benzoin + sub below 15 feet O.C. 1300 Amelanchier Canadencis (sub) 15 feet O.C. 105	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	19 100 104 101 37 16 137 140 100 6 4 23 23 100		
A	Sambucus Canadensis 15 feet O.C. 1300 Viburum Prunifolium 15 feet O.C. 1300	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0 4 25 25 43 19 160 164 43 19 160 164		
A	Warm Season Native Seed Mix, Type N 50 lbs/acre 1349	183 25 2 30 35 303 73 300 4	15 16 161 45 20 165 170		
B	Carya Ovata 8 feet O.C. 900 290 1 Liriodendron Tulipifera 8 feet O.C. 900 290 1	102 232 276 102 232 276			
B	Quercus Alba 8 feet O.C. 900 290 1 Quercus Rubra 8 feet O.C. 900 290 1	102 232 276 102 232 276			
B B	Quercus Velutina - sub below 8 feet O.C. 0 0 Quercus Alba 8 feet O.C. 300 97	0 0			
B B	Cercis Canadensis 8 feet O.C. 325 105 Quercus Phellos 8 feet O.C. 300 97	37 83 100 34 77 92			
B B	Cornus Florida 15 feet O.C. 325 105 Amelanchier Canadensis (substitute item) 15 feet O.C. 315 103	36 84 100 32 82 98			
B B	Viburnum Dentatum 15 feet O.C. 325 105 Viburnum Prunifolium 15 feet O.C. 325 105	36 84 100			
С	Acer Negundo (sub items below) 8 feet O.C. 0				
C C	Quercus Bicolor 10-20" 8 feet O.C. 2500 Quercus Bicolor 5-12" 8 feet O.C. 390		758 674 170 266 114 42 71 118 105 27 41 18 6 11	149 50 99 107 23 8 16 17	
C	Quercus Phellos 3-6" 8 feet O.C. 1888 Fraxinus Pensylvanica 8 feet O.C. 4845		573 509 128 200 86 32 54 1,470 1,306 330 515 220 81 138	112 38 75 81 289 96 193 207	
C	Platanus Occidentalis 8 feet O.C. 4860 Quercus Palustris 8 feet O.C. 4850		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	290 97 194 208	
C	Nyssa Sylvatica 8 feet O.C. 4778 Clethra Alnifolia 15 feet O.C. 1700		1,450 1,288 325 508 217 80 136 516 458 116 181 77 29 48	285 95 190 204 101 34 68 72	
C C	Vaccinium Corymbosum 15 feet O.C. 1700 Viburoum Denatum 45 6 400 4300		516 438 116 181 77 29 48 516 458 116 181 77 29 48 516 458 116 181 77 29 48	101 34 68 72 101 34 68 72	
С	Wet Meadow Seed Mix, Type W 38 Ibs/acre 1,340		407 361 91 143 61 23 38	101 34 03 72 1 <th1< th=""> <th1< th=""> 1 1</th1<></th1<>	
D	Alnus Serrulata 12 feet O.C. 415 Cephalanthus Occidentalis 12 feet O.C. 415			62 46 269 38 62 46 269 38	
D D	Cornus Stolonifera 12 feet O.C. 415 Viburnum Dentatum 12 feet O.C. 415			62 46 269 38 62 46 269 38	
E	Pontedaria Cordata 3 feet O.C. 842			842	
E E	Sparganium Americanum 3 feet O.C. 842 Sagittaria Latifolia 3 feet O.C. 842			842 842 842	
E E	Scipus Atrovirens 3 feet O.C. 842 Saururus Cemuus 3 feet O.C. 842			842 842	
E E	Penstemon Digitalis 3 feet O.C. 2480 Carex Stipata 3 feet O.C. 3625			2,480 3,625	
E E	Carex Lurida 3 feet O.C. 3825 Eupatorium Coelestinum 3 feet O.C. 1950			3,625	
E E	Eupatorium Maculatum 3 feet O.C. 3280 Eupatorium Perfoliatum 3 feet O.C. 3280			3,280 3,280 3,280	
E E	Eupatorium Purpureum 3 feet O.C. 3280 Spirea Tomentosa 30 feet O.C. 100			3,280	
F	Salix Species 3 feet O.C. 7500 Wet Meadow Seed Mix Type W co. r. co.				
r C	Wern Secon Netve Seed Mix Ture N 50				1.065
Ч	Wall Season Paulye Seed Mix, Type IN 50 IDS/acre 1,805 Recreational Field Seed Mix 250 Unclosed 2000				925 593 1 350 200
T	Clethra Alnifolia 8 feet o.c 70				
I I	Cornus Amonum 8 feet O.C. 70 Vaccinium Corymbosum 8 feet O.C. 70				
I I	Viburnum Dentatum 8 feet O.C. 70 Wet Meadow Seed Mix, Type W 38 lbs/arre 15.2				
 J	Comus Amomum 8 feet O.C. 50				
J	Lindera Benzoin 8 feet O.C. 50 Sambucus Canadensis 8 feet O.C. 50				
J J	Viburnum Prunifolium 8 feet O.C. 50 Warm Season Native Seed Mix, Type N 50 lbs/acre 15				50
·					

		5						Z	1									3									2								1	
	ZONE:			B 1 B	2 B	3 3 B 4	Al	A 2 A 3	A 4	A 4c A	5 A 7	A 6	A 8-1	A 8-2	A 8-3 A	8-4 C 1	C 2	C 3	С4	C 5	C 6 C 7	7 C 1	8 C 9	C 10	C 11 D	1 D 2	2 D 3	D4 F	1 E 2	F1 F	2 G	61 H1	H2 H3	— н4		J1
	AREA (AC): TOTAL AC PER ZONE:			2 0	0.7 6.2	1.6 1.9	3.66	0.5 0.03	0.6	0.69 6	5.05 1.45 26.98	6	0.9	0.4	3.3 3.	4 10.7	9.5	2.4	3.75	1.6	0.6 1 35.25	2.1	1 0.7	1.4	1.5 0	.8 0.6	3.5 5.4	0.5 0.	87 4.69 5.56	0.7 0.3	8 3	9.3 3.7 9.3	2.37 5.4 12.27	0.8	0.4	0.3
		Spacing	Total Quantity																																	
A A	Acer Saccharinium Betula Nigra	8 feet O.C. 8 feet O.C.	3,650				492 492	68 4 68 4	80 80	94 8 94 8	323 195 323 195	815 815	120 120	54 54	447 45 447 45	58																			++	
A A	Carya Ovata (sub. for cordoformis) Platanus Occidentalis	8 feet O.C. 8 feet O.C.	3650 3650				492 492	68 4 68 4	80 80	94 8 94 8	323 195 323 195	815 815	120 120	54 54	447 45 447 45	58 58																				
A A	Quercus Palustris Cornus Amonum	8 feet O.C. 15 feet O.C.	3650 1300				492 176	68 4 24 1	80 29	94 8 32 2	323 195 292 70	815 290	120 43	54 19	447 45 160 16	58 54																		<u> </u>		
A A	Amelanchier Canadensis (sub)	15 feet O.C. 15 feet O.C. 15 feet O.C.	1113				25	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	25 4 29	4 32	$ \begin{array}{c cccccccccccccccccccccccccccccccccc$	248 41 290	57 6 43	4	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	3 54																		<u> </u>	+	
A A	Viburnum Prunifolium Warm Season Native Seed Mix. Type N	15 feet O.C. 15 feet O.C. 50 lbs/acre	1300				176 183	24 1 25 2	29 29 30	32 2 32 2 35 3	292 70 303 73	290 290 300	43 45	19 20	160 16 165 17	54 70																		+	+	
в	Carya Ovata	8 feet O.C.	900	290 1	.02	232 276																														
B B	Liriodendron Tulipifera Quercus Alba	8 feet O.C. 8 feet O.C.	900	290 1 290 1	02	232 276 232 276 232 276																	_											<u> </u>		
B B	Quercus Kubra Quercus Velutina - sub below Ouercus Alba	8 feet O.C. 8 feet O.C. 8 feet O.C.	000	290 1 0 97 3	0	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$																												+	+	
B B	Cercis Canadensis Quercus Phellos	8 feet O.C. 8 feet O.C.	325	105 3 97 3	37 34	83 100 77 92																												+	+	
B B	Cornus Florida Amelanchier Canadensis (substitute item)	15 feet O.C. 15 feet O.C.	325 315	105 3 103 3	36 32	841008298																												<u> </u>		
B B	Viburnum Dentatum Viburnum Prunifolium	15 feet O.C. 15 feet O.C.	325 325	105 3 105 3	36 36	84 100 84 100																												<u> </u>		
C C	Acer Negundo (sub items below) Quercus Bicolor 10-20"	8 feet O.C. 8 feet O.C	0													758	674	170	266	114	42 71	L 14	9 50	99	107										+	
C C	Quercus Bicolor 5-12" Quercus Phellos 3-6"	8 feet O.C. 8 feet O.C.	390													118 573	105 509	27 128	41 200	18 86	6 11 32 54	1 23 4 11	3 8 2 38	16 75	17 81										+	
C C	Fraxinus Pensylvanica Platanus Occidentalis	8 feet O.C. 8 feet O.C.	4845 4860													1,470) 1,306 2 1,307	330 332	515 516	220 222	81 133 82 140	8 28 0 29	89 96 10 97	193 194	207 208											
C C	Quercus Palustris Nyssa Sylvatica Clethra Albifolia	8 feet O.C. 8 feet O.C.	4850													1,472	2 1,306 1,288 458	330 325	514 508	222 217 77	80 140 80 130 29 48	$ \begin{array}{c c} 0 & 29 \\ 6 & 28 \\ 7 & 10 \end{array} $	$ \begin{array}{c cccc} 90 & 94 \\ 85 & 95 \\ 91 & 32 \end{array} $	194 190	208 204 72										+	<u> </u>
C C	Cornus Amonum Vaccinium Corymbosum	15 feet O.C. 15 feet O.C. 15 feet O.C.	1700													516	458	116 116 116	181 181 181	77 77 77		3 10 3 10 3 10	$\frac{3}{1}$ $\frac{3}{34}$	68 68	72 72 72									+	+	
C C	Viburnum Denatum Wet Meadow Seed Mix, Type W	15 feet O.C. 38 lbs/acre	1700													516 407	458 361	116 91	181 143	77 61	29 48 23 38	3 10 3 80	01 34 0 27	68 53	72 57										+	
D	Alnus Serrulata	12 feet O.C.	415																						(52 46	269	38								
D D D	Cornus Stolonifera Viburoum Dentatum	12 feet O.C. 12 feet O.C. 13 feet O.C.	415																							52	269 269 269	38 38 38						<u> </u>	+	
E	Pontedaria Cordata	3 feet O.C.	842																									8	42					<u> </u>	+	
E E	Sparganium Americanum Sagittaria Latifolia	3 feet O.C. 3 feet O.C.	842 842																									8	42 42							
E E F	Sciipus Atrovirens Saururus Cemuus Penetemon Dicitalia	3 feet O.C. 3 feet O.C.	842 842																									8	42 42 2 494					<u> </u>	+	
E E E	Carex Stipata Carex Lurida	3 [feet O.C. 3 [feet O.C. 3 [feet O.C.	2480 3625 3625																										3,62	5				<u> </u>	+	
E E	Eupatorium Coelestinum Eupatorium Maculatum	3 feet O.C. 3 feet O.C.	1950 3280																										1,95 3,28)				<u> </u>		
E E	Eupatorium Perfoliatum Eupatorium Purpureum	3 feet O.C. 3 feet O.C.	3280 3280																										3,28)						
E F	Spirea 1 omentosa	30 feet O.C. 3 feet O.C	7500																										100	3.500 4.00	000			+	+	
F	Wet Meadow Seed Mix, Type W	38 Ibs/acre	57																											26.6 30.	0.4			<u> </u>	<u>+</u> †	
G	Warm Season Native Seed Mix, Type N	50 lbs/acre	1,965																												1,	965		<u> </u>		
H	Recreational Field Seed Mix	250 Ibs/acre	3,068																													925	593 1,35) 200		
I I T	Cieura Amfiolia Cornus Amonum Vaccinium Corymbosum	8 feet O.C. 8 feet O.C.	70 70 70																															+	70 70 70 70	
I I	Viburnum Dentatum Wet Meadow Seed Mix, Type W	8 feet O.C. 38 lbs/acre	70																																70 15	
J	Cornus Amomum	8 feet O.C.	50																																	50
J J	Lindera Benzoin Sambucus Canadensis	8 feet O.C. 8 feet O.C.	50 50																																	50 50
J J	Viburnum Prunifolium Warm Season Native Seed Mix, Type N	8 feet O.C. 50 lbs/acre	50 15																															<u> </u>		50 15

	ě	SCALE IN FEET		
6	5		4	









	8	-	7	
F				N 626
E				E 465,50
D				
C				
В				
A	NOTES: REFER TO C22 FOR PLANTING DESIGNATIONS. NO SEEDING/PLANTING ON NATURE TRAIL.		А В С D	RIPARIAN FOREST UPLAND FOREST WETLAND FOREST UPLAND SCRUB SHRUB







	F	STREAMBANK PLANTING		
-	G	GRASSLAND	+ + + + + + + + + + + + + + + + + + +	
SHRUB	Н	RECREATIONAL FIELDS		0 25 50
				SCALE IN FEET

$\hat{\mathbf{b}}$	5	



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
Herbaceous Species		
Allegheny blackberry	Rubus allegheniensis	FACU
American burro-reed	Sparganium americanum	OBL
American marshpennywort	Hydrocotyle americana	OBL
Arrow arum	Peltandra virginica	OBL
Arrow-leaf tearthumb	Polygonum sagittatum	OBL
Aster spp.	Aster spp.	_
Barnvard grass	Echinochloa crus-galli	FAC
Bearded beggar-ticks	Bidens aristosa	FACW
Beggar-ticks	Bidens sp.	_
Bentgrass	Agrostis sp.	ii
Bindweed	Calvstegia sepium	FAC
Bitter dock	Rumex obtusifolius	FAC
Black mustard	Brassica nigra	NI
Black-eyed Susan	Rudbeckia hirta	FACU
Bladder sedge	Carex intumescens	FACW
Blue vervain	Verbena hastata	FACW
Broadleaf arrowhead	Sagittaria latifolia	OBL
Broad-leaved cattail	Tvpha latifolia	OBL
Brome grass	Bromus spp.	
Buttercup	Ficaria verna	FACW
Canadian goldenrod	Solidago canadensis	FACU
Canadian thistle	Cirsium arvense	FACU
Clearweed	Pilea pumila	FACW
Climbing false buckwheat	Polygonum scandens	NI
Common boneset	Fupatorium perfoliatum	FACW
Common chickweed	Stellaria media	FACU
Common cocklebur	Xanthium strumarium	FAC
Common milkweed	Asclenias svriaca	NI
Common mugwort	Artemisia vulgaris	NI
Common plantain	Plantago major	FACU
	Phytolacca americana	FACU
Common ragweed	Ambrosia artemisiifolia	FACU
Common sunflower	Helianthus annuus	FACU
Common varrow	Achillea millefolium	FACU
Craborass	Digitaria sp	_
Creeping wood sorrel	Oxalis corniculata	FACU
Crested sedge	Carex cristatella	FACW
Crowned beggar-ticks	Bidens coronata (tichosperma)	OBI
Curly dock	Rumex crispus	FAC
Cut-leaf evening primrose	Oenothera laciniata	FACU
Dames rocket	Hesperis matronalis	FACU
Deertongue witchgrass	Dicanthelium clandestinum	FACW
Devil's beggar-ticks	Bidens frondosa	FACW
Dodder	Cuscuta sp	_
Dogbane	Apocynum spp.	_
Duckweed	lemna minor	OBI
English plantain	Plantago lanceolata	FACU
European stickseed	Lappula squarrosa	_
Ealse daisy	Eclipta prostrata	FACW
False nettle	Boehmeria cylindrica	OBI
Field mint	Mentha arvensis	FACW
Field mustard	Brassica rana	_
Field pennycrest	Thlashi arvense	NI
Field perperweed	Lenidium campestre	NI
Fireweed	Erechtites hieracifolia	FACU
Fox grape	Vitis Jahrusca	FACU
Fox sedge	Carex vulpinoidea	OBI
Garlic mustard	Alliaria netiolata	
Giant foxtail	Setaria faberi	FACU
Giant horweed	Heracleum mantegazzianum	NI
Giant ragweed	Ambrosia trifida	FAC
Goldenrod	Solidado son	_
Grass	Gramineae (family)	
Great water dock	Rumey orbiculatus (britannica)	OBI
		ODL .

	Appendix C	
Plant Species Documen	ited at the Finderne Farm Mitigation Site	•
	1	

Common Name	Scientific Name	Indicator Status
Herbaceous Species		
Allegheny blackberry	Rubus allegheniensis	FACU
Greater burdock	Arctium lappa	—
Ground ivy	Glecoma hederacea	FACU
Halberd-leaf tearthumb	Persicaria arifolium	OBL
Hedge mustard	Sisymbrium officinale	NI
Hop sedge	Carex Iupulina	OBL
Horse nettle	Solanum carolinense	FACU
Hypericum sp.	Hypericum sp.	—
Indian grass	Sorghastrum nutans	FACU
Indian hemp dogbane	Apocynum cannabinum	FAC
Japanese hop	Humulus japonicus	FACU
Japanese knotweed	Polygonum cuspidatum	FACU
Japanese stiltgrass	Microstegium vimineum	FAC
Jewelweed	Impatiens capensis	FACW
Jimsomweed	Datura stramonium	NI
Joe pve-weed	Eupatorium purpureum	FAC
Ladv's thumb	Persicaria maculosa	FAC
Little bluestem	Schizachvrium scoparium	FACU
Lizard's tail	Saururus cernuus	OBL
Marshpepper smartweed	Persicaria hvdropiper	OBL
Mermaid weed	Proserpinaca palustris	OBL
Milkweed	Asclepias sp.	_
Mint	Mentha spp.	_
Moneywort	I vsimachia nummularia	FACW
Multiflora rose	Rosa multiflora	FACU
Mustard	Brassica spp	_
Narrow-leaved cattail	Typha angustifolia	OBI
Narrow-leaved goldenrod/Flat-topped	Futhamia graminifolia	FAC
New York ironweed	Vernonia noveboracensis	FACW
Northern blue violet	Viola sententrionalis	FACU
Northern budeweed		OBI
Ovate spikerush	Eleocharis obtusa	
	Chrysonthemum leuconthemum	
	Heliopsis heliopthoides	FACU
Panicled aster	Symphyotrichum lanceolatum	FACW/
Partridge pea	Chamaecrista nictitans	FACU
Path rush		FAC
Pennsylvania hittercress	Cardamine nensylvanica	FACW
Pennsylvania smartweed	Persicaria pensylvanica	FACW
Pickerelweed	Pontederia cordata	OBI
Poison hemlock	Conjum maculatum	FACW
Purple loosestrife	I vthrum salicaria	OBI
	Daucus carota	NI
Ragwood	Ambrosia sp	
Reed capany grass	Phalaris arundinacea	EAC\M
Rice cutarass		OBI
Rice Culgrass		ODL
Rush Buo	Elymus app	
Sodgos	Carox spp.	
Sensitive form	Oncolos consibilio	
Sensitive term	Oncolea sensibilis	
	Carex Iurida	
Small water plaintain	Aluma aubaardatum	
Small water plaintain	Alisma subcordatum	OBL
Smakeroot	Functorium sp	<u> </u>
Shakelool	Eupatonum sp.	
Solit (USI) Coff atommod bulguab	Junicus ellusus	
Soli-stemmed bulrush	Scrivenopiectus tapernaemontani	UBL
Spike rush	Eleocharis spp.	
Spotted Joe-Pye weed	Eutrocnium maculatum	UBL
Stinging nettle	Urtica dioca	FAC
Strawberry	ragaria sp.	-
Swamp milkweed	Asciepias incarnata	OBL
Swamp smartweed	Persicaria hydropiperoides	OBL

	Appendix C	
	Plant Species Documented at the Finderne Farm Mitiga	tion Site
non Name	Scientific Name	Indicator Status

Common Name	Scientific Name	Indicator Status
Herbaceous Species		
Allegheny blackberry	Rubus allegheniensis	FACU
Sweetflag	Acorus calamus	OBL
Switchgrass	Panicum virgatum	FAC
Tall goldenrod	Solidago altissima	FACU
Thistle	Cirsium spp.	_
Threeway sedge	Dulichium arundinaceum	OBL
Timothy	Phleum pratense	FACU
Tumble mustard	Sisymbrium altissimum	FACU
Velvet grass	Holcus lanatus	FACU
Water hemlock	Circuta maculata	OBL
Water horehound	Lycopus americanus	OBL
Water purslane	Ludwigia palustris	OBL
Watercress	Nasturtium officinale	OBL
White beardtongue	Penstemon digitalis	FAC
White heath aster	Symphyotrichum ericoides var. ericoides	FACU
White snakeroot	Ageratina altissma	FACU
White vervain	Verbena urticifolia	FAC
Whorled loosestrife	l vsimachia quadrifolia	FACU
Wild cucumber	Echinocystis lobata	FACW
Wild mustard	Brassica rapa	NI
Wood-sorrel	Oxalis sp.	_
Wrinkleleaf goldenrod	Solidago rugosa	FAC
Yellow foxtail	Setaria glauca (pumila)	FAC
Yellow nutsedge	Cyperus esculentus	FACW
Yellow rocket	Barbarea vulgaris	FAC
Yellow wood-sorrel	Oxalis stricta	FACU
Woody Species		17.00
American elder	Sambucus canadensis (nigra)	FACW
American elm	Ulmus americana	FACW
Blackgum	Nyssa sylvatica	FAC
Box Elder	Acer negundo	FAC
Chokecherry	Prunus virginiana	FACU
Common buttonbush	Cephalanthus occidentalis	OBI
Cottonwood	Populus deltoides	FAC
Flm	Ulmus spp	_
False indigo bush	Amorpha fruticosa	FACW
Grav birch	Betula populifolia	FAC
Green ash	Fraxinus pennsylvanica	FACW
Highbush blueberry	Vaccinum corvmbosum	FACW
Honey locust	Gleditsia tricanthos	FAC
Oak	Quercus sp.	_
Pepperbush	Clethra alnifolia	FAC
Pin oak	Quercus palustris	FACW
Pvrus sp.	Pvrus sp.	NI
Red maple	Acer rubrum	FAC
Red osier dogwood	Cornus alba	FACW
River birch	Betula nigra	FACW
Royal paulownia	Paulownia tomentosa	NI
Shadblow serviceberry	Amelanchier canadensis	FAC
Silky dogwood	Cornus amomum	FACW
Silver maple	Acer saccharinum	FACW
Smooth alder	Alnus serrulata	OBL
Southern arrowwood	Viburnum dentatum	FAC
Speckled alder	Alnus incana	FACW
Swamp white oak	Quercus bicolor	FACW
Sycamore	Platanus occidentalis	FACW
Tulip poplar	Liriodendron tulipifera	FACU
Willow	Salix spp.	_
<u> </u>		

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

Summary Calculation Tables

	Spring Su	vey Plot #50			Spring Survey Plot #51						
Species			% Aerial					% Aerial	Height		
	# Live	# Dead	Coverage	Height (in.)	Health	# Live	# Dead	Coverage	(in.)	Health	
Acer rubrum											
Nyssa sylvatica						1	0	<1	29	P	
Quercus bicolor	1	0	<1	24	F	1	0	<1	46	P	
Fraxinus pennsulvaica											
Quercus palustris	2	0	<1	45	P	11	0	5	35	P	
Total Trees	3	0				13	0				
Rosa multiflora											
Cornus amomum											
Viburnum dentatum						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 herbovory)

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

	Spring	Survey P								
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Acer rubrum						1	0	<1	8	Р
Nyssa sylvatica										
Quercus bicolor										
Fraxinus pennsulvaica										
Quercus palustris										
Total Trees						1	0			
Rosa multiflora										
Cornus amomum										
Viburnum dentatum										
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

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

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

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

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

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F= Fair (Plant is moverately healthy and may have some moderate herbivory)
Finderne Farm Vegetation Monitoring - 2012 Summary of Observed Planted Woody Species Forested Wetland Enhancement/Creation Area 1 (EC1)

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

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	Spring Su	Irvey Plo	t #15 (No W	loody Plan	its)	Survey	Plot #16	(No Woody	/ Plants)	
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Quercus palustris										
Total Trees	0	0				0	0			
Amporpha fruticosa										
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

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	Fall Su	rvey Plot	: #57			Fall Su	rvey Plot	t #58		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Quercus palustris						1		<1	38	Р
Total Trees	0	0				1	0			
Amporpha fruticosa	1		1	77	F					
Total Shrubs	1	0				0	0		1	
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									<u> </u>	
Average Percent Survival									<u> </u>	
Average Density (woody stem/acre)										
Average Height (inches) ***not averaging in plots with none present									1	
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									1	

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

Species	Spring S	Survey Pl	ot #55			Spring	Survey F	Plot #56		
Species	# Live	# Dead	% Aerial Coverage	Height (in.)	Health	# Live	# Dead	% Aerial Coverage	Height (in.)	Health
Acer negundo										ĺ
Fraxinus pennsylvanica						1		<1	48	Р
Dead Stem										ĺ
Total Trees	0	0				1	0			
Alnus serrulata										1
Amorpha fruticosa	12		5	60	Р					
Cephalanthus occidentalis										1
Rosa multiflora										Í
Salix 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							

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

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

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

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

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

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

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

	Spring Surv	ey Plot #32	Spring Surv	ey Plot #33	Spring Surv	vey Plot #34	Spring Surv	ey Plot #35	Spring Surv	ey Plot #36
Species										
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
	Cover or #	Cover or #	Cover or #	Cover or #	Cover or #					
	Live	Dead	Live	Dead	Live	Dead	Live	Dead	Live	Dead
Lysimachia nummularia		45.00/	49.0%	00.00/	5.0%		10.0%			0.00/
Lythrum salicaria		15.0%		30.0%	10.0%		55.0%			8.0%
Phalaris arundinacea					5.0%					
Acer rubrum (seedling)	-				5.076					
Aster sp										8.0%
Bidens coronata	1.0%						1.0%			01070
Bidens sp.										
Cardamine pensylvanica							<1%			
Carex sp.										
Cyperus esculentus										
Dulichium arundinaceum			10.0%						5.0%	
Echinochloa crus-galli										
Eleocharis sp.	1.0%									
Hypericum sp.										
Juncus effusus			5.0%				30.0%		10.0%	
Juncus tenuis										
Juncus sp.									2.0%	
Leersia oryzoides	5.0%								5.0%	
Ludwigia palustris										
Onoclea sensibilis										2.0%
Peltandra virginica										
Pericaria hydropiperoides										
Persicaria sagittata	2.0%		5.0%				2.0%		55.0%	
Polygonum pennsylvanicum										
Polygonum sp.	75.0%		1.0%		80.0%		1.0%		5.0%	
Solidago sp.	1.0%									
Stellaria sp.										
Symphyotrichum ericoides										
Vernonia noveboracensis										
Unidentified herb										
Unidentified grass										
Bare ground										
Total Percent Cover Native/Target Hydrophytes	85%	0%	21%	0%	80%	0%	34%	0%	82%	<u>1</u> 0%
Total Percent Cover Invasive Species	0%	15%	49%	30%	20%	0%	65%	0%	0%	8%

Planting Zone Density

	Spring Surv	vey Plot #37	Spring Surv	ey Plot #38	Spring Surv	ey Plot #39	Spring Surv	ey Plot #40	Spring Surv	ey Plot #41
Species	Percent Cover or # Live	Percent Cover or # Dead								
Lysimachia nummularia			58.0%		3.0%					
Lythrum salicaria			10.0%		5.0%		58.0%		2.0%	
Phalaris arundinacea					60.0%		0.00/			
Persicaria maculosa							3.0%			
Actor on			5.0%							
Asiel sp. Ridons coronata			5.0%		-					
Bidens sp			-1							
Cardamine pensylvanica										
Carex sp					1		1			-
Cvperus esculentus										
Dulichium arundinaceum			1.0%		12.0%					
Echinochloa crus-galli										
Eleocharis sp.										
Hypericum sp.										
Juncus effusus	35.0%		15.0%		5.0%		2.0%			
Juncus tenuis	1.0%									
Juncus sp.										
Leersia oryzoides										
Ludwigia palustris									20.0%	
Onoclea sensibilis										
Peltandra virginica									<1	
Pericaria hydropiperoides										
Persicaria sagittata	3.0%		10.0%				20.0%			
Polygonum pennsylvanicum										
Polygonum sp.	60.0%				5.0%		15.0%		1.0%	
Solidago sp.										
Stellaria sp.										
Symphyotrichum ericoides										
Vernonia noveboracensis	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

	Fall Survey	Plot #18	Fall Survey	Plot #19	Fall Survey	Plot #20	Fall Survey	Plot #21	Fall Survey	Plot #22
Species	Percent Cover or # Live	Percent Cover or # Dead								
Lysimachia nummularia									20.0%	
Lythrum salicaria	89.0%		67.0%				78.0%		40.0%	
Phalaris arundinacea										
Persicaria maculosa							-1		1.09/	
Actor rubrum (seedling)	1.0%						<1		1.0%	
Asier sp.	1.0 %									
Bidons sp										
Cardamine pensylvanica										
Carex sp	1								5.0%	
Cyperus esculentus					65.0%				0.070	
Dulichium arundinaceum										
Echinochloa crus-galli										
Eleocharis sp.										
Hypericum sp.							10.0%		3.0%	
Juncus effusus									5.0%	
Juncus tenuis										
Juncus sp.										
Leersia oryzoides										
Ludwigia palustris					15.0%					
Onoclea sensibilis										
Peltandra virginica										
Pericaria hydropiperoides										
Persicaria sagittata			30.0%				1.0%		2.0%	
Polygonum pennsylvanicum			3.0%							
Polygonum sp.									1.0%	
Solidago sp.							1.0%			
Stellaria sp.					20.0%					
Symphyotrichum ericoides									5.0%	
Vernonia noveboracensis										
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

	Fall Survey	Plot #23	Fall Survey	Plot #24	Fall Survey	Plot #25	Fall Survey	Plot #26	Fall Survey	Plot #27	
Species	Percent Cover or # Live	Percent Cover or # Dead	Total								
Lysimachia nummularia							00.00/		5.0%		150.0%
Lythrum salicaria	40.00/						60.0%		20.0%		547.0%
Phalaris arundinacea	40.0%										100.0%
Acer rubrum (seedling)										-	1.0%
Aster sp											14.0%
Bidens coronata											2.0%
Bidens sp.											0.0%
Cardamine pensylvanica											0.0%
Carex sp.											5.0%
Cyperus esculentus			65.0%		40.0%						170.0%
Dulichium arundinaceum											28.0%
Echinochloa crus-galli					10.0%						10.0%
Eleocharis sp.											1.0%
Hypericum sp.					25.0%						38.0%
Juncus effusus	20.0%	29.0%					5.0%				161.0%
Juncus tenuis											1.0%
Juncus sp.											2.0%
Leersia oryzoides											10.0%
Ludwigia palustris			35.0%		25.0%						95.0%
Onoclea sensibilis											2.0%
Peltandra virginica											0.0%
Pericaria hydropiperoides	10.0%										10.0%
Persicaria sagittata	1.0%						25.0%		15.0%		171.0%
Polygonum pennsylvanicum											3.0%
Polygonum sp.											244.0%
Solidago sp.									<1		2.0%
Stellaria sp.											20.0%
Symphyotrichum ericoides							10.0%		60.0%		75.0%
Vernonia noveboracensis											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

	Spring	Survey P	lot #13			Spring	Survey F	Plot #14 (No Woo	ody Plants)	
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Acer negundo (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 herbovory)

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

	Fall Su	rvey Plot	#49 (No Woody F	Plants)		Fall Survey Plot #50 (No Woody Plants)						
Species			% Aerial	Height				% Aerial	Height			
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health		
Acer negundo (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/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	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)

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

	Spring	Survey P	lot #9			Spring	Survey P	lot #10		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Fraxinus pennsylvanica	1		20	420	E	10		18.5	149	F
Fraxinus pennsylvanica						12		18.5	396	G
Fraxinus pennsylvanica (Seedlings)						14		1	20	G
Amorpha fruticosa	2		5	114	G					
Betula nigra						5		38	600	E
Betula nigra (Seedlings)						1		<1	12	G
Ulmus (Seedlings)										
Quercus palustris										
Quercus palustris (Seedlings)										
Pyrus communis										
Total Trees	3	0				42	0			
No Shrubs										
Total Shrubs	0	0				0	0			
Total Woody Stems	3	0				42	0			
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) Average Density (woody stem/acre)	11% 100					160% 1400				
Average Height (inches)	216					227				
Calculations (Average Per Planting Area) **Including Recuits										
Average Percent Survival	103%									
Average Density (woody stem/acre)	900									
Average Height (inches) ***not averaging in plots with none present	190 43									
	100110									
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 herbovory)

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

	Fall Su	rvey Plot	#47			Fall Su	rvey Plot	#48		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Fraxinus pennsylvanica						51		80	300	F
Fraxinus pennsylvanica	1		<1	12	F					
Fraxinus pennsylvanica (Seedlings)										
Amorpha fruticosa										
Betula nigra										
Betula nigra (Seedlings)	2		1	36	F					
Ulmus (Seedlings)	9		1	12.4	F					
Quercus palustris						2		1	33.5	G
Quercus palustris (Seedlings)						1		<1	9	F
Pyrus communis						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/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)	46%			195%		
Average Density (woody stem/acre)	400			1700		
Average Height (inches)	16.3			302.4		

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

4%					0%				
33.33					0				
12					0				
	4% 33.33 12	4% 33.33 12	4%	4% 33.33 12	4%	4% 0% 33.33 0 12 0	4% 0% 33.33 0 12 0	4% 0% 33.33 0 12 0	4% 0% 33.33 0 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 herbovory)

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

	Spring	Survey P	lot #11 (No Wo	ody Plants)	Spring Survey Plot #12 (No Woody Plants)					
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(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 herbovory)

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

	Fall Su	rvey Plot	#51 (No Woody	Plants)		Fall Su	rvey Plot	#52 (No Woody	Plants)	
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(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 herbovory)

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

Spring S	Survey Plo	ot #1 (No Woody	/ Plants)		Spring	Survey F	lot #2 (No Wood	dy Plants)	
		% Aerial	Height				% Aerial	Height	
# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
0	0				0	0			
0	0				0	0			
0	0				0	0			
	Spring S # Live	Spring Survey Plo # Live # Dead	Spring Survey Plot #1 (No Woody) # Live # Dead % Aerial # Live # Dead Coverage	Spring Survey Plot #1 (No Woody Plants) # Live # Dead % Aerial Height # Live # Dead Coverage (in.)	Spring Survey Plot #1 (No Woody Plants) # Live # Dead % Aerial Height (in.) Health # Live # Dead Coverage (in.) Health Image: Survey Plot #1 (No Woody Plants) Image: Survey Plot #1 (No Woody Plants) Image: Survey Plot #1 (No Woody Plants) # Live # Dead Coverage (in.) Health Image: Survey Plot #1 (No Woody Plants) Image: Survey Plot #1 (No Woody Plants) Image: Survey Plot #1 (No Woody Plants) Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey # Dead Image: Survey# # Dead Image: Survey# # De	Spring Survey Plot #1 (No Woody Plants) Spring # Live % Aerial Height (in.) Health # Live # Live # Dead Coverage (in.) Health # Live Image: Survey Plot #1 (No Woody Plants) Image: Survey Plot #1 (No Woody Plants) Height (in.) Health # Live Image: Survey Plot #1 (Soverage Image: Survey Plot	Spring Survey Plot #1 (No Woody Plants) Spring Survey F # Live # Dead % Aerial Height (in.) Health # Live # Dead # Live # Dead Coverage (in.) Health # Live # Dead Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F Image: Survey F	Spring Survey Plot #1 (No Woody Plants) Spring Survey Plot #2 (No Woody Plants) # Live % Aerial Height (in.) Height (in.) % Aerial % Aerial # Live # Dead Coverage (in.) Health # Live # Dead Coverage Image: Survey Plot #2 (No Woody Plants) Image: Survey Plot #2 (No Woody Plants) Model % Aerial Coverage % % Aerial % Aerial % Aerial Coverage % % Aerial % Aerial Coverage % Aerial Aerial Model <	Spring Survey Plot #1 (No Woody Plants) Spring Survey Plot #2 (No Woody Plants) # Live % Aerial Height (in.) Height (in.) % Aerial Height (in.) # Live # Dead Coverage (in.) Health # Live # Dead Coverage (in.) Image: Survey Plot #2 (No Woody Plants) Image: Survey Plot #2 (No Woody Plants) % Aerial Height (in.) Image: Survey Plot #2 (No Woody Plants) Image: Survey Plot #2 (No Woody Plants) (in.) % Aerial Height (in.) Image: Survey Plot #2 (No Woody Plants) Image: Survey Plot #2 (No Woody Plants) (in.) % Aerial Height (in.) Image: Survey Plot #2 (No Woody Plants) Image: Survey Plot #2 (No Woody Plants) (in.) Image: Survey Plot #2 (No Woody Plants) (in.) Image: Survey Plot #2 (No Woody Plants) Image: Survey Plot #2 (No Woody Plants) Image: Survey Plot #2 (No Woody Plants) (in.) Image: Survey Plot #2 (No Woody Plants) Image: Survey Plot #2 (No Woody Plants) Image: Survey Plot #2 (No Woody Plants) Image: Survey Plot #2 (No Woody Plants) Image: Survey Plot #2 (No Woody Plants)

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%		1
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 herbovory)

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

	Spring	Survey F	lot #3 (No Wood	ly Plants)		Spring Survey Plot #4 (No Woody Plants)					
Species			% Aerial	Height				% Aerial	Height		
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health	
Quercus bicolor											
Dead Stem											
Quercus palustris											
Platanus occidentalis											
Acer rubrum (seedlings)											
Nyssa sylvatica											
Total Trees	0	0				0	0				
Cornus amomum											
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%		l
Average Density (woody stem/acre)	0			0		Í
Average Height (inches)	0			0		l
Calculations (Average Per Planting Area) **Including Recruits						í I

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 herbovory)

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

	Fall Su	vey Plot #	#1 (No Woody F	Plants)		Fall Su	rvey Plot	#2 (No Woody	Plants)	
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Quercus bicolor										
Dead Stem										
Quercus palustris										
Platanus occidentalis										
Acer rubrum (seedlings)										
Nyssa sylvatica										
Total Trees	0	0				0	0			
Cornus amomum										
Total Shrubs	0	0				0	0			
Total Woody Stems	0	0				0	0			
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				
				•	•	-			•	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) **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										

Bold indicates Recruited species

Average Density (woody stem/acre)

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

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

Average Height (inches) ***not averaging in plots with none present

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

	Fall Su	vey Plot	#3			Fall Su	rvey Plot	# 39		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Quercus bicolor	1		2	10	G					
Dead Stem		1	<1	48	D					
Quercus palustris						3		2	32.3	G
Platanus occidentalis						1		<1	65	P
Acer rubrum (seedlings)						6		1	12.8	Р
Nyssa sylvatica						2		1	28	G
Total Trees	1	1				12	0			
Cornus amomum	1		<1	27	Р	1		<1	18	Р
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 herbovory)

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

	Spring Su	rvey Plot	#5 (No Woo	dy Plants)		Spring S	urvey Plo	ot #6		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Acer rubrum						5		<1	12.6	F
Salix sp.						8		50	300	E
Salix sp.										
Acer negundo										
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		ŀ	<		
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 herbovory)

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

	Spring	Survey F	Plot #7			Spring	Survey P	lot #8		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Acer rubrum						1		<1	15	F
Salix sp.	4		20	68.5	F					
Salix sp.						21		77	38	G
Acer negundo										
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	К			F2		
Average Percent Survival (Total observed stems per plot/Planting density per plot	11%			65%		i .
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 herbovory)

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

	Fall Su	rvey Plot	#35 (No Woody	Plants)		Fall Survey Plot #36 (No Woody Plants)						
Species			% Aerial	Height				% Aerial	Height			
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health		
Acer rubrum												
Salix sp.												
Salix sp.												
Acer negundo												
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

K					K				
0%					0%				
0					0				
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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 herbovory)

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

	Fall Su	rvey Plot	#37			Fall Survey Plot #38						
Species			% Aerial	Height				% Aerial	Height			
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(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 herbovory)

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

	Spring S	urvey Plot	: #42			Spring	Survey F	Plot #43		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Acer rubrum (seedling)										
Ulmus (seedlings)										
Betula nigra										
Salix spp.	2	2 0	5	5 47	F	13	0	10	42	F
Rosa multiflora										
Acer negundo										
Total Woody Stems	2	0				13	0			
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										I
Average Percent Survival	10%					67%				I
Average Density (woody stem/acre)	285.7	,				1857				I
Average Height (inches)	47	,				42				
Calculations (Average Per Planting Area) **Excluding Recruits										
Average Percent Survival	21%									
Average Density (woody stem/acre)	571.4									

Bold indicates Recruited species

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

Average Height (inches) ***not averaging in plots with none present

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

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

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

48.7

	Spring	Survey F	Plot #44			Spring Survey Plot #45						
Species			% Aerial	Height				% Aerial	Height			
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health		
Acer rubrum (seedling)	1	0	<1	12	F							
Ulmus (seedlings)												
Betula nigra	1	0	<1	21	P							
Salix spp.	8	0	25	70	F	2	0	1	41	F		
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					l

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 herbovory)

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

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

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

	Fall Su	rvey Plot	#28			Fall Surve	ey Plot #2	9		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Acer rubrum (seedling)						1		<1	12	Р
Ulmus (seedlings)						2		<1	26.5	Р
Betula nigra										
Salix spp.	2		10%	46.5	G	4		15%	44	Р
Rosa multiflora										
Acer negundo										
Total Woody Stems	2	0				7	0			
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 stern/acre)										
Average Height (inches) for averaging in plots with hone 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 herbovory)

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

	Fall Sur	vey Plot #	#30			Fall Su	rvey Plot	#31		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Acer rubrum (seedling)										
Ulmus (seedlings)										
Betula nigra										
Salix spp.	3		7%	47	F	1		<1	41	Р
Rosa multiflora						1		2%	38	Р
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 herbovory)

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

	Fall Su	rvey Plot	#32			Fall Sur	vey Plot	#33		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Acer rubrum (seedling)										
Ulmus (seedlings)										
Betula nigra										
Salix spp.	4		10%	55.8	F	1		10%	50	E
Rosa multiflora										
Acer negundo	1		<1	18	F	1		<1	18	Р
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 herbovory)

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

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

61.0

Bold indicates	Recruited	species

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

Average Height (inches) ***not averaging in plots with none present

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

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

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

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

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

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

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

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

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

Bold indicates Recruited species

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

Average Height (inches) ***not averaging in plots with none present

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

F= Fair (Plant is moverately healthy and may have some moderate herbivory)
	Fall Su	rvey Plot	#11			Fall Su	rvey Plot	: #12		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Acer rubrum										
Betula nigra										
Fraxinus pennsylvanica	2		<1	36	P	1		<1	69	P
Plantanus occidentalis	1		<1	18	P					
Quercus bicolor	2		3	94	F					
Quercus palustris	3		2	26.3	F	2		<1	40.5	Р
Dead Stem							1	<1	51	Р
Total Trees	8	0				3	1			
Amorpha fruticosa										
Clethra alnifolia	1		<1	27	Р					
Cornus amomum										
Rosa multiflora										
Vaccinium coryumbosum										
Viburnum dentatum										
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

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

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

	Spring S	urvey Pl	ot #20			Spring S	urvey Pl	ot #21		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Acer rubrum (seedling)										
Fraxinus pennsylvanica	1	0	<1	48	Р					
Fraxinus pennsylvanica (seedlings)										
Nyssa sylvatica	1	0	<1	36	G					
Quercus bicolor						1		1	120	G
Quercus palustris	5	0	2	45.6	Р	1	1	1	156	G
Platanus occidentalis										
Ulmus sp. (seedlings)										
Betula nigra										
Total Trees	7	0				2	1			
Amorpha fruticosa										
Clethra alnifolia										
Cornus amomum										
Vaccinum corymbosum										
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

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

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

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

34%					27%				
300.0					233.3				
90.7					60.0				
	34% 300.0 90.7	34% 300.0 90.7	34%	Image: state of the s	Image: Market State Image: Market State	Image: Market State Image: Market State	Image: state of the s	Image: Market in the state in the	Image: state in the s

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

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

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

	Spring	Survey F	Plot #24			Spring	Survey F	lot #25		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Acer rubrum (seedling)						1	0	<1	12	F
Fraxinus pennsylvanica						1	0	<1	60	Р
Fraxinus pennsylvanica (seedlings)										
Nyssa sylvatica										
Quercus bicolor	0	1	<1	96	G					
Quercus palustris	0	1	<1	60	G	3	0	1	100	G
Platanus occidentalis										
Ulmus sp. (seedlings)										
Betula nigra										
Total Trees	0	2				5	0			
Amorpha fruticosa						1	0	<1	72	G
Clethra alnifolia						1	0	<1	3	Р
Cornus amomum										
Vaccinum corymbosum										
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		
Coloulations (Average Der Denting Area) **Eveluding Descuite						

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 herbovory)

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

	Fall Su	rvey Plot	#13 (No Woody	Plants)		Fall Sur	vey Plot	#14		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Acer rubrum (seedling)										
Fraxinus pennsylvanica						2		<1	58	Р
Fraxinus pennsylvanica (seedlings)										
Nyssa sylvatica										
Quercus bicolor						3		2	76	F
Quercus palustris						9		10	128.8	E
Platanus occidentalis										
Ulmus sp. (seedlings)										
Betula nigra										
Total Trees	0	0				14	0			
Amorpha fruticosa						1		<1	12	Р
Clethra alnifolia										
Cornus amomum										
Vaccinum corymbosum										
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 herbovory)

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

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

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

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

Bold indicates Recruited species

Average Density (woody stem/acre)

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

Average Height (inches) ***not averaging in plots with none present

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

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

Species */* F */* Arrial # Lue */* Arrial # Lue */* Arrial Banda Factors Factor		Spring Sur	vey Plot #17				Spring Sur	vey Plot #18			
Product angementProduct angementProd	Species			% Aerial					% Aerial		
Boula nigna Image and the set of the set o		# Live	# Dead	Coverage	Height (in.)	Health	# Live	# Dead	Coverage	Height (in.)	Health
Betula maya (seedings) Image (seed	Betula nigra										
Umus sp. (seedings) Image sp. (seedings)	Betula nigra (seedlings)										
Acer regundo 1 0 <1	Ulmus sp. (seedlings)						8	0	2	8.5	G
fraxinus pennsylvanica 1 0 <1	Acer negundo	1	0	<1	12	Р	-				
Insump prints prints prints prints prints 1 0 <1	Fraxinus pennsylvanica	1	0	<1	8	G	3	0	1	25	Р
Plating accordentials 1 0 <1	Fraxinus pennsylvanica										
Quercus policin Image in the i	Platanas occidentalis	1	0	<1	84	G	1	0	<1	96	F
Culericus printion C <thc< th=""> C <thc< th=""></thc<></thc<>	Quercus bicolor										
Oldericus pairstris 6 0 2 70 6 7 1 2 69 G Salix sp. 3 0 1 28 68 Salix sp. <	Quercus phellos						_				
Safu Sp.	Quercus palustris	6	0	2	70	G	/	1	2	69	G
Salk Sp. Image: Control Trees Image: Control Trees<	Salix sp.						3	0	1	28	G
Ideal release 3 0 22 1 Image: Control of Co	Salix sp.										
Calculation I U Ci Zi P I I I I U Ci Zi P I	Total Trees	9	0		04	-	22	1			
Amergan Price 1 0 0 0 Total Shrubs 1 0 0 0 0 Planting Zone Density Trees 8 feet OC Strutus 15 feet OC 0 0 0 0 0 Original Planting Density 800 trees/are + 194 shrubs/acre = 874 woody stems/acre 20? Radius Circular Plats = 0.03 acres 2 1 0		1	0	<1	24	F					
India Woody Stems I	Amorpha mulicosa	1	0				0	0			
Inter Modury Stein's Into Into <th< td=""><td>Total Weady Stome</td><td>10</td><td>0</td><td></td><td></td><td></td><td>22</td><td>0</td><td></td><td></td><td></td></th<>	Total Weady Stome	10	0				22	0			
Planting Zone Density Trees B bet OC Shrubs 15 fet OC Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre Density Per Pots = 0.03 acres Density Per Pots = 20.4 trees/pot + 5.82 shrubs/plot = 26.22 woody stems/plot Shrubs 15 fet OC Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre Density Per Pots = 20.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot Backutations (Average Per Plot) "Including Recruits N Average Persity (woody stem/acre) 333.33 O Average Persity (woody stem/acre) 343.33 O Average Persity (woody stem/acre) 343.33 O Average Persity (woody stem/acre) 3455% O Average Persity (woody stem/acre) 3105.56 O O Average Persity (woody stem/acre) 30.34 O O Average Persity (woody stem/acre) Average Persity (woody stem/acre) Ave	Total Woody Stellis	10	0				22	1			
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Calculations (Average Per Planting Area) **Including Recruits 0	Average Height (inches)	54.8					36.6				
Calculations (Average Per Planting Area) **Including Recruits 355% Image Proceed Survival 36% Image Proceed Survival Image Proceed Survival <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>											
Average Percent Survival 355% Image Density (woody stem/acre) 3105.66 Image Density (woody stem/acre) Image Density (Wo	Calculations (Average Per Planting Area) **Including Recruits										
Average Density (woody stem/acre) 3105.56 Image: Construction of the second stem second s	Average Percent Survival	355%									
Average Height (inches) ***not averaging in plots with none present 30.34 Image: Constraint of the second sec	Average Density (woody stem/acre)	3105.56									
Calculations (Average Per Plot) **Excluding Recruits Image: Description of the served stems per plot/Planting density per plot) 31% Image: Average Density (woody stem/acre) 42% Image: Description of the served stems per plot/Planting density per plot) Average Density (woody stem/acre) 266.7 366.7 Image: Description of the served stems per plot/Planting density per plot) 31% Image: Description of the served stems per plot/Planting density per plot) 31% Image: Description of the served stems per plot/Planting density per plot) 31% Image: Description of the served stems per plot/Planting density per plot) 366.7 Image: Description of the served stems per plot/Planting density per plot) Image: Description of the served stems per plot/Planting density per plot) 366.7 Image: Description of the served stems per plot/Planting density per plot Image: Description of the server plot plot plot plot plot plot plot plot	Average Height (inches) ***not averaging in plots with none present	30.34									
Calculations (Average Per Plot) **Excluding Recruits Image: Calculation (Average Per Plot) **Excluding Recruits											
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Calculations (Average Per Planting Area) **Excluding Recruits Image: Construction Image:	Average mergin (incres)	66					00.3				
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Average Hein/ (incles) ***not averaging in plots with none present 51.97	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 herbovory) F= Fair (Plant is moverately healthy and may have some moderate herbivory)

Species Fill or all block % Aerial weight in the pit it block Fill of the pit it block it coverage % Aerial weight it coverage % Aerial weight it coverage </th <th></th> <th>Spring Su</th> <th>rvey Plot #19</th> <th>)</th> <th></th> <th></th> <th>Fall Surve</th> <th>y Plot #4</th> <th></th> <th></th> <th></th>		Spring Su	rvey Plot #19)			Fall Surve	y Plot #4			
Image: Section space Image: Se	Species			% Aerial	Height				% Aerial	Height	
Betaba ingrag 1 0 <1 36 G 1 18 G Umus sop. Ceedings) 1 0 <1 12 0 Cd 10 G Accer negundo 1 0 <1 12 0 G G 10 G Accer negundo 1 0 <1 32 F 2 1 40 P Pattanas occidentinis 3 0 <1 32 F 2 1 40 P Pattanas occidentaris 3 0 <1 32 F 2 1 40 P Ouersca pholios 1 1 1 1 1 1 40 P 1 40 P Ouersca pholios 1 <th></th> <th># Live</th> <th># Dead</th> <th>Coverage</th> <th>(in.)</th> <th>Health</th> <th># Live</th> <th># Dead</th> <th>Coverage</th> <th>(in.)</th> <th>Health</th>		# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Betula migra (seedings) 1 0 -1 3 1 18 G Aper negulato 1 0 -1 12 6 200 12 10 6 Aper negulato 1 0 -1 32 F 2 1 40 P Aper negulato 3 0 -1 32 F 2 1 40 P Presense promotylanics 3 0 -1 32 F 2 1 40 P Operators brother - - - - - - - - - Operators brother - - - - - - - - - Operators brother - - - - - - - - Operators brother - - - - - - - - Operators brother - - - - - - - - Operators brother - - - - - - - - Operators brother - - - - - -	Betula nigra	1	0	<1	36	G	-				-
Units sp. (seedings) 1 0 -1 12 6 200 12 10 6 Praxins perins/Wanka 0 1 0 -1 0 0 0 Praxins perins/Wanka 3 0 -1 32 F 2 1 40 0 Platans occidentalis 0 -1 0 0 1 52 1 40 0 Queress becho 0 1 52 G 5 8 71.2 C Safir sp. 3 0 1 52 G 5 8 71.2 C Safir sp. 0 1 0 1 0	Betula nigra (seedlings)						3		1	18	G
Ace regulado Image in a service in a servic	Ulmus sp. (seedlings)	1	0	<1	12	G	200		12	10	G
Practing perins/varials 3 0 <1	Acer negundo										
Haunus accidentalis 3 0 <1	Fraxinus pennsylvanica					_				10	_
Parama socoophilais Image: Comparison of the second s	Fraxinus pennsylvanica	3	0	<1	32	F	2		1	40	Р
Output: Description Description <thdescription< th=""> <thdescription< th=""> <th< td=""><td>Platanas occidentalis</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<></thdescription<></thdescription<>	Platanas occidentalis										
Outericus plantistrine Image: Control of the second s	Quercus bicolor										
UderCost pailustris 3 0 1 52 6 5 8 7.2 6 Salix sp. 1	Quercus phelios				50					74.0	0
Salix sp. Image: Contrast Sp. Image: ContrastSp. Image: Contread Sp. <th< td=""><td>Quercus palustris</td><td>3</td><td>0</td><td>1</td><td>52</td><td>G</td><td>5</td><td></td><td>8</td><td>/1.2</td><td>G</td></th<>	Quercus palustris	3	0	1	52	G	5		8	/1.2	G
Salit Sp. Image: Control Trees	Salix sp.										
Ideal release 8 0 210 0 Amorpha fruticosa 1 0 12 F 1 1 Amorpha fruticosa 1 0 12 F 1 1 1 Total Models 1 0 1 0 0 0 1 Total Models 9 0 210 0 0 1 Planting Zone Density Trees 8 fort 0C Structs 15 fort 0C Orginal Planting Density Borney & 20 & structs/plot = 26.2 woody stems/acre 20 Radius Circular Plots = 0.03 acres 20	Salix sp.						040				
Cleffina altholia I	Total Trees	8	0				210	0			
Amorpha Indicesa 1 0 1 1 0 1 1 0 1 1 0 1 0 1 0 1 0 0 1 0 1 0 0 1 0 1 0 0 1 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 0 1 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 1 0 0 0 1 1 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 <th1< th=""> 1 <th1< th=""></th1<></th1<>	Clethra alnifolia				70	_					
I otal Woody Stems I	Amorpha fruticosa	1	0	<1	72	F					
Total Woody Stems 3 0 210 0 0 Planting Zone Density Trees 8 feet OC Shrubs 15 feet OC Shrubs 1	Total Shrubs	1	0				0	0			
Planting Zone Density Trees 8 foret OC Original Planting Density 680 trees/acre + 194 shrubs/acre = 874 woody stems/acre 20' Radius Circular Plots = 0.03 acres Density Per Plot = 2.0.4 trees/plot + 5.82 shrubs/plot = 26.22 woody stems/plot Calculations (Average Per Plot) "Including Recruits Average Period Vincluding Recruits Average Perind Vinclod (stems per piol/Planting density pe	Total Woody Stems	9	0				210	0			
Average Percent Survival (Total observed stems per plot/Planting density per plot)34%801%801%1Average Density (woody stem/acre)300700011Average Height (inches)41.211.8611Calculations (Average Per Planting Area) **Including RecruitsAverage Density (woody stem/acre)1111Average Density (woody stem/acre)11111Average Per Plot) **Excluding Recruits111111Average Per Plot) **Excluding Recruits1111111Average Per Plot) **Excluding Recruits11111111111Average Per Plot) **Excluding Recruits11	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										
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Average Height (inches) 41.2 11.86 11.86 Calculations (Average Per Planting Area) **Including Recruits Average Density (woody stem/acre) Average Height (inches) *** not averaging in plots with none present Calculations (Average Per Plot) **Excluding Recruits	Average Density (woody stem/acre)	300					7000				
Calculations (Average Per Planting Area) **Including Recruits Image Density (woody stem/acre) Image Densi	Average Height (inches)	41.2					11.86				
Calculations (Average Per Planting Area) **Including Recruits Image of the second se											
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Average Height (inches) 45 62.3 Calculations (Average Per Planting Area) **Excluding Recruits 62.3 62.3 Average Per cent Survival 62.3 62.3 Average Per planting Area) **Excluding Recruits 62.3 62.3 Average Pensity (woody stem/acre) 6 6 6 Average Height (inches) ***not averaging in plots with none present 6 6 6	Average Density (woody stem/acre)	266.7					333.33				
Calculations (Average Per Planting Area) **Excluding Recruits Image Per cent Survival	Average Height (inches)	45					62.3				
Calculations (Average Per Planting Area) **Excluding Recruits											
Average Percent Survival Image: Density (woody stem/acre) Image: Densit	Calculations (Average Per Planting Area) **Excluding Recruits										
Average Density (woody stem/acre) Image: Construction of the stem/acre in the stem/acre in the stem and the stem acre in the stem	Average Percent Survival										
Average Height (inches) ***not averaging in plots with none present	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 herbovory) F= Fair (Plant is moverately healthy and may have some moderate herbivory)

	Fall Surve	v Plot #5				Fall Surve	v Plot #6			
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Betula nigra										
Betula nigra (seedlings)	60		36	13	G					
Ulmus sp. (seedlings)	200		10	10	G	15		3	12	G
Acer negundo										
Fraxinus pennsylvanica										
Fraxinus pennsylvanica						8		3	18.8	Р
Platanas occidentalis						3		2	51	F
Quercus bicolor	2		1	48	G					
Quercus phellos						1		<1	43	G
Quercus palustris	3		1	44.3	G	4		3	48	F
Salix sp.										
Salix sp.	10		8	96.6	G					
Total Trees	275	0				31	0			
Clethra alnifolia						2		1	22	F
Amorpha fruticosa										
Total Shrubs	0	0				2	0			
Total Woody Stems	275	0				33	0			
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	ſ					ſ				
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 Sunvival (Total observed stems per plot/Planting density per plot)	10%					60%				
Average Density (woody stem/acro)	166 7					600				
Average Height (inches)	100.7					32.4				
Average Height (Inches)	40.0					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 herbovory) F= Fair (Plant is moverately healthy and may have some moderate herbivory)

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

	Spring Surv	vey Plot	#48			Fall Survey	Plot #46			
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Acer negundo	4		1	18	F	1		<1	18	Р
Acer saccharinum	1		3	600	G					
Amelanchier canadensis	1		<1	18	P					
Betula nigra	8		1	21	F					
Fraxinus pennsylvanica	5		2	28	F					
Gleditsia triacanthos						2		<1	11	F
Platanus occidentalis	1		4	600	F					
Pyrus communis (seedlings)	8		4	35	Р	19		2	22.9	F
Quercus palustris (seedlings)						3		<1	10.3	Р
Ulmus sp. (seedlings)						3		1	23	F
Total Trees	28	0				28	0			
Rosa multiflora	2	0	2	26	F	2		2	40	Р
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 saccharium, Quercus palustris, Acer rubrum, and Quercus rubra not included in calculation for recruited species because trunchs 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 herbovory)

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

Finderne Farm Vegetation Monitoring - 2012 Summary of Observed Woody Species Riparian Area 1 (A1)

	Spring Su	rvey Plot	#49			Fall Surve	y Plot #45	5		
Species			% Aerial	Height				% Aerial	Height	
	# Live	# Dead	Coverage	(in.)	Health	# Live	# Dead	Coverage	(in.)	Health
Acer saccharinum	1		3	120	E					
Quercus palustris						1		<1	38	F
Dead stump		1	<1	26						
Total Trees	1	1				1	0			
Amelanchier canadensis	1		2	74	G					
Sambucus canadensis						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)

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

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

Spring 2014 Survey Data Sheets

Spring 2012 Vegetation Monitoring

Constant Plant Clance Date: 51(2)11/2 Date: Date: Planted Date: Date: Planted Date: Date: Planted Date: Date: Planted Date: Date: Planted Date: Date: Planted Date: Date: Planted Date: Planted Date: Planted Date: Planted Date: Planted Date: Planted Date: Planted Date: Planted Planted Planted <thplanted< th=""> Planted P</thplanted<>	Field Team: M S / K S	Sample Plot Nu	Imber:	Weather: C/oいるう	n e	Percent Are	al Coverage: w V ACK	debris) = 5
Menode Interface Particip (woody Sumon) No. Live (woody Sumon) No. Deal (woody Sumon) Particip (woody Sumon) No. Deal (woody Sumon) Particip (woody Sumon) Partip (woody Sumon) Particip (woody Sumon)	Circular Plotor Quadrat Plot (Circle	Date: 22/1	2	Dominant Cov	ALDUM	/ N005			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	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
Inductivation H I T H Smort weed Sp, Polybanum Sp, H B H B Smort weed Sp, Techt Jock H B B B Smort weed Sp, Techt Jock H B B B B Techt Jock H B B B B Techt Jock H B B B B B Field Peper weeol H B S B <t< td=""><td>indanese hoos</td><td>H</td><td></td><td></td><td></td><td>30</td><td></td><td></td><td></td></t<>	indanese hoos	H				30			
Dolysemum sp. H H Smort weed sp. Jreft alck H B B Smort weed sp. Jreft alck H B B B	advist make	H				L			
Match Jock H B <th< td=""><td>DOLVOONSD.</td><td>I</td><td></td><td></td><td></td><td>¥</td><td></td><td></td><td>smart weed sp.</td></th<>	DOLVOONSD.	I				¥			smart weed sp.
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	great dock	+				00			
field pepper week H Image: State interval	rommon cockle bur	I				N			
Cutrig dock H Image: State of the st	(1. compestive)	Ŧ				M			
	curla Anck	Ŧ				V			
		-							
Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:	×								
Total Woody Stems: Total Woody Stems:		14							
Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
		Total W	oody Stems:						

Spring 2012 Vegetation Monitoring

Field Team;	Sample Plot Nu	umber:	Weather:	(e S s	Percent Area	I Coverage:	1 2	/.
Circular Plotor Quadrat Plot (Circle	Date: 12211	1 6	Dominant Cov	ler Type:	slove	t ua.	ter d	ock
one) ZV	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	General Observations
Species Name	Stem?	only)	stems only)	stems only)	4 S		6	
Japanese hops	r I				45			
great water aver	I				17			
ctana artic	±				2			
and and and the	I				Ŋ			
(I. compestre)	. <u>t</u>				-			
LICIA PRIVER MARIN								
	Total V	Voody Stems			MAN STREET		Note #	

Spring 2012 Vegetation Monitoring

Field Team; \As / k. <	Sample Plot Nu	umber:	Weather: cloudu	60s	Percent Area	k debr	5 - 20	
Circular Plot) or Quadrat Plot (Circle	Date: 7.7	5	Dominant Cov	er Type: Smovt	wed			
	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	No. Live Plants (Woody stems onlv)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
Species Name	#				42			
intel mod	4				1			
Locept relanding	- +				2		:•	
annele lonce chife	±				N)			
purphy house	±				Q			
inusional strand	Ħ				N			
show served of	П				V			
reed canany grass	H				2			
great water anon	3				17			
Griectics Ducations	T T				17			
mustared, willow	1				_			
raguered (continue)	- +				-			
annus pool	-				LN			
aurily dack								
「二」「「二」「二」「二」」「二」」「二」」「二」」」	Total M	loody Stems :				Service un		

Field Team: M < I K <	Sample Plot Nu	Imber:	Weather:	200)	Percent Area	al Coverage	1.	
Circular Plot Quadrat Plot (Circle	Date: 02	2	Dominant Cov	her Type: Cerco Co	warn a	10155		
one)	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
VAPA CANOTI OLOS	#				40			
mustaro sp.	Ŧ				F			
dunit - t	I				00 00			
inned nese hots	I				60			
	Ŧ				24			
	- T				Q			
Cald hind week					17		9	
	+				17			
The post of the stand	Ŧ							80
And the total	t				S			
great the buck	T							
	I				17			
thim ble initiation	Ŧ				-			· a l'h ssimum
manufied (manuel)	<u>–</u>				1>			
Tewel weed	+				12			
polson hendach	+				-			
the second s	Total M	loody Stems			The Local Division	南部と見た		

Spring 2012 Vegetation Monitoring

Field Team;	Sample Plot Ni	umber:	Weather:		Percent Are	al Coverage:		
NISI KS	EO L L	n	cloudy	605	1	00		
Circular Plot or Quadrat Plot (Circle	Date: Date:	12	Dominant Cov	rentype:	ater	Doct		
Old land	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	General Observations
Species Name	Stem?	only)	sterns only		0.0	16.00	16	,
preat water and	- I				20			
What has a second								
								2
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						100 m 100 m		
はないのないの日本になったのである。 ない	Total V	Voody Stems.					N THE STREET	
Al-dan.								

Spring 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	umber:	Meather:	605		al coverage:	S NOG	-34%
Circular Plot or Quadrat Plot (Circle	Date: Date:) (Dominant Cov	rer Type:			-	
	Herbaceous or Woody Stem 2	Planted? (Woody stems	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems onlv)	Plant Health* (Woody stems onlv)	General Observations
Species Name	SM SM	Z	20		17	141,110°112, 11°110°	12 10 12 12 12 12 12	volumteer .
willow 500.	SM	Z	8]	251	Ш	Canopy cover 50%
Smart (Styleonunsp)	E				St			
arein arein	t				17			
sedar S.	エ				17		-	(nut scale)
iemel meed	F				17			
arrow caf tearthumb	Ŧ				- 17			
money wort					10			
imustard so	-in				/			
burble loosestrife	T				2			
MUA WANT	T				2			
hice the avacs	=1				_			2
bidens coronata	Þ				17			HCKGEEO SUN-flower
1 dmutsta	Ĩ				_			Ĩ
bidens frondosa	+				V			(unde leaf)
unidentified herb	I				77	7		
	Total W	oody Stems:						

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Field Team: M S 1 1/25	Sample Plot Ni モ 8 ー P ー	umber: Y	Weather: Cloudu	09	Percent Are	al Coverage	г 1 20	i. bave ground 19:
Circular Plotor Quadrat Plot (Circle	Date: 5122	2	Dominant Cov	/er Type:				
	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal Coverade	Average Height (Woody stems onlv)	Plant Health* (Woody stems onlv)	General Observations
Species Name	SM	King Z	H		20	121, 3011 64 3, 36"	UL IL	Small willows have debris
ourble loose stufe	H				19			
rice cut avass	А				IJ			
dmintallal	Ħ				0 1			
UNING MOAND	H				S			
Small Station	+							
						ļ.		
	Total W	oody Stems:						

Spring 2012 Vegetation Monitoring

Greater Parter Data Data Data Data Repeter No. Live strans Parter Parter No. Live Parter No. Dead Parter No. Dead Parter Parter Parter Window Specter WS Y Z1 T 38" Rans Strans Strans Str	Field Team: MS < S	Sample Plot Ni 元の - P	umber:	Weather: C(pudy	605	Percent Are	al Coverage: 00 //		
Matrix Herbaceous No. Live Service No. Live Partis strands No. Live Partis strands <th>Circular Plot or Quadrat Plot (Circle</th> <th>Date: 22</th> <th>112</th> <th>Dominant Cov</th> <th>rer Type:</th> <th></th> <th></th> <th></th> <th></th>	Circular Plot or Quadrat Plot (Circle	Date: 22	112	Dominant Cov	rer Type:				
willow SppWSYZ17138"Gsoft rushHPBBCsoft rushHNCCCJoe partedHNNCCJoe partedHNNFCJoe partedHNNFCCarex throadHNNFCAnothg grassHNNFCHoothg grassHNNFCCarek turshHNNFCAnothg grassHNNFCAnothg grassHNNNFAnothg grassHNNNNAnothg grassHNNNAnothg grassHNNNAnothg grassHNNNAnothg grassHNNNAnothg grassHNNNAnothg JockHNNNAnothg JockHNNNAnothg JockHNNNAnothg JockHNNNAnothg JockHNNNAnothg JockHNNNAnothg JockHNNNAnothg JockHNNNAnothg JockHNNNAnothg Jock <t< th=""><th>Species Name</th><th>Herbaceous or Woody Stem?</th><th>Planted? (Woody stems only)</th><th>No. Live Plants (Woody stems only)</th><th>No. Dead Plants (Woody stems only)</th><th>% Areal Coverage</th><th>Average Height (Woody stems only)</th><th>Plant Health* (Woody stems only)</th><th>General Observations</th></t<>	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
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	WILLOW SOP	SM	7	21		LL	38"	G	
$ \frac{s_{p,tred}}{1000} \frac{1}{p,tred} \frac{1}{h} \frac{1}{h} \frac{1}{5} $	soft rush	Ŧ				00			
Toriest spp. H \square $[\Gamma] [\Gamma] [\Gamma] [\Gamma] [\Gamma] [\Gamma] [\Gamma] [\Gamma] [\Gamma] [\Gamma] $	sputed 100 Dia weed	Ŧ				2			
careexluridaHIIIIreal maple MS N I Z P (scedima)Amothy grass H R I I I P P Amothy grass H R R I I I P path rush H R R Z R R curly stars H R Z Z R purple loosestrife H Z Z R in the stars R R R in the stars <t< td=""><td>COREX SPD.</td><td>Ţ</td><td></td><td></td><td></td><td>Ы</td><td></td><td></td><td></td></t<>	COREX SPD.	Ţ				Ы			
red mapleWISNIZI IS'' F(Seed in 3)Hin othg gvassHIIIIIIpartin vusinHIIIIIIbartin vusinHIIIIIIbartin vusinHIIIIIIbartin vusinHIIIIIIbartin vusinHIIIIIIburple loosestrifeHIII <tdi< td="">IIIIIII<tdi< td=""><tdi< td="">IIIIII<tdi< td=""><tdi< td=""><tdi< td="">III<td>carex luvida</td><td>Ŧ</td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td></tdi<></tdi<></tdi<></tdi<></tdi<></tdi<>	carex luvida	Ŧ				1			
t_{1cn} of hy grass H I <td>redmapte</td> <td>SM</td> <td>Z</td> <td>1</td> <td></td> <td>17</td> <td>15-</td> <td>4</td> <td>(Secol 1173)</td>	redmapte	SM	Z	1		17	15-	4	(Secol 1173)
porth vush H Z Z Clurig Alock H 1 1 Clurig Alock H Z 2 Pwiple loosestrife H Z 2 Pwiple loosestrife H Z 2 Image: Strife H Z Z Image: Strife Image: Strife Z Image: Strife Image: Strife Z Image: Strife Z<	tranothy arass	+				1			
Curring Aack H I I Pumple Loosestnife H 2 2 Pumple Loosestnife H 2 2	path rush	t				2			
Purple loosestrife H 2 2 Purple loosestrife H H H	CUVIN HACK	4				_			
	ourble loosestrife	エ				2			
Total Woody Stems: Total Woody Stems: Image: Contract of the cont									
Total Woody Stems: Total Woody Stems:									
Total Woody Stems: Total Woody Stems:									
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Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
		Total W	oody Stems:						

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Spring 2012 Vegetation Monitoring

Outline Date: Date: Date: Date: Outline Fait: No. Live No. Live No. Live No. Live Noody Pants No. Live No. Live No. Live No. Live Noody Pants Pants No. Live No. Live No. Live Noody Pants No. Live No. Live No. Live No. Live Noody stems only stems only stems only stems only N N N 1 N T Noody woody stems only stems only stems only N N Z T Di T N Z T Z T Di N N Z T Di T N Z T Z T Di N Z Z T Di T N Z Z	S	Sample Plot NI 回し、 PC	umber:	Weather: Cloudy	(00s	Percent Are	al Coverage: 001/.		
Herbaceous Planted? No. Live No. Live	ot (Circle	Date:	0	Dominant Cov	er Type:	Mary	ava SS		
Stem? onlyl stems onlyl onlyl stems onlyl	2	Herbaceous	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	
With Michael Michael Michael	3	Stem?	only)	stems only)	stems only)	Coverage	only)	only)	General Observations
WS N 2 - 10, 9' E,G Ygonum 20 H X1 X1 X1 E,G Ygonum 20 H X1 X2 X1 E,G Ygonum 20 H X1 X2 X2 X1 Ygonum 20 H X1 X2 X2 X1 Ygonum 20 H X1 X2 X2 X1 Ygonum 20 H X1 X1 X2 X1 Ygonum 20 Ygonum 20 X1 X2 X1 X1 Ygonum 20 Ygonum 20 Ygonum 20 X1 X1 X1 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 X1 X1 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygonum 20 Ygo	100	53	Z			. 1	35-	U	20% tree canopy
Provential of the second states of the second state		SM	Z	7		1	10,91	E,G	51. tree canopy
rg.coum 30 H 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		H				Ň			
Image: 100 minimum mini	2 MUROBY	+				2			
Image: 100 minipage state sta									
Total Woody Stems: Total Woody Stems:									
Image: 1 mining of the second state									
Total Woody Stems: Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
		Total W	oody Stems:						

Spring 2012 Vegetation Monitoring

Field Team: MS1 KS	Sample Plot NI	umber: > \ ()	Weather:	/oUs	Percent Area	al Coverage:	101 = 2	
Circular Plot or Quadrat Plot (Circle	Date: 22	2	Dominant Cov	er Type:		5		
	Herbaceous	Planted? (Woodv	No. Live Plants	No. Dead Plants		Average Height (Woody	Plant Health* (Woody	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
reed canan gross	1				62			
lesser celendine	- 1				00			
ruperus so	T							
iewel weed	1.				2			
MONENLOVE	Ţ				2			
river birch	SM	Z	ហ		1	50'	Ш	138% compy
MINALC hoos	t				1			
hreen ash	SM	12-Planted	nted See	below	1	see bel	3	18.5-Plantel 18.5-Not obutel & Canopy
stinging nette	st				2			
Smart WPA Q	±				17			
river birch seedling	SM	Z	-		V	12"	5	
areen ash secolling	SM	Z	51	11.25	1			see below
								75%. canopy total
								0
A A A A A A A A A A A A A A A A A A A	Total W	oody Stems:						
Notes: * E = Excellent (Plant is thriving and has li G = Good (Plant is healthy and may have F = Fair (Plant is moderately healthy and P = Poor (Plant is dying and/or has heav	tte to no signs of s some herbivory may have mode y herbivory)	herbivory)) rate herbivory		1 2 0 2 2 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2		12, 250, 250, 250, 250, 250, 250, 250, 25	Fred (1911) 1 6 13 1 6 13 1 7 8 1 7 8 1 7 8 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1
			 \ -{}-	6- PS	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	.3	57	

Spring 2012 Vegetation Monitoring

Field Team: MS/KS	Sample Plot NI 一の一つ	umber:	Weather: 2100004	60s	Percent Are:	al Coverage: ערסוטים א	101 =	
Circular Plot or Quadrat Plot (Circle	Date: Date: 5 22	2	Dominant Cov	ver Type: OV C C +	watch	dock		
	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	General Ohservations
species name					COVERAGE (0 S	(Allo	(fillo	
japanese hops	+				20			
common cackle bur	±				S			
bitter dock	T				17			į.
	Total W	oody Stems:						

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Spring 2012 Vegetation Monitoring

Field Team: M < 1 V C	Sample Plot Nu	umber:	Weather:	605	Percent Area	al Coverage:	100110	- 3./
Circular Plot Quadrat Plot (Circle	Date:)	Dominant Cove	er Type:	-			
one) 70 /	51221	2	6	heat u	vater	dock		
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
areat water dock	+				40			
canada thistle	Н				7			
lapanese hops	H				30			
lesser celendine	H				10			
DOISON NEW LOCK	Ť				2			
bitter dock	H				2			
comman cocklebur	H				ħ			
stinging nette	Ŧ				17			
field mustard	+				17			
							~	
	Total Wo	oody Stems:						
Nhtee.								

Spring 2012 Vegetation Monitoring

Field Team: MS/ I/S	Sample Plot Nu	umber: 0/3	Veather:	605	Percent Area	al Coverage:	2	
Circular Plot or Quadrat Plot (Circle	Date: EX72	17	Dominant Cov	er Type:		V CO		
)				1	Average	Plant	
4	Herbaceous	Planted? (Woody	No. Live Plants	No. Dead Plants		Height (Woody	Health* (Woody	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
lapanese hops	+-1				73			
areat water dock	í t		U.		2			
common cockleburr	t				1		•	
bitter dock	t				2			
curla Jock	safer Review				2	I		
lesser celendine	aj.				S			
Black mustard	+				2			
White ares	t							
7								
	Total W	oody Stems:						
Notae.								

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Spring 2012 Vegetation Monitoring

Field Team: N/S K S	Sample Plot Ni Tロレク	umber: して	Weather:	2 60 S	Percent Are	al Coverage:	= 200	3 '.
Circular Plobor Quadrat Plot (Circle	Date: 22	2	Dominant Cov	er Type: C. P. P. M.	dine	>		
	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	
Species Name	Stem?	oniy)	stems only)	stems only)	Coverage	oniy)	(Aluo	General Observations
lesser relendine	_Ţ				(0)			in flower
cutle dock	=1				-	- 4		
reed canary aross	I				ſſ	1		
arent water dock	T				2	ĸ		
Jewel weed	<u>.</u>				2			
smart weed	1				61			
(non sp.	Z	Z		(- Andrewski -	1]	trunks outside of plot
broad leaf dock	T				_	5. 8 3	а.	
ladusthumb	Ţ				2	.73		
clear weed	H				7	1.5		1000
box elder mapleopy)	S	Z		(and the important)	Thunks out side of pla
iananece Knohneed	Ŧ				-	×.		
box elder maple seeding	mar w S	Z	100 +			-9-+	F	under mature tree
	۲							
								total canopy = 25%
								45
	Total We	oody Stems:						

Spring 2012 Vegetation Monitoring

Sal	E	mber:	Weather: ℃ \ \ ∩	2,07	Percent Are	al Coverage: സംവിവി	ind ~	2
t (Circle Da	ate: 10(22)	2	Dominant Co	ver Type:	. Well	a ct		
9 <u>F</u>	erbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	Ganaral Observations
arass		(ÅIIIO			78	límo	lámo	
1	±.				01			-
	T							
	1							
	1				N			
harred .	A							
	1				- >			
	Ţ.				-			
			2					
	Total Wo	ody Stems:						

Site
Mitigation
Farm
Findeme
ngineers-I
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Corps c
Army
ΝS

Spring 2012 Vegetation Monitoring

Field Team:	Sample Plot Ni ビ (umber: ک \ لہ	Veather:	50 a)	Percent Area	al Coverage:		
Circular Plot or Quadrat Plot (Circle one)	Date: (22	21	Dominant Cov	rer Type:	Canan	1 ONORS		
	Herbaceous or Woody Stom 2	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal Coverane	Average Height (Woody stems	Plant Health* (Woody stems	General Observations
reed colination arass	Π.	(fino		16 ino pillopo	70	lino	ii ii	
Soft rush	- <u>-</u>				10			
COMMON MAINEEd	T				J			
COMMON COCKLEbUL.	Ħ				2			
mustard adblack)	Ŧ				2			
witches which	đ				\sim		10	
Se Co K So	Ŧ				M			
DUVALE Prose christe	Ξ				v			
Fleid musicial	Ì				-			
Arass sp.	I				N			Unident fied
alrowleaf tcarlhumlo	£				17			
	Total W	oody Stems:			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			

<u>Notes:</u> * 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 moderate herbivory) P = Poor (Plant is dying and/or has heavy herbivory)

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Spring 2012 Vegetation Monitoring

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-ield Team: Jim / Klaun	Sample Plot NI C 3 - P I	umber:	Weather:	+ 705	Percent Are	eal Coverage ແມນ	a but	·/. /
Circular Plot ar Quadrat Plot (Circle one) 20 [/]	Date: 23	2	Dominant Cov	ver Type:		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
V OO CIA	SM	7	+th 16		N	7.6 7'4 9.2	P	
Stra more	SM	\succ	-		V	rt-	F	
sweet. Droper bush	S M	7			\mathbf{i}	21	L	
box elder	SM	2	~			11	2	
ladies thumb	土				25			
Danicum veraatum	土				0			
soft rush	+				0			
Carlox SD	Ħ				2			
mlanort	Ħ				0			
(clandine (1954)	T				3			
aleen ash	SM	Z	-		V	511	G	
MULEN ANNES VALL	T				/		1	
Polysonum hudiopian	H Star				S			
	Total W	oody Stems:			1.0			

<u>Notes:</u> * 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 moderate herbivory) P = Poor (Plant is dying and/or has heavy herbivory)

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n: / Kliran	Sample Plot NI C3- P1	umber: Ø	Weather: ろという y	2011	Percent Are	ial Coverage: 자연 신신	"YAY"	10
Dor Quadrat Plot (Circle	Date: 5123	12	Dominant Co	ver Type:	30.05			
ame	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
annes lace	I				01			
Dak	SM	\succ	Lf	_	d	9, 2, 2, 8,	ىلە	
	NS	Z	00		2	1, 6", 1' 1 6 8 8 6	Ъ,	
N <0	N S	7	0			2,2,2	G. G. F	
ash	SM	2	M			21012	۵_	Rectultment
Jo Xo	SM	7			17	۵	L	planted
PCDDev	E (Si				40			
5 + MW 2	T				01			
ruch	1				6			
es o	====				2			
in vergature)	t				0			
10 + 0 m A	Ţ				2			
IND POL	J							
	Total W	- de Oteman						

Spring 2012 Vegetation Monitoring

Field Team:	Sample Plot N	umber:	Weather: DV P.V. C.M.	A 705	Percent Area	al Coverage:	10 1	
Circular Plot or Quadrat Plot (Circle	Date: 23	2	Dominant Cov	ver Type:				
lana.	Herbaceous	Planted? (Woody	No. Live Plants	No. Dead Plants		Average Height (Woody	Plant Health* (Woody	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
Din nak	SM	7		3	-	.Z',E'	5	
dreen ash	SM	7		3	71	242	Ŀ	
A. olm	SM	Z		-	17	1	t	
indial bush	SB	2		-	17	0	G	
river birch	SM	7			17	3'	F	
with which we	1				10			
and hurd or k	T				\sim			
Water orboev	10				10			
ladres thumb	t				39			
Alleen alsher fore	77				10			
Caloring mill alred	T				m			
rewel weed	±				S			
celendine/15811)	I				20			
Crane Sn	<u></u>				2			
	-							
		_						
	Total M	loody Stems:						N. C. MARKEN ST. S. C. MARKEN ST. S. C.

<u>Notes:</u> * 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 moderate herbivory) P = Poor (Plant is dying and/or has heavy herbivory)

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egiater Prior Gueda Por (Carcle Date: / 22), 2010 Not the first of the	eld Team:	Sample Plot NI C 2 - P	Lumber:	Weather: SUMM y	2 01 S	Percent Are	al Coverage		
Image Participation No. Live Reserved stands No. Live Reserved stand stand stands No. Live Reserved stand s	iteutar Plot or Quadrat Plot (Circle	Date: (23/	Ē	Dominant Cov	er Type:				
Pirt cak WS Y S Z 3^2 3^2 3^2 7^2 P Panitum Urgatum H X Y I Z Z P Panitum Urgatum H X Y I Z Z P P Panitum Urgatum H X Y I Z Z P P Panitum Urgatum H X Y I Z Z P P Jewel weed H X I Z Z Z G P Jewel weed H X I Z Z G P P Jewel weed H X I Z Z G P P P P P Z G P P Z G P P Z G P Z G P Z P Z Z G Z Z G Z Z G Z Z G Z Z Z Z	there is a number of the second se	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	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
Arren ash panifum virgation WS Y I $ panifum virgation H P P P jewel weed H P 2 P jewel weed H P 2 P black gum WS Y I Z P Plack gum N P Z P P Plack gum N P Z P P Plack gum N P Z Z P Place gum N N N N N Pla$	DIN Oak	SM	7	S		N	e m N M	õ.	
Miritam Urgatum 14 9 9 9 Jewel weed H P 2 2 Jewel weed H F 2 5 Jewel weed H F 5 5 Jewel weed H F<	Areen ash	N S	7			17	4.	Р	
ewort weed H I Z I Z black gam WIS Y I ZI Z G Index gam WIS Y I ZI Z G Image: Single	MUNICUM VICAA NIM	1				96			
black gum WS Y I ZI Zi Zi Zi Image: Second Secon	ipivel weed					N			
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Total Woody Stems: 1	All aspect								
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Total Woody Stems: Total Woody Stems:									
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	A CONTRACT OF THE OWNER OWNER OF THE OWNER OF THE OWNER OF THE OWNER OWNE	Total W	oody Stems:						
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Spring 2012 Vegetation Monitoring

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Field Team:	Sample Plot N	umber: 2 (Weather: SUUNN M	705	Percent Are (つく	al Coverage		
Circular Plot or Quadrat Plot (Circle	Date: (23)	112	Dominant Cov	Ver Type:	5			
	Herbaceous	Planted? (Woody stems	No. Live Plants (Woodv	No. Dead Plants (Woodv	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	
Species Name	Stem?	only)	stems only)	stems only)	Coverage	only)	only)	General Observations
panicum vicantum	+				23			
swamp white oak	SM	\succ	-	7	_	0	৬	
Din Oak	SM	\checkmark			_	13,	5	
milk weed	T						(*)	
ire wel weed					_			
alles almost lare	Ŧ							
and to be due b	T							
ladies thumic					_			
	Total W	'oody Stems:						
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Spring 2012 Vegetation Monitoring

Field Team:	Sample Plot NL	umber:	Weather:	1	Percent Area	al Coverage:			
JIM KIVON	C2-72	22	SUNNU	105		00			Τ
Circular Plot or Quadrat Plot (Circle	Date: 25/25/	2	Dominant Cov	ier Type:	SW				
(and		Planted?	No. Live	A No. Dead		Average Height	Plant Health*		
Procise Name	Herbaceous or Woody Stem?	(Woody stems onlv)	Plants (Woody stems onlv)	Plants (Woody stems onlv)	% Areal Coverage	(Woody stems only)	(woody stems only)	General Observations	
SWAME Maile	53	7	m		-	21,91,6	હ		
ate en ash	53	7	2			2, 11,	۲ ^ر د		
	S M	7	2		-	121 121	F		
Silky Anawood	5 <u>Z</u>	$\sum_{i=1}^{n}$	-		15	4'	t		
swanp de de la	S Z	4			17	12	ণ		
inter wed	t	×.							
Contor 1 - 1 - 1	. +				12				
Constituted and a source of the source of th	t	1			95				
	Total W	oody Stems:			2000				

Spring 2012 Vegetation Monitoring

tor Quadrat Plot (Circle			Dominort Co	T. T. man.					
	Date: [23]	2		ALL LYPE.	vera	otum			
	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems onlv)	General Observation:	
ch	M	7	7			12,21	7,9		
	MS	>	4		2	+,55,01	G, P, P		
bluebenn	NS N	7			7	3.5	9		
ced	+				2				
Vivaetum	:)				95				
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	Total W	oody Stems:							
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Spring 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	umber: 24	Weather: ろはいりら	201	Percent Area	al Coverage:		
Circular Plot or Quadrat Plot (Circle	Date: / 25	2	Dominant Cov	er Type				
	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	Concrel Observations
Species Name	Stem :	/ ouiy	stems only			8 ' UIIY	ر السريم ال	
Din oak	\$3	7		-	71	I.	ch	
Shinaina netto					17	-		
iewel weed								
a root of build acts								
alleen anner lare					17			
Padios Abrumb					17			
Ornit was to reach the					ßS			
					2			
	Total W	oody Stems:						

Spring 2012 Vegetation Monitoring

Field Team:	Sample Plot NI C 2 - P 2	umber:	Weather: C(DUOL	y 80	Percent Are	eal Coverage			
Circular Plot an Quadrat Plot (Circle	Date: 23/ 5/23/	17	Dominant Cov	Ver Type: 20,0 \ (,u V	٤				
	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	General Ohservations	
Species Name	Stems				COVELAGE	8, 13,4	G, G, P		
Indian buch	SM	Z			7	و	J		
aren ach	SM	7	_		J	N	Р		
be pock bush	SM	7	_		1	3'	d		
red mapt (seedlings	Sm	Z			Ī	, 1	4		
iquel weed	T				2		e		
Just dock	Ŧ				-				
stinains nettle	7				2				
Davie Wirandum	T				7				
					-				
	Total W	oody Stems:					N		
Notae.									

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Totaliar Data Data Classes Derivative No. No. Reside Pathon Prinned No. No. No. No. No. Reside Pathon No. No. No. No. No. No. Reside Pathon No. No. No. No. No. No. Reside Name No. No. No. No. No. No. Reside Name No. No. No. No. No. No. Sinn No. No. No. No. No.<	Field Team:	Sample Plot N	P26	Weather: Su ∩ ∩ ∿	505	Percent Are	al Coverage:		
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$\begin{array}{ c c c c c c c c c c c c c c c c c c c$			Planted?	No. Live Diante	No. Dead ^{Diante}		Average Height	Plant Health* Woodv	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
Silky dogwood WS Y I ZI F G F G Suamp whit bak WS Y 2 Z ZI 73 G P Suamp whit bak WS Y 2 Z ZI 73 G P G F C A C A C A C A C A C A C A C A C A C	pin oak	NS	Y	ю			2.5 2.5	७ ५३	
Subarp white back MS \vee 2 \sim 21 43 6P soft rush H \sim 10 \sim 10 \sim 10 \sim 11 \sim 10 \sim 11 \sim 10 \sim 11 \sim 10 \sim 11 \sim 1	silky drawood	SM	Y	1		17	2	A	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Swamp white bak	MS	$\overline{}$	2	ų 	17	4 3	G P	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	soft rush	Ŧ				01			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Tewel weed	T				1			
Aucen annos lac H ∠I I Sedape Sp. H I I reed carrany gyass H SS S reed carrany gyass H SS S	ladies thumb					1			
Sedare sp. H I I I I I Feed canany grads H N SS N N Interval SS N SS N N N Interval SS N SS N N N Interval N N N N N N Interval N N N N N N Interval N N N N N N N Interval N N N N N N N N Interval N	ALCEN CUMUS LACE	1							
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Total Woody Stems: Total Woody Stems:									
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		Total W	oody Stems:						

Spring 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu $C_1 - P_2$	umber:	Weather: Sunn y	805	Percent Are	al Coverage 0 0		
Circular Plotsor Quadrat Plot (Circle	Date: 23	21	Dominant Co	ler Type:	AN ONN	010	2	
						Average	Plant	
	Herbaceous	Planted? (Woody	No. Live Plants	No. Dead Plants		Height (Woody	Health* (Woody	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
swamp white oak	SM	F)	12	8'	ସ	
Jun nak	SM	7		/	17	5'2	Y	
silky dogwood	SM	\succ		1	17	3.5	L	
reed canam are	+ SS				69			
¥1								
								5
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	Total W	oody Stems:			1 New York		1 S	

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Field Team:	Sample Plot N	umber: 0 D	Weather:	Š	Percent Are	al Coverage		
Sircular Plot or Quadrat Plot (Circle	Date:	2	Dominant Co	ver Type:				
			-			Average	Plant	
	Horboodin	Planted?	No. Live	No. Dead		Height	Health*	
Sheries Name	nerbaceous or Woody Stem?	(woody stems onlv)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems onlv)	stems onlv)	General Observations
swamp white ook	SM	X	r.		-	t's'9	t t	
a v ook	MS	7	00		2	11 8,9.510	5 5 B	
Silky drowood	2M	1			5	2	Ŀ	
arten ach	SM	7	_		17	M	ۍ	
Sucamore	53	X	4		_	2.5,4,4	5'5	
Willow So	SM	7	-		- >	m	U	
highbuch bluebern	S M	7	60		17	5-11-5-1	بل بل بل	
indiao buch	N 3	Z	_		IV	5.9	Ś	
red maple recruits	SM	Z			12	C''	J	
multim viradum								
coft ruch					10			
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assured burdack								
path rush					2			
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ladies thimb					-			
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	Total W	oody Stems:			10 N N			
Notes:								

* 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 moderate herbivory) P = Poor (Plant is dying and/or has heavy herbivory) mik ພິລິຊີຊີ

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Spring 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	o Der:	Weather:	KO.	Percent Are	al Coverage		
Circular Plotsor Quadrat Plot (Circle	Date: 1		Dominant Cov	er Tvpe:	Ś			
	5123	112	ree	ed car	I alm on	NR 55		
					2	Average	Plant	
	Herhareous	Planted? (Woodv	No. Live Plants	No. Dead Plants		Height (Woodv	Health* (Woodv	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
DIN Jak	SM	7	4	M	2	11,4,75	5 5 2	
Swamp white oak	SW	7	M		-	t's " al	G16, G	
river birch	SM	7	k		T	5	Ľ	
WILLOW So.	WS	4	1		7	M	Ŀ	
water pepper	:=				V			
ipine inced	Ì				1			
hox elder manle	SM	7	_		$\overline{\checkmark}$	-	Ŀ	
ladies thumb	Ŧ				01			
recal rangen arass	Ŧ				85			
		1. 1.	-					
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	Total Wo	oody Stems:						
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Field Team: KIVOLD	Sample Plot NI	umber:	S / N N IN	XUX	Percent Are	al Coverage:		
Circular Plotor Quadrat Plot (Circle	Date: 23	12	Dominant Cov	/er Type:				
1	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	
Species Name	Stem?	only)	stems only)	stems only)	Coverage	only)	only)	General Observations
Swamp white oak	SM	- >	+		N	2.5,8,9	. J	
Din Oak	SM	>	4		C	4,12,15	J	
Silky dogwood	SM	>	2		R.V	2,3	5	
mult flora cose	N/S	2			N V		F	
red maple victurits	SM	2	0		V	π ۵۱	F	
areen eish	SM	7	_		V	N	5	
Shramore.	SN	7			$\overline{\vee}$		R	
DEPARTY DISN	SM	7	0		Ň	5.2.2.1	2	
Sedap Spi	T				0)			
Soft rush	T				26			
IEWEL WEED	F-1				(
ladies thumb	÷.							
oath rush	+				~~~			
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Aldeen annes lale	+-							
paniarm vivatum	t				57			
0	Total W	oody Stems:						
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				General Observations																
1.00		arach	⊖Plant Health* (Woody stems	only)	G	G,G	0	S	S	S		G								
al Coverage:		and	Aveřage Height (Woody stems	only)	4,40,75	+,4	ŧ	I)	6.6	2	P	4								
Percent Area		d can	% Areal	Coverage	2	17	17	< >	1	17	dea	$\langle \mathbf{x} \rangle$	5	H)	1	-	82	1		
801	er Type:	ree	No. Dead Plants (Woodv	stems only)																
Weather: Stu⊳iolio	Dominant Cov		No. Live Plants (Woodv	stems only)	H	2	1		-											
umber:		12	Planted? (Woody stems	(Aluo	\checkmark	X	Υ	7	2	7		\geq								oody Stems:
Sample Plot Nu	Date:	5/23	Herbaceous or Woodv	Stem?	NS	SM	SM	SM	SM	SM	+	N S								Total We
Field Team:	Circular Plot or Quadrat Plot (Circle	one) 20		Species Name	pin oak	mighbush bluebeng	areen ash	Swamp white oak	inder (A faturese)	pepper bush	Durble Looseshife	arran wood unburning	Sold Lush	adirs thumb	Sedae SD.	worky sepacy	red canave and is	Dath Kush		

<u>Notes:</u> * 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 moderate herbivory) P = Poor (Plant is dying and/or has heavy herbivory)

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Plot or Quadrat Plot Circle	ES-P Date: 24	12	Dominant Cov	er Type: polioin				
lame	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
loosestrife	H				5			old + dead Stems
Sector Sector	M				15.			
leaf tear thumb	1-1				2			
rush	H				/			
ut a hash	Ŧ				LI.			
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	+							
	Total W	oody Stems:						

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Christian Flot or <u>editoriant Plot (christian Plot)</u> Derivative Constant Plot or <u>editoriant Plot (christian Plot)</u> Derivative Constant Plot or <u>editoriant Plot (christian Plot)</u> Second Reference Reference None (christian Plot) None (christian Plo	Field Team: v_ <	Sample Plot NI モスーロ	umber: ≳ ⊰	Weather:	409 F	Percent Are:	al Coverage:		
Manual Participation No. Live (work) submot	Circular Plot or Quadrat Plot (Circle	Date: 241	2	Dominant Cov	er Type:	ر ۲	0004		
Secret Amore Amore Market Amore Markt Amore Markt		Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	Canada Oheanatione
Purple loss shife H Set Set dead stans in Aroubleaf hearthumb H H Set Set H Aroubleaf hearthumb H H H Set H Aroubleaf hearthumb H H H Set H Palyanum string H H I H H Set get usert H I I H I Set get usert H I I I I Palyanum string H I I I I Set get usert H I I I I I Set get sp (3: uoay) H I I I I I I Set get sp (3: uoay) H I	Species Name	Stem 2	omy	sterns only					
Automate of teau-thread H E E H Imported teau-thread H H H H The request teau-thread H H H H The request teau-thread H H H H The request team string H H H H The request team string H H H H Sedage string H H H H H Sedage string H H H H H H Sedage string H H H H H H H Sedage string H H H H H H H H Sedage string H H H H H H H H H Sedage string H	purple loose stiff	H				30			dead stems too
Imane yearet H H H H H Palyanum Spin H H 1 1 1 Sedage Sp. (3 rubuy) H H 10 10 10 Sedage Sp. (3 rubuy) H H 10 10 10 10 Sedage Sp. (3 rubuy) H H 10 10 10 10 Sedage Sp. (3 rubuy) H H 10 10 10 10 Sedage Sp. (3 rubuy) H H 10 10 10 10 Sedage Sp. (3 rubuy) H 10 10 10 10 10 Sedage Sp. (3 rubuy) H 10 10 10 10 10 Sedage Sp. (3 rubuy) H 10 10 10 10 10 Sedage Sp. (3 rubuy) H 10 10 10 10 10 Sedage Sp. (3 rubuy) H 10 10 10 10 10	arrowleat tearthumb	t				IJ			
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sedder sp. (3 -way) H IO IO IO interview IO IO IO IO IO interview IO IO IO IO IO IO interview IO IO IO IO IO IO IO interview IO IO IO IO IO IO IO IO interview IO <	Dollonnum SP.	Ť				1			
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* 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 moderate herbivory) P = Poor (Plant is dying and/or has heavy herbivory)

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Field Team:	Sample Plot N	umber:	Weather:		Percent Area	al Coverage: I ∩ ∩ /		
Circular Plot of Quadrat Plot Circle	Date: /		Dominant Cov	er Type:				
one)	72124	112		POLLA	WYU1			
	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	
Species Name	Stem?	oniy)	stems only)	stems only)	Coverage	(VIIIO	(juo	General Observations
00/1000 0000 0000 0000	ł				0,60			
money wort	Ŧ				٦			
ladics thumb	F				S			
	Total W	oody Stems:						

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Field Team:	Sample Plot Nu E 3 - P	umber: S	Weather:	209 +21	Percent Area	al Coverage: しつレイ			
Circular Plot or Quadrat Plot (Circle	Date: 5124	112	Dominant Cov	rer Type: buvro	V 0 0 -	C Strips		1.5	
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	
Durthe lonce thite					5				
south vush	I				30				
polyonnium sp.	t								
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AUVAILLESE Jean Thumb	t				2				
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	Total W	oody Stems:							
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Field Team: MS \ K <	Sample Plot N	umber: 3(6	Weather:	4 1005	Percent Are	al Coverage:		
Circular Plot or Quadrat Plot Circle	Date:	2	Dominant Cov	ver Type:	ow I car	F F	11-12	
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
puriole 1005cstrife	14				00			dead stems mostly
bolvani co	Ц				Ŋ			2
arrow leaf tearthumb	H				52			
3-way scage	Ľ				5			
caft rush	Ŧ				0			
concitive for DEAD	Ч				2			
acted as DIAD	t				Co			
vice into as a	+				Ю			
as ysin	t				2			
	i a							
	Total W	loody Stems:						

÷.

Field Team: MS/KS	Sample Plot Ni	umber: 3.7	Weather: DV eV CaS	t 605	Percent Are	al Coverage		
Circular Plot or Quadrat Plot (Circle one)	Date: Date	12	Dominant Cov	Holight	UN W		1	
Snarias Name	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	No. Live Plants (Woody stems onlv)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
soft much	#				351			
00 WANNA	Ţ				(00)			
include the theme	H				M			
and hush	+				-			
(NN)	T				_			
	Total W	loody Stems:						
Matac:								

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Field Team: M < 1 LS	Sample Plot Nu	S when:	Weather: Cloudy	209	Percent Area	I Coverage:		
Circular Plot or Quadrat Plot (Circle one)	Date: 5 24		Dominant Cov	er 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
mohen wort	4				20			
usini tjos	I				S			5
arrow-leaf Lear thumb	Ŧ				01			
ourole loose strife	H				0			
IINKNOWN aster 30.	t				Ŋ			
bidens so	t				1 >			
set as	t				-			
	*				20			
	Total Wo	oody Stems:					No I and	

Spring 2012 Vegetation Monitoring

-ield Team:	Sample Plot Nu	Jmber:	Weather:	1001 +2	Percent Area	al Coverage:	1		_
Circular Plot or Quadrat Plot (Circle	Date: 74		Dominant Cov	ler Type:	a har	2 0 V 0 C		· /	1
	Herbaceous	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems		
Species Name	Stem?	only)	stems only)	stems only)	Coverage	only)	only)	General Observations	- 1
reca canary grass					g N				1
outrole loosestrife	t				IJ				
3-way sedae	+				12				
monen wor t	t				M				_
A Marine An	+1				N				
									-
									_
	Total We	oody Stems:							

Spring 2012 Vegetation Monitoring

Field Team: M S (Ł <	Sample Plot Nu	mber: ک ()	Weather:	it love	Percent Area	al Coverage:		
Circular Plot or Quadrat Plot (Circle	Date:	17	Dominant Cov	er Type:	ce ctrife			
	Herbaceous	Planted? (Woody stems	No. Live Plants (Woodv	No. Dead Plants (Woodv	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	
Species Name	Stem?	only)	stems only)	stems only)	Coverage	only)	only)	General Observations
purple loose strife	H				S 8			
arrow leaf tearthink	11				20			
pollysonum sp	I				15-			
l dues thumb	Η				M			
soft rush	Ħ		×		N			
dray heronan	H				N			
						-		
	Total We	oody Stems:						

Spring 2012 Vegebation Monitoring

Field Team:	Sample Plot Nu	umber:	Weather:		Percent Area	al Coverage:	1.1.1	
NS ICS	たらった	-+	OVENCON	S-1 6 0 2	Dave	= 46,00 =	; 9 9	
Circular Plot or Quadrat Plot (Circle one)	Date: いして	2	Dominant Cov	ler Type: ≁ ກີບປະໂ∻	1100			
Snociae Name	Herbaceous or Woody Stem?	Planted? (Woody stems	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems onlv)	Plant Health* (Woody stems onlv)	General Observations
Purple loosestinfe	I	(funo		line anao	2			
water burslane	Ţ				20			
Politican SP.	I				_			
arrow arum	H				17			
unknown arass	1				10			Sport
				П				
	Total W	oody Stems:						

Spring 2012 Vegetation Monitoring

Stratul Total Policy Policy Claration Desc / 101 Desc / 101 Stratul Total Policy Policy Claration Partnet/ Partnet/ Partnet/ Stratung Desc / 101 Desc / 101 Partnet/ Policy Policy Policy Partnet/ Stratung Partnet/ Partnet/ Partnet/ Stratung Partnet/ Partnet/ Partnet/ Stratung Desc / 101 Desc / 101 Partnet/	-ield Team: M < / 比 <	Sample Plot NL モター P	umber:	Weather: อันคร co ร	54 705	Percent Are	al Coverage:	ater	- S /
Milestance Intractions (notion stands) No. Deal (notion stands) No. Deal (notion s	Circular Plot or Quadrat Plot (Circle	Date: Date: Date:	- CI	Dominant Cov	reed	Canar	5		
Muguart H 30 30 1 Freed canary grass H 50 50 50 Interest laps Must laps Must laps 50 50 50 Wulbursp WS M 22 2 64 70 Jurusel weed H 2 2 64 1 1 Jurusel weed H 2 2 64 1 2 Jurusel weed H 2 2 64 1 2 Jurusel weed H 2 2 64 2 64 Jurusel weed H 2 2 64 2 64 Jurusel weed H 2 2 64 2 64 Jurusel weed H 2 2 64 2 64 2 Annony 2 2 2 64 2 2 64 2 Jurusel weed H 2 2 2 64 2 2 2 2 2 2 2	Suecies Name	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	No. Live Plants (Woody stems onlv)	No. Dead Plants (Woody stems onlv)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		Ţ		1		30	:	:	
image: parameter logs H 2 2 2 4 willow spanned WS V Z S 66° 20° 6° P Jrunel weed H N Z Z Z Z Jrunel weed H Z Z Z Z Adam research H Z Z Z Adam research H Z Z Z Adam research H Z Z Z Angene with Z Z Z Z Angene with H Z Z Z Angene with Z Z Z Angenewith <td>red canan arasi</td> <td>Ŧ</td> <td></td> <td></td> <td></td> <td>56</td> <td></td> <td></td> <td></td>	red canan arasi	Ŧ				56			
willow sp WS VS V Z S 66° 28° 6° P Jruel weed H H Z Z Z Z Andread H Z Z Z Z Z Andread Z Z Z	anonece hous	T				N			
Jrusel weed H H K Alart ragueed H K K Alart ragueed H K K Anangartte K K K Ananan	WILLOW SO	SN	57	2		IJ	482	G - P	
Alart ragued H Z1 Z1 Sthranger H1e H Z1 Z1	inter a red	I				/			
Shnging with H Z1 H Shnging with H H H Image: Shnging with H H H	Jean Vouleed	H				V			
	channo o the	1				- 7			
Total Woody Stems:	C. Marine								
Total Woody Stemes:									
Total Woody Stems:								×**	
Total Woody Stems: Total Woody Stems:									
Total Woody Stems: Total Woody Stems:									
Total Woody Stems: Total Woody Stems:									
Total Woody Stems: Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
		Total W	oody Stems:						

Spring 2012 Vegetation Monitoring

Field Team: M S //LS	Sample Plot Nu	umber: 243	Weather:	64,705	Percent Are	al Coverage 00 // ⊂ 04	é.		
Circular Plot or Quadrat Plot (Circle	Date: 241	12	Dominant Cov	ier Type: reed	anany	ONVOISS			
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	
	+				SI				
reed canary grass	Ţ				60				
willow spp.	SM	\succ	13		10	04,36,46 27,49,39 25,35,36	1 1 1 1 1 1 0 1 1 0 1 0 1 0 1 0 1 0 1 0	38 F 48 F (Incasulad	(Solar 11)
Durble loose strife	Н				_				
Irwel weed	Ŧ				1				
arass spi	H				N				
aiant raqueed	Ħ				$\overline{\checkmark}$				
Deisoned hemlock	Ţ				1				
bed straw	t				17				
	Total Wo	oody Stems:							
Notes:									

Spring 2012 Vegetation Monitoring

Field Team: MS KS	Sample Plot Nu 正	mber: 44	Weather:	54 705	Percent Are	al Coverage: othe approximation	+ pun	7%, covered by willow canapy
Circular Plot or Quadrat Plot (Circle one)	Date: 2U	17	Dominant Cov てで	er Type:	nami	arass		
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 Canami arase	Ŧ		. 0		01			
alont rosmeed	I				لی ۲			
leurol wiced	Ţ				1			
purple loosestrife	Ĩ				- 17			
evola a fortura 50.	Н				ドア			
News work Troncerd	I				7			
	T				1			
Viver Dires	N.S.	X	~		V	214	2	
willow 500.	NS W	Y	80		1	00. 27" 75 25 "67" 00	с тт С е ^{ль} т п	zurigstrum uf shoots Canopy = 25%
CLUM ALOCK	±				2			
hellow rocket	N				5		P	
Doldenrod sp	Ľ				1 7			
red maple	SM	Z			1 1 2	2	14	ود دفالم و
cockle bui (common)	A				5			
Sting ng nettle	Ť				1 7			
MUStard SO.	-T							
carex crinita	Z				17			
	Total Wo	ody Stems:						

Spring 2012 Vegetation Monitoring

Field Team: MS \ V <	Sample Plot Nu E	Jmber: U	Weather: JVevca	57 705	Percent Are	al Coverage: Arconstructure	o pund	Jen worter : 25"1.
Circular Plot or Quadrat Plot (Circle	Date: 27	12	Dominant Cov	rer Type:	50.	2		
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
polyonum sp.	H				40			
Perry CLESS	-11				- 17			
great water dock	Ц				0			
NY Iron weed	14							
red rama arass	T				60			
thickie (canada)	4				1			
bitterdack	I				2 =			
Mu autort	I				4			
binduced	Ŧ				1 >			
wardenthed herb	T				2			-
Scor Sounder	t				\sim			
MILLION SO	SM	7	2		=	The se	L- L-	
bed straw	T				V			Salium (ciravers)
ladies thumb	H				S			
No. of the second se	Total W	oody Stems:						

Notes: * 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 moderate herbivory) P = Poor (Plant is dying and/or has heavy herbivory)

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Spring 2012 Vegetation Monitoring

Field Team: ///s k_S	Sample Plot Ni モター P	umber: 46	Weather:	+ 205 205	Percent Are	al Coverage:	10 MM	10%
Curcular Plot or Quadrat Plot (Circle	Date:	0	Dominant Cov	/er Type: Y f f f 0	, מוֹע מוֹעיע	Û		
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	No. Live Plants (Woody stems onlv)	No. Dead Plants (Woody stems onlv)	% Areal Coverage	Average Height (Woody stems onlv)	Plant Health* (Woody stems onlv)	General Observations
red canach arack	Н				416			
teur weed	Ţ				60			
areat water dock	Н				2			
AD (NOV VA	Ţ							
Date user-	Η				2			
	H				0			
DATSON Primtock	H				Ū.			
cupatorium 50	I				-			
WILLOW SPD.	SN	7	rt-		12	26 52 64 24 60 64	11 12 0 12 12 12 12	(neasured in inchas)
ladies thumb	1				1			
cutto dock	Ĩ				_			
	Total W	oody Stems:						

Field Team:	Sample Plot N て	umber: エユ	Weather: DV ev co	YOL FS 0	Percent Area	al Coverage:	No / N	ater = 5 %.
Circular Plotor Quadrat Plot (Circle	Date: 5124		Dominant Cov	ier Type:	Jort			
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	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
mua wort	Ч				61			
arass sp.	+1				10			
wild musticed	H				1			
timothin are so	+1				17			
Mente daish	<u>7</u>				-			
C S MULLIN	SM	7	_		_	118 m	4	
hin durood	I				1			
red CNNAM avall	. 1				- 20			
								×
	Total W	oody Stems:						and the second se
Nintae'								

Notes: * 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 moderate herbivory) P = Poor (Plant is dying and/or has heavy herbivory)

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Spring 2012 Vegetation Monitoring

Field Team: M S 1 K <	Sample Plot N	umber:	Weather:	100 T	Percent Arei	al Coverage:	- 41-1	
Circular Plet or Quadrat Plot (Circle	Date: 24	1	Dominant Cov	er Type:	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
around ive	I				62			
ameter hundlock	T				Ŋ			
Sthraine nette	Ŧ				2			
transition of the	Ŧ				IJ			
	t				17			
the we tree	SN	2	8		4	36.70.35	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1 rdus
aver ash	SZ	2	5		2	26 tz 32	11 12 10 10	Indres
viver birch	SM	>	00		1	24 22 26	е 12-12- 12-12-13-12-13-12-13-12-13-12-13-12-13-12-13-12-13-12-13-12-13-12-13-13-13-13-13-13-13-13-13-13-13-13-13-	Indies
box elder maple	SN	Z	4			22 12 18 20	6- 14- 14-	inches
multiflora rose	SZ	Z	al		2	16 31	ٹ چ	
SUCAMOVE (MOLTANE)	SM	Z			A two	192 N K	¢.	S diameter
Amelanchier Canadensis	SM	γ			17	(5 1	d	
silver maple (mature)	SM	Z			N	50'+	÷	5° bliamator
Unknown hub	Ħ				IJ			
Orass son	I				2			
								30% total canopy cover
	Total M	loody Stems:						

Spring 2012 Vegetation Monitoring

Field Team: IKS	Sample Plot Nu	umber:	Weather: ONEVCOLS	+ 705	Percent Area	al Coverage: \0.0 '/.			- 1
Circular Plot or Quadrat Plot (Circle	Date: 2-(12	Dominant Cov	rer Type:	MM	2017			
Snorios Name	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	No. Live Plants (Woody stems onlv)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations	
mua.jort	I				57				
a, canadensis	SM	X			ſ	14	৫	Canopy ~ 2 K.	
silver maple	SM	7)	10,	¢.	Canopy : 3%.	
onidentified herb.	1				~				T
paicab hetvilack	Ĩ								
DOLING MILL SN.	-T				1				
intra interest	T				 M				
calidado So.	Ţ				ന				
Jobahese Knotweed	1				\sim				
reed can ames	Ц				20				
areat waren dock	T.				<)				
Jack thumb	Ť				V				
bind weed	Ţ.				17				
curly dock	T1				~				
areater burdock	ŧ				17				
inita mustarial	Ť				17				1
dead stump	S M	5		~	17	50%			1
	Total W	oody Stems:							
Metoo.									

Notes: * 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 moderate herbivory) P = Poor (Plant is dying and/or has heavy herbivory)

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Spring 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	umber: ער	Weather: DVeVCASt	205	Percent Area	al Coverage:	11	0 / 0
Circular Plot or Quadrat Plot (Circle	Date: 5(24	112	Dominant Cov	/er 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
Durple loosestrife	Ť				٢			
NY ironwed	T				17			
arrow leaf tear thumb	I				0)			
bidens colontata	t				17			
soft rush	I.				0			
thmo-thy aracs	1				20			
A a a a a a a a a a a a a a a a a a a a	SM	7	2		17	٤ ,٦2,	L. Q.	Indes
summer white oak	SZ	7	1		1 ×	24	L	inchas
cares scoparia	T				5			flowers on top of stem
carex Vulpinoidea	T				20			
carex lurida	H				-			
carex crinita	Ţ				ŋ			
reed canary grass	1				0	3		
				ŕc				
	Total W	oody Stems:						

Spring 2012 Vegetation Monitoring

Field Team: MS {	Sample Plot Nu ECI	P 5 (Weather: DVEV COLS	+ 70s	Percent Area	al Coverage: \D\\/		
Circular Plotor Quadrat Plot (Circle one) 20	Date: 5 24	12	Dominant Cov	ler Type: Him of tr	010	ر س		
1000		9 			5	Average	Plant	
	Herbaceous or Woody	(Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Height (Woody stems	(Woody stems	General Observations
Species Name	S M				M. 10	22, 24 W. 1 - 6 22, 20 - 401	240	nerbivery, Flood dmg, wask daleris
swamp white oak	SM	7			$\overline{\checkmark}$	9	¢.	> inches
black gum	Z IN	X			1	124	R	~
timothy arass	Ţ				TL			
reed canany arass	Н				5			
MAYEX UN DENOIDER	÷.,				(
curtin dack	I				17			
NY Tronwerd	Т.				\sim			
Avverid Laona	533	7			V	5 11	0_	
								A
	Total W	oody Stems:						

Spring 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	Imber:	Weather: ヘレーンのみ	101 +2	Percent Are:	al Coverage.		
Circle Circle	Date:	70	Dominant Cov	/er Type:				
	172/S	2	100	d cono	10 M	0.55		
Sneries Name	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	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
bolucion namo	Ŧ				20			*
reed canany arass	I				54			
alivele loose strife	T				S			
timethy averss	T				7			
bidenes connected	1				h			
NY Trouved	1				3			
Alor John	1				_			
Jeat water and	I				64			
drawth week have	Ŧ				N			
ave and took to burk	Ħ							
Capy lupiting	Ħ							
Kedulaan turiy	1				V			
	Total W	oody Stems:						

Spring 2012 Vegetation Monitoring

Field Team: ///S/_I <s< th=""><th>Sample Plot NI</th><th>umber: UU:</th><th>Weather: Dv ev co s</th><th>+ 70S</th><th>Percent Are</th><th>al Coverage:</th><th></th><th></th></s<>	Sample Plot NI	umber: UU:	Weather: Dv ev co s	+ 70S	Percent Are	al Coverage:		
Crcular Plot or Quadrat Plot (Circle one) 20 ¹	Date: 5/24	2	Dominant Cov	CCO CONDU	Mr. M. W.	d MUST	Lava	
Sanotice Mamo	Herbaceous or Woody Stem?	Planted? (Woody stems	No. Live Plants (Woody stems onlv)	No. Dead Plants (Woody stems only)	% Areal Coverade	Average Height (Woody stems onlv)	Plant Health* (Woody stems onlv)	General Observations
plectes Name	Ŧ	(funo	16-22-222		00			ting purple/ lolue fromers
reed canany arass	-				28			
tothe mush	÷				01			
ladio thumb	T				M			
and Kan we to	t				M			
budens coronata	đ				7			
Initial Boundary	+				42			
bolio and and	4				01			
hollows leaf travethemb	: I				0			
arrow lead tear thumb	t				M			
Pesel weed	t				12			
swamp milk weed	H				17			
Sedar So (untrown)	Ŧ				1			
common bone set	t				1			
natha rush	÷				2			
red maple	SIN	Z	3		1	× 80	L	
	Total W	oody Stems:						

Spring 2012 Vegetation Monitoring

Spring 2012 Vegetation Monitoring

ield Team; MS KS	Sample Plot Nr	umber: DU	Weather:	101 12×	Percent Are (UD	al Coverage		
Circular Plot or Quadrat Plot (Circle	Date: 24	2	Dominant Cov	reredice		0 0 0 0		
	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	General Observations
species name	T T				54	III		
(A futrosa)	SM	2	12		ß	5	2	
policeoutin So.	T				10			
coft visch	Ţ				-			
timothis arace	1				V			
	Total W	foody Stems:			A N N			A STATE OF STATE OF STATE OF STATE
Matter.								

Spring 2012 Vegetation Monitoring

Circular Plot or Quadrat Plot (Circle one) 2.0								
	Uate: 12 12 12 12 12 12 12 12 12 12	2	Dominant Cor	ver Type:	anary	22010	~	
Snecies Name	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Avérage Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
PLAUBLE LOORESTIFE	t				>			
timothy arass	T				00			
Swama milkweed	Ŧ				17			
NY IVONWEED	H							
soft rush	Ŧ							
aroon ach	SM	7	-		<		L	
average teat transform	1				17			
reed canony avass	t				88			
		a.						
	Total W	oody Stems:						

Spring 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	서 나 나	Weather:	5.02	Percent Are	al Coverage	= pura	2
Circular Plot or Quadrat Plot (Circle	Date:	27	Dominant Cov	rer Type:	AN AY	0 770	timort	at avoiss
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 canary aross	Ţ				27			
Himothic arace	t				H			
hor rider maple	SM	7	/		12	12"	E.	
arean ach	SM	7				1.80	I¥.	bent over wrace debris
indian bush	SW	Z			7	1	D_	
colidor en	i t	2	-		5			
Larhol wood					1			
with turkt	t				-			
multiflate voce	SM	Z	-		17	MO.	5	
smooth alder	SM	. 7			1	3(° n	G	
soft rush	I				5			
curtin dock	1				~			
						0		
	Total W	oody Stems:						

Spring 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	umber:	Weather: OVEV CO	201 12	Percent Are	al Coverage: アモービス	14-15	·/·
Circular Plot or Quadrat Plot (Circle	Date: 124	112	Dominant Cov	ver Type: ℃ € Ø	Danam	010	2.55	
Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	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 loncestrife	H			N	00			
reed canamy arass	t				62			
Swamp mulkined	H				17			
timution arass	T				S			
soft rush	I.				S			
Indian buch	MS	Z			~	401	d	
arrow hat tearthant	H				9			
To an IAM CO	I				3			
rice rut arass	t				2			
wild mustard					17			
Tewel Luccol	1				1			
colinaan Sa	H				17			
Ladies - humb	Ч				-			
Sedae 50.	Ħ				1			
	Total W	oody Stems:						
Alotoo:								

Fall 2014 Survey Data Sheets
Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	umber:	Weather:	200	Percent Are	al Coverage:		
Circular Plot or Quadrat Plot (Circle	Date:		Dominant Cov	er Type:				
one) 20	10/10/	2		1 apent	Se h	0 2 5		
	Herbaceous or Woody Stam?	Planted? (Woody stems	No. Live Plants (Woody stems onlv)	No. Dead Plants (Woody stems onlv)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
Species Name	T	Ifuno	(001			
Japanese hops	-							
			.4					
	Total M	loody Stems						

Fall 2012 Vegetation Monitoring

Ministry Ext-ryle Deminant Mark (Circle Ext-ryle Deminant Mark (Circle	⁼ ield Team _;	Sample Plot NL	Jmber:	Weather:		Percent Are	al Coverage	3	٤ĵ
Container Date Durinant Over Type: Durinant Over Type: Durinant Over Type: Species Name Partiner No. Live No. Live No. Live No. Live No. Bartiner Species Name Partiner No. Live No. Live No. Live No. Live No. Bartiner Partiner Species Name Partiner No. Live No. Live No. Live No. Bartiner Partiner Lingon Cost of No. No. Live No. Live No. Bartiner Partiner Partiner Lingon Cost of No. Partiner No. Live No. Live No. Bartiner Partiner Lingon Cost of No. Partiner <	MS/KC	トート	7	SUNNS	605		: 001		
Image Patrix Heriotic No. Livio Noticy Servic	Circular Plobor Quadrat Plot (Circle	Date: 10/16/	2	Dominant Celv	ver Type:	w DC	ncilyour	incum	
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lepanese hops Llack mustand polygianum pransipluorum H purple loosethife H read comeng grass H read comeng grass H nug uart mug uart Tail Woody States Tail Woody States	Species Name	Stem?	only)	stems only)	stems only)	Coverage	only)	only)	General Observations
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Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	umber:	Veather:	C	Percent Area	al Coverage:		-
Circular Pled or Quadrat Plot (Circle	Date:	2	Dominant Cov	Ver Type:	NOVON O	22020		
	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	
Species Name	Stem?	only)	stems only)	stems only)	Coverage	only)	only)	General Observations
reed conard arriss	H				0			
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purple lossestrife	H				0			
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alemente considents and	+				б			
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white keoth aster	Ŧ				17			
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And want with)	N S	×			17	.+ 7	-	A GA BELA OFEN A
and wood is in the second	+				7			
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	Total V	Voody Stems	082			10		and the second se
Notes:								

Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot N	umber:	Weather:	(a.D. c	Percent Area	al Coverage:		
Circular Plot or Quadrat Plot (Circle	Date:	Ţ	Dominant Cov	rer Type:	+~~			
01e) 2 0		Planted?	No. Live Diants	No. Dead Plants	3	Average Height (Woodv	Plant Health* (Woodv	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
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white highly acter	t				12			
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and all all all all all all all all all al	I				1			
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river birch Scedlings	SN	Z	N		-	13"	Ŀ	
olm Seedlink	SM	Z	2007		121	101	Ŀ	
Fragria (stranbourg	ιŢ				- 2			
agrostis Sp.	± =				- ى			
5014 YUSH		loody Stems:						
<u>Notes:</u> * E = Excellent (Plant is thriving and has li G = Good (Plant is healthy and may hav F = Fair (Plant is moderately healthy and P = Poor (Plant is dying and/or has heav	ttle to no signs of e some herbivory I may have mode y herbivory)	f herbivory)) :rate herbivory	2			40 [,]	G	
black eyed susan	1	-	I		17			
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II 2012 Vegetation	
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All of the stand of t	Field Team:	Sample Plot Nt	umber:	Weather: SUMMU	000	Percent Area	al Coverage:			
Mathematication Participation No. Live Heating Section status No. Live Mondy status No. Live Mondy status <th< th=""><th>Circular Plot & Quadrat Plot (Circle</th><th>Date: 10/16/</th><th>2</th><th>Dominant Cov</th><th>Jer Type:</th><th>birch</th><th>NNAN</th><th>+100</th><th></th><th></th></th<>	Circular Plot & Quadrat Plot (Circle	Date: 10/16/	2	Dominant Cov	Jer Type:	birch	NNAN	+100		
Decrete Name Multiple		Herbaceous or Woody Stom?	Planted? (Woody stems	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems onlv)	Plant Health* (Woody stems only)	General Observations	
Retarina H H H Retarina WS N $\frac{1}{2}$ ($\frac{1}{2}$) $\frac{1}{2}$ ($\frac{1}{2}$) Kriver Willow 40 WS N $\frac{1}{2}$ ($\frac{1}{2}$) $\frac{1}{2}$ ($\frac{1}{2}$) Kriver Line WS N $\frac{1}{2}$ ($\frac{1}{2}$) $\frac{1}{2}$ ($\frac{1}{2}$) Willow 40 WS N $\frac{1}{2}$ ($\frac{1}{2}$) $\frac{1}{2}$ ($\frac{1}{2}$) Willow 40 WS N $\frac{1}{2}$ ($\frac{1}{2}$) $\frac{1}{2}$ ($\frac{1}{2}$) Willow 40 WS N $\frac{1}{2}$ ($\frac{1}{2}$) $\frac{1}{2}$ ($\frac{1}{2}$) Winth beath Color 10 10^{10} ($\frac{1}{2}$) $\frac{1}{2}$ Winth beath Color 1 10^{10} ($\frac{1}{2}$) $\frac{1}{2}$ Winth beath Color 1 1^{10} ($\frac{1}{2}$) $\frac{1}{2}$ Winth beath Color 1 1^{10} ($\frac{1}{2}$) $\frac{1}{2}$ Winth beath Color 1 1^{10} ($\frac{1}{2}$) $\frac{1}{2}$ Winth beath Color 1 1^{10} ($\frac{1}{2}$) $\frac{1}{2}$ Winth beat WS 1^{10} ($\frac{1}{2}$) 1^{11} ($\frac{1}{2}$) $\frac{1}{2}$ Winth beat WS 1^{10} ($\frac{1}{2}$) 1^{11} ($\frac{1}{2}$) $\frac{1}{2}$ <	opecies Name	t t	lfuno			20				
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willow sp. WS N \widehat{MS} N \widehat{MS} N \widehat{MS} <td>Viver birch</td> <td>NS N</td> <td>Z</td> <td>Life Line out of c</td> <td>(ćw n</td> <td>36</td> <td>\$0 48" \$0 48"</td> <td>B</td> <td>12, ave 13'</td> <td></td>	Viver birch	NS N	Z	Life Line out of c	(ćw n	36	\$0 48" \$0 48"	B	12, ave 13'	
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bidens ap H Z Z bidens ap H 2 read canary gyass H Z I read canary gyass H Total Woody Stems: Total Woody Stems:	pin nav	S M	~	" 2		_	28: 1,35	ر ک		
reed Canary grass H 2 2 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2	Ledon of the	н				2				
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Total Woody Stems:										
Total Woody Stems:										
		Total W	oody Stems:						and the second of the	

Willow all 59005 3 VIVEN b HEL large clump of Volumber

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Fall 2012 Vegetation Monitoring

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Field Learn: MS / I <s< th=""><th></th><th>P (</th><th>SUNNU</th><th>605</th><th></th><th>00%</th><th></th><th></th></s<>		P (SUNNU	605		00%		
Circular Plot or Quadrat Plot (Circle	Date:	12	Dominant Cov	ier Type: MUO	trom			
	Herbaceous	Planted? (Woodv	No. Live Plants	No. Dead Plants		Average Height (Woody	Plant Health* (Woody	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
m Uquiort	Н				42			
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monent rocareta	H				4			
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green as	ST ST	Z	15		σ	12 "	G	
	Total W	oody Stems:						
<u>Notes:</u> * E = Excellent (Plant is thriving and has live G = Good (Plant is healthy and may have F = Fair (Plant is moderately healthy and	ttle to no signs of e some herbivory i may have mode	herbivory)) rate herbivory	c.					
P = Poor (Plant is dying and/or has heav	y nerbivory)	7	m -		ς.	36,78	1 1 4 L	
SWEET REPRENDED	53	۲.	- 1			24" 20"	6 + 4	
WILLON OBK	53	~			Ī		5	10.242

Fall 2012 Vegetation Monitoring

Offender Politik for of undrat Plat (Clinda Derivative Schröher Grant Derivative Schröher	Field Team;	Sample Plot NL	umber:	Weather:	(*)	Percent Are	al Coverage.		
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Species Name Series Display and the series of the se		Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	General Observations
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minigateWYZI $\mathbb{E}^{3/6}$ \mathbb{V}_{P} green ashWYYHIIpurple loossthfeHNSYHSSpin oakWSYZISSgaamineaeHSZISSsuamp white oakWSYZISSsuamp white healthasterHZZISsubmpt healthasterHZZZIunhthhealthasterHZZZblue vervainHZZZZLblue vervainHZZZZLblue vervainHZZZZLblue vervainHZZZZLblue vervainHZZZZZblue vervainHZZZZZblue vervainHZZZZblue vervainHZZZZblue vervainHZZZZblueVZZZZblueVZZZZblueZZZZZblueVZZZZblueVZZZZblueVZZZ	reed canary grass	t				20			
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pin oak WS Y H 3 37 m F F F grammmeae H Y Z I 5 37 m F F grammmeae H Y Z I 5 5 m F F grammmeae H Y Z I 5 m F F grammpeae H Z Z I 5 m F F submput H Z Z I 5 m F F submput H Z Z Z Z Z which health astres H Z Z Z Z Z Z blue vervain H Z Z Z Z Z Z Z blue vervain H Z Z Z Z Z Z Z Z Z blue vervain H Z <th< td=""><td>gurale loncethife</td><td>t</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>	gurale loncethife	t							
frame H E <td>rupic rosses</td> <td>SM</td> <td>2-</td> <td>J</td> <td></td> <td>M</td> <td>18t . 09' 18</td> <td>LL LL LL</td> <td></td>	rupic rosses	SM	2-	J		M	18t . 09' 18	LL LL LL	
Summe white oak WS Y Z I ¹ ^{55° 46° F F Summe white oak WS Y Z 21 ²¹ ^{55° 46° F F Saldege gigantea H 21 ²¹ ²¹ ²¹ ²¹ ²¹ ²¹ ²¹}}		1				IJ			
Allering 4 4 4 4 4 Saldago gigantea H 2 2 2 White health aster H 2 2 2 White health aster H 2 2 2 Carlow Lurida H 2 2 2 blue vervain H 2 2 2 blue vervain H 2 2 2 1 1 2 2 2 1 1 2 2 2 1 1 2 2 2 1 1 2 2 2 1 1 2 2 2 1 1 2 2 2 1 1 2 2 2 1 1 2 2 2 1 1 2 2 2 1 1 2 2 2 1 1 2 2 2 1 1 2 2 2 1 2 2	grammer white are	53	×	2			184 155		
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	blue vervoir	+				1			
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		Total W	oody Stems.						

Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot Ni	umber:	Weather:	(a. D	Percent Area	al Coverage.		
Circular Ploton Quadrat Plot (Circle	Date:	2 0	Dominant Cov	ver Type: Y ←	eed co	man	21051	
one) <		1				Average	Plant	
Ð		Planted?	No. Live	No. Dead		Height	Health*	
Species Name	Herbaceous or Woody Stem?	(Woody stems only)	Plants (Woody stems only)	Plants (Woody stems only)	% Areal Coverage	(woody stems only)	(wooay stems only)	General Observations
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ourple loosestrife	Ħ				\sim			
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on ook	N S	Y	\mathcal{C}^{\prime}		N	28" 48" 38	2	
	Total W	oody Stems:						

Fall 2012 Vegetation Monstoring

Field Team:	Sample Plot Nu	umber:	Weather:	0	Percent Area	al Coverage:			
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one) 2.0 Circle	Date: 10/16	12	Dominant Cov	ver lype:	Canaw	1 gra	s S		_
		Planted 2	No Live	No Dead		Aveřáge Height	Plant Health*		
	Herbaceous or Woody Stem 2	(Woody stems	Plants (Woody stems only)	Plants (Woody stems onlv)	% Areal Coverage	(Woody stems onlv)	(Woody stems onlv)	General Observations	
species Name	T	(fino			90				
Survey milk moded	t				1				
by oak	S Z	7	S		9	10' 85' 10.5' 40' 4.5'	יז רדי לדו רח והו		
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Swamp white oak	S M	4	2		2	54 JJ	ы 4	محدلمانده والمحدد وسلم	
202 2020	SM	7	_	ei.	V	ۍ ا د. ۲	2		
diter as									
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	Total W	oody Stems:			Bull I L				

Fall 2012 Vegetation Monitoring

-ield Team: M < 1 I < c	Sample Plot Ni	umber: C	Veather:	101	Percent Are:	al Coverage: (
Provider Blot and Output (Circle	Date:		Dominant Cov	rer Tvne:				
	10116	2	Lec 2	d car	na na	S Q D		
					>	Average	Plant	
J	Harbaraniis	Planted?	No. Live Plants	No. Dead Plants		Height (Woodv	Health* (Woodv	
Procise Name	or Woody Stem?	stems onlv)	(Woody stems only)	(Woody stems onlv)	% Areal Coverade	stems onlv)	stems onlv)	General Observations
	E				007			
reed canary grass	F				2			
	Total W	'oody Stems:						

Fall 2012 Vegetation Monitoring

Circular Plots Quadrat Plot (Circle Date: 10/116/12 one) 20' Plot (Circle Date: 10/116/12 Planted? Pla	Dominant Cove Plants (Woody stems only) 3	er Type: Yec of Plants (Woody stems only)	(ONOR M % Areal Coverage 20 (o lo	Average Height (Woody	Plant Health* (Woody	
Species Name Species Name Species Name Parateous Planted? Planted? (Woody only) Stem? only) stems stems only) APA Stem? only) APA Stem? only) Stems only) APA Stem? Only) Stems Stem? Only) Stems Stems Stems Stems Only) Stems Stems Only) Stems Stems Only) Stems Stems Only) Stems Stems Only) Stems Stems Stems Only) Stems Stems Only) Stems Only) Stems Stems Only) Stems Only) Stems Stems Only) Stems Only Stems Stems Only Stems Only Stems Stems Only Stems Only Stems S	No. Live Plants (Woody stems only)	No. Dead Plants (Woody) stems only)	% Areal % Areal Coverage 20	Average Height (Woody	Plant Health* (Woody	
Species NameStem?only)Species NameAAPerhicum virgotumAreed canary grassASwamp milkweedAWhite headth asterAWPCarex Sp.ASycamoreWSPin oakWSPrin oakWSPrin oakWS	stems only)	stems only)	Coverage 20	onano	stems	
panicum virgatum H reed canary grass H swamp milkweed H white heath astar H carex Sp. H sycamore H Sycamore WS Y Pin oak WS Y	- M		20 (olo	only)	only)	General Observations
reed canary grass H swamp milkweed H white heath estar H covex Sp. H sycamore WS Y pin oak WS Y	- M		90)			
swamp milkweed H white heath astor H carex Sp. H sycamore WS Y pin oak WS Y	- M					
white heath astor H carex sp. H sycamore WS Y pin oak WS Y green ash WS Y	- M		б			
carex sp. H sycamore WS Y Pinoak WS Y green ash WS Y	- M					
sycamore WS Y Pinoak WS Y Green ash WS Y	- 10		17			
Pinoak WSY	8		5	18"	٩	(shop)
green ash WS Y			2	13' 39 27 1	ц. Д. [1]	
	2		- V	32" 40"	9	(nearly dead)
H H			2			
H upinit xonos			17			
supert amber bitch WS Y	-		12	27"	٢	
Sultant white oak WS Y	2		N	Se 11	Ш	hereivory
Soft rush H			-			
Total Woody Stems:	;;					

S9 Aree S 0 ob served CINI DUCK

Fall 2012 Vegetation Monitoring

Treat Dominant Cover Type: Treat To / 16 12 Treat Planted No. Live No. Dead Plante No. Live No. Live No. Dead Prescent Woody Stems Woody Planted Prover Woody Stems No. Live No. Live Prover Woody Stems Woody No. Live Prover WS WS 2 Planted Prover WS WS 2 Planted Prover WS WS 1 Planted Prover WS WS 1 Planted Prover WS WS 1 1	Distor Oundrat Dist (Circle Date:			2					
Mile Mody Molection Molection Planted? No. Live No. Live No. Live Planted? No. Live No. Live No. Dead Planted? No. Live No. Live No. Dead Planted? No No. Live No. Dead Planted? No No No. Live Planted? No No No Planted? NS No Z Plants Plants Plants Plants No No Planted? NS No Plants NS Plants Planted? NS Plants Plants NS Plants <				Dominant Cov	er lype:	2			
Planted? Planted? No. Live (Woody stems only) No. Live plants woody stems only) No. Live plants woody stems only) No. Live plants woody stem coll No. Live	20	9	1				101		
Tread Canary areas Tread stams Tread stams Tread stams Woody stams only stams on labeled and stams on l	Horboc		anted? Moodv	No. Live Plants	No. Dead Plants)	Average Height (Woodv	Plant Health* (Woodv	
reed canary gracs H 2 2 proved canary gracs MS 2 1 green ash WS 1 1 woody stem (:) WS 1 woody stem (:) WS 1 reft rush H 1 seft rush H 1 rush 1 rush H 1 rush H 1 rush 1 rush H 1 rush 1	or Wo	ody s	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
pin aak WS Z Z A A A A A A A A A A A A A A A A A	Canany arriver H					96			
green ash woody stem (2) WS 1 rath H H H saft rush H H	W W			2		12	39"42	۲, ۴	
Woody stem (?) WS 1 1 sert rush H A 1 1	W W			_		17	64"	Р	ans And
Kott rush	du stem (2) W			-		17	51	۷	
	H H			<		1			
	2								
		-							
Total Woody Stems:		And the second se	A CONTRACTOR OF A CONTRACTOR O						

Fall 2012 Vegetation Monitoring

ield Team: MC C S	Sample Plot Nu	umber: 13	Weather:	6 05	Percent Are	al Coverage:		
Arcular Plot or Quadrat Plot (Circle	Date: LO/I b/I	~	Dominant Cov	er Type: painicum				
Sociac Name	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	No. Live Plants (Woody stems onlv)	No. Dead Plants (Woody stems onlv)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
provide on virge hom	I				98			
reed coner and	I				1			
stinaise netle	t				レ			
swamp milkweed	Ħ				V			
	Total W	oody Stems:						

Fall 2012 Vegetation Monitoring

Field Team: MS/ KS	Sample Plot Nu C 2 - P1	umber:	Weather: SUNNU (20.0	Percent Are	al Coverage:		
Circular Plotor Quadrat Plot (Circle one)	Date: 10/1/0/	2	Dominant-Cov	P OLINI CULI	٤			
(Herbaceous	Planted? (Woody	No. Live Plants	No. Dead Plants		Average Height (Woody	Plant Health* (Woody	α.
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
DOINTCUM V. C. ANT	Ħ				83			
pin oak	SZ	Y	6		01	1,51,51,58	பார பிரார பிரார	COME OF OFFICE
swamp white nak	NS N	7	3		2	(c+1, 62, 85'	П Л П	her bit or y (wyrach de bris
aleen ash	N N	7	2		17	64 " 52 "	0	
swamp milk weed	Ŧ				17			
And the	H				17			
(A. fatiosa)	SM	Z	_		17	12 11	d	
stinaina nette	t				17			
read range of and size of	Ŧ				M			
	Total W	oody Stems:					15 - 13 V	

Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	P C	SUNDU	605		al Coverage:) 〇 ・		
Circular Plot or Quadrat Plot (Circle	Date:	17	Dominant Cov	er Type:				
	Herbaceous	Planted? (Woody	No. Live Plants	No. Dead Plants		Average Height (Woody	Plant Health* (Woody	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
panicum Vireehm	H				£ 8			
NY ironuced	H				17			
polygonum hydropiperoid	es H				-1			
stinaina nette	Ŧ				2			
cwamp milkueed	H				17			
a va	МS	γ	Ŧ		7	* *	u)	
thistle so.	H				17			
	I				17			
swams white oak	SM	7	T		Ч	40" 60")2	454	herbiory / wract dobris hebivory
elm seedings	NS	Z	_		17	Q	ш	
Viver birch	SM	Υ	1		_	,21	Ŀ	
iapanese hors	Ŧ				T			
	Total W	oody Stems:						

Fall 2012 Vegetation Monitoring

Field Team: MS / K <	Sample Plot Nu	umber: ۱۱	Weather:	60 s	Percent Are	al Coverage:		
Circular Plot or Quadrat Plot (Circle	Date:	12	Dominant Cov	er Type:				
	Herbaceous	Planted? (Woody	No. Live Plants	No. Dead Plants		Average Height (Woody	Plant Health* (Woody	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
Dan Cum Michael	Ţ				92			
pural loosestrife	Ţ				17			
oin oak	s Z	\succ	Ŋ		4	6, 52 48" SH 18"	с. Г.	
NY Ironweed	Ŧ				17			dead
swamp white oak	SM	γ	S		3	60" 6 2" 48	1- 11-11- 11-0	herbivery on all
polhanum hudison Deroides	#				~ ~			
	Total W	oody Stems:			The second second			

Fall 2012 Vegetation Monitoring

Field Team: Mo 1 U o	Sample Plot Nu	umber:	Weather:	6 OS	Percent Area	al Coverage:		
Circular Plot or Quadrat Plot (Circle	Date:	<u>ר</u>	Dominant Co	ver Type:				
		5				Average	Plant	
	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Height (Woody stems	Health* (Woody stems	
Species Name	Stem?	only)	stems only)	stems only)	Coverage	only)	only)	General Observations
Danicum. rechm	H				179			
and a second sec	7				3			
purgunation burger in the	T				S			
side and the second ford					It-			
I cod control grass	SM	7	2		Ч	8136"	с L	
Sundan milkine-d	Ţ	-			17			
N- Londer A	I				1 >			
summer white oak	SN	4	7			36"79	ць. П	
stimula in the	, +				2			
Strain Singer								
							1	
	Total W	oody Stems:						

Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	mber:	Weather:		Percent Area	al Coverage:		
Circular Plot or Quadrat Plot (Circle	Date:	0	Dominant Cov	rer Type:	Der tri	q		
	Herbaceous	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	
Species Name	Stem?	only)	stems only)	stems only)	Coverage	only)	only)	General Observations
purple loosestrife	I				69			
unidentified #	H				0			
actar co	E				17			
	_							
and the second second	Total W	oody Stems:						and and the state of the second

Fall 2012 Vegetation Monitoring

ielu lealii.			VVCGUICI.	2				
MS I KS	E O I	-	Dominont Con	le C)			
		21		1016 100	seth fe			
Sneries Name	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	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
attale loosestrife	1				67			
and the stand	Ŧ				30			
(smartweed)	H H				2			
k								
				3				
	Total W	oody Stems:						

Fall 2012 Vegetation Monitoring

Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	umber:	Weather:	ť		al Coverage:			_
M> IKS	202	17	huuns	202	500				Τ
Circular Plot or <u>Quadrat Plot</u> (Circle one)	Date:	21	Dominant Cov	Ver lype:	oose str	f			
Snecies Name	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	No. Live Plants (Woody stems onlv)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations	
burble loosethife	П				78	i.			
undertified #1	Ħ				10				
burger from So	I				10				
red maple scedling	SM	Z			17				
solidade ca	ナ				1				
average of tractomer	Ŧ				1				
		×							
	Total W	oody Stems:							

Fall 2012 Vegetation Monitoring

Field Team: MC 1/V C	Sample Plot Nu ぜる し Plot Nu	mber:	Weather:	09	Percent Area	al Coverage:	.)	
Circular Plot or Quadrat Plot (Dircle	Date:	12	Dominant Cov	er Type:	setute			
	Herbaceous or Woody Stom?	Planted? (Woody stems	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems onlv)	% Areal Coverage	Average Height (Woody stems onlv)	Plant Health* (Woody stems onlv)	General Observations
opecies Naille		lino			L O			
purple looses	Ţ				N			
500 - 50 - 50 - 50 - 50 - 50 - 50 - 50	I				5			
and tear trumb	Ħ				2			
	±				.00 1			
inte meath astor	±				γ			
	±				20			
ted more credition	SM	Z	-					
the maple second	Ŧ				3			
with call of the								
				A*.				
	Total W	oody Stems:	705					

Fall 2012 Vegetation Monitoring

Transfer for a regardar Presynal fragment of the second second press of the second second press of the second seco	reld leam:	Sample Plot Nu	Jmber: っ ょ	vveatner:			al Coverage.	1 12		_
Amerade Interset Participant Period No. Live Woody Server No. Live Period No. Live Woody Server No. Live Period No. Live Woody Server No. Live Period No. Live Woody Server No. Live Period	ircular Plot or Quadrat Plot Circle	Date:	1	Dominant Cov	er Type:		0 1-0		1000 1405 augus	
Perchention Starty Aug Starty Aug Starty Aug Starty Aug Soft vush H H H HO HO HO HO Feed canary grast H H HO HO HO HO Subgenim hydropilerode H HO HO HO HO Subgenim hydropilerode H H HO HO HO Subgenim hydropilerode H H HO HO HO Subgenit hydropilerode H H HO HO HO Subgenit hydropilerode H HO HO HO HO <		Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems		
Feed canary grass H H U H I undegenim buydrexisterode H H I I I utrauleet fee-thumid H H I I I utrauleet fee-thumid H I I I I utrauleet fee H I I I I I utrauleet fee H I I I I I utrauleet fee I I I I I I utrauleet fee I I I I I I utraule	pecies Name Soft vush	Stem /	(XIIIO	stems only)	stems only	2 O Coverage	(jino	oniy)	Gereral Observations	
allogenin hydravjerade H 10 10 10 11 10 10 10 10 10 10 10 10 10	reed canary arass	I				ot				
Notest tearthumb H I I I DEAD Coft rush H I 23 also some bare DEAD Coft rush H I 23 also some bare Image: Ima	soluanim hudrapiperoide	+				10				
DEAD Ceft rush H 24 3150 Some bare Image: Some bare	atrowleat tearthumb	Ŧ				1				
	DEAD Soft rush	H				29			also some bare	
Image: Line line line line line line line line l										
Image: Contract of the second structure Image: Contract of the second structure Image: Contract of the second structure Image: Contract of the second structure Image: Contract of the second structure Image: Contract of the second structure Image: Contract of the second structure Image: Contract of the second structure Image: Contract of the second structure Image: Contract of the second structure Image: Contract of the second structure Image: Contract of the second structure Image: Contract of the second structure Image: Contract of the second structure Image: Contract of the second structure										
Total Woody Stems: Total Woody Stems: 1										
Image: Contract of the second state										
Image: Constraint of the second se										
Total Woody Stems: Total Woody Stems: Total Woody Stems: Total Woody Stems:										
Total Woody Stems: Total Woody Stems:										
Total Woody Stems:										
Total Woody Stems:										
Total Woody Stems:										
		Total We	oody Stems:					100 - 100 -		_

Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot N	umber: っっ く	Weather:	201	Percent Area	al Coverage:		
	0 2 2 2 2 2	1	Dominant Con	ier Tyne				
Circular Plot or Quadrat Plot (Circle	Uale.	2		LINT.	sedae			
	Herbaceous	Planted? (Woody	No. Live Plants	No. Dead Plants		Average Height (Woody	Plant Health* (Woody	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
ENDO COSCULENTUS	Н				59			
water aureland	4				35			
	Total W	loody Stems:						

Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	imber:	Weather:	(Percent Area	al Coverage:		
MS IKS	E3-F2	0	hums	SDD	001	1.		
Circular Plot or Quadrat Plot Circle	Date:	12	Dominant Cov	er Type: ທູລາ 5 250	u hund u	S		
						Average	Plant	
	Herbaceous	Planted? (Woody	No. Live Plants	No. Dead Plants		Height (Woody	Health* (Woody	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
Water DUrs am	Ŧ				25			
cubral esculentus	I				0 J			
hypericum so	Н				25			19 (X.)
barnuard arass	Ŧ				0			
5								
	a.							
	Total W	oody Stems:						

Fall 2012 Vegetation Monitoring

Field Team: M S \ Ł S	Sample Plot Nu モろーP	umber: 2 (ی	Weather: Sนกก ง (100	Percent Area	al Coverage:		
Circular Plot or Quadrat PloD(Circle one)	Date: Date:	2	Dominant-Cov	/er Type: DWY	ble 100	sestinfe		
	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	Ganaral Ohsenvations
Species Name		ouid			Loverage (6.0)		(illin)	
suft ruch					5			
arrowleaf tearthumb					25			
white heath astor					0			
	Total W	oody Stems:						

Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu		Sun n u	500		al Coverage: DO		
Circular Plot or Quadrat Plot Circle	Date: 10/17		Dominant Cov	er Type:	ath as	ter		
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				20			
arrow leat searthumb	H				SI			
white heath aster	Ħ				0 C			
money wort	H				Ŋ			
Calidado SD.	4				17			
	Total W	oody Stems:						

Fall 2012 Vegetation Monitoring

Field Team: M S	Sample Plot Nu	umber: 2 S	Weather: Sนททษ	د 0 م	Percent Area	al Coverage: DO/-		
Circular Plobor Quadrat Plot (Circle one)	Date: Date: Date:	2	Dominant Co	er Type: col cour	0 17 0	1rass		
		Planted?	No. Live	No. Dead	1	Average Height	Plant Health*	
Species Name	Herbaceous or Woody Stem?	(Woody stems only)	Plants (Woody stems only)	Plants (Woody stems only)	% Areal Coverage	(Woody stems only)	(Woody stems only)	General Observations
reed canany arass	Ŧ				915			
muquort o	H				30			
stinging nettle	H				00			
black mustarch	H				17			DEAD
plant root tro	Ţ				17			
wollin	S Z	7	7		10	31	<u>س</u> ۲۲	
white heath astor	H				IJ			
	Total W	oody Stems:			1			

Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	umber: 29	Weather:	202	Percent Are	al Coverage			
Circular Plot or Quadrat Plot (Circle	Date: 101171	1	Dominant Cov	ver Type:	NA AC	200			
				5. 500	P P	Averado	Dlant		Γ
	anocochic	Planted?	No. Live Plants	No. Dead Plants		Height	Health* (Woodv		
Snecies Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations	
willow 200.	SM		Ţ		5	5. 26 24 66	ه ه م ر	buck rule, flood almg asing down huck rue	
reed concer avacs	Ŧ				Sg				
muawart der	Ŧ				25				Τ
NY I TONUTEd	I				17				
elm scedling	SM	Z	7		17	29.	22		
red mark reduna	S 3	Z	-		17	n C t	Q		
	Total W	foody Stems:							
Natas.									

Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot N	umber:	Weather:		Percent Area	al Coverage:		
SYISW	107	200	SUMMIN C	202	101			
Circular Plobor Quadrat Plot (Circle	Date:	1	Dominant-Cov	Cahov	N ACA	12		
					0	Average	Plant	
	Herbaceous	Planted? (Woody	No. Live Plants	No. Dead Plants		Height (Woody	(Woody	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
willaw Spb.	S M	X	8		t	101 101 101	ш هـ و	
reed canary grass	Ŧ				(,3			
Mualish't	I				30			
-								
	Total W	oody Stems:						

Fall 2012 Vegetation Monitoring

Officialist TBDsr Clanatar Plant Deminant Cover Type: ID Demin	Field Team: MS / KS	Sample Plot Nu	imber: 33/	Weather: ວັບເກາງ	6 0	Percent Area	al Coverage: 가 는	X 8	
Planter evidence serror sero	Circular Plotor Quadrat Plot (Circle one)	Date: IO/I7	12	Dominant Cov γ	er Type: Ecd Can	ann anns	s /mua	trum	
poison hemiotic h	Species Name	Herbaceous or Woody Stem?	Planted? (Woody stems only)	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Avérage Height (Woody stems only)	Plant Health* (Woody stems only)	General Observations
Interval H 36 40 40 Interval W W H H H H Willow 2ρ W H H H H H H Willow 2ρ W H H H H H H H Jack musteral H H H H Z Z^{m} T D_{EAO} Multiclear rose W N I Z Z^{m} T D_{EAO} Multiclear rose W N I Z Z^{m} T D_{EAO} Pollogonum huduepiperides H Z Z^{m} T D_{EAO} D_{EAO} astar sp. H Z Z^{m} T D_{EAO} D_{EAO} D_{EAO} Z W I Z Z^{m} Z Z^{m} Z Z^{m} Z Z Z Z Z Z Z Z Z	poison hemlock	4		- -		5			
read canacy grass H H HO HO HO willow sp WS Y L Sidesp altissina H Solidage altissina H L <td< td=""><td>muquort</td><td>t-)</td><td></td><td></td><td>2.1</td><td>36</td><td></td><td></td><td></td></td<>	muquort	t-)			2.1	36			
willow Q with Q	retal canarry arross	H				40			
Joidago altissima H Image: 2 Defail black mustarda H N I Defail multicipae: rose WS N I Defail polygomin hydropiperoids H N Z Z star spin H Z Z Z star spin Z Z Z	Willow 50	SM	T	1		1		٩	
black mustared H I I I DEAD multificar rose WS N I 2 *** * polygowinh hydropiperoles H N I 2 *** * polygowinh hydropiperoles H N I N 1 N stor sp. H N N I N N estor sp. H N N N N in the store N N N N	solidago altissíma	Ţ				2			
multiclerae rose WS N I Z ³⁸ r polygonum hydropiperoides H I I I I I I ast er sp. H I I I I I I ast er sp. H I I I I I I ast er sp. H I I I I I I I ast er sp. H I </td <td>black mustarial</td> <td>1</td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td>DEAD</td>	black mustarial	1				-			DEAD
Polygonium hujdicepi percieles H I I I I a sk ev P I I I I I a sk ev P I I I I I a sk ev P I I I I I a sk ev P I I I I I I I I I I I I I I	multiplora rose	S B	Z	1		2	38	بد	
aster sp. 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	polyaonin hudroni peroid	H sak				_			
	astor co.	Ħ				S			
						1			
Image: Constraint of the state of the s									
Total Woody Stems: Image: Contract of the contra									
I otal Woody Stems: I otal Woody Stems: I otal Woody Stems: I otal Woody Stems:									
Total Woody Stems: Total Woody Stems:									
Total Woody Stems: Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
		Total Wo	oody Stems:						

Stream bed win flot

Field Team:	Sample Plot N	umber:	Veather:	20 <	Percent Are:	al Coverage:		
Circular Plot or Olladrat Plot (Circle	Date:	1	Dominant Cov	/er Tvpe:				
	1011/11/1	2		MU AWOV	r / Yeeo	1 cana	m ara	, A
	Herbaceous	Planted? (Woodv	No. Live Plants	No. Dead Plants		Average Height (Woody	Plarit Health* (Woody	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
muquort	ŦŦ				30			
reed canary grass	H				30			
boison hemiock	Ŧ				2	1		
WILLOW SOD.	MS	7	H		0	15. 3.c. 4.8.	UT La a	in alter for the pas
110 Mapanese hops	H				20			
milia noim maniluane um	H				2			
white heath astar	н				2			
minor huntros serai des	t				2			
anifer and a manual seeding	S.M	Z	-		17	15 1	1	
Hack mustard	H				17			
bidens coronata	н				17			
violet sp.	H				Ň			
197 1								
	Total W	oody Stems:						The second se

Fall 2012 Vegetation Monitoring

Circular Plothor Quadrat Plot (Circle Date: one) O data Plot (Circle Date: herbaci Species Name Sterr reed can any grass H			Dominanț Cov	er Type:				
one) 10° 10° 10° Herbaci Species Name Sterr recol control grass H muswort A			J.		S Note			
Species Name Herback Species Name Sterr Vecd Canary Mushort H		1				Swort		
Species Name Herbaccon void Species Name Sterr recd Canary muawort grass	-	olanted?	No. Live	No. Dead		Average Height	Plant Health*	
Species Name stem reed canary grass H muawort H	oody	(Woody stems	Plants (Woody	Plants (Woody	% Areal	(Woody stems	(Woody stems	Canaral Oheanvatione
reed canary grass H muquort H		oniy)	stems only)	stems only)			(init)	
muawort d					2			
					30			
NY iron weed					7			
M S Inclus	5	>	-		- 01	8	L.	
box elder maple WS	5	Z	_		17	# 81	d	
H muniminglement of H					29			
H surv survey					- 01			
H advised lancestrife					2			
black innectation H					-			DEAD
arout vaqueed H					R			
H H					V			
	Total Woo	ody Stems:						

Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot N	umber: ルイ	Weather:	, c	Percent Are	al Coverage		
Circular Plot or Quadrat Plot (Circle	Date:		Dominant Cov	/er Type:				
one) 2.0	101	7111		Dani	(MM)			
		Planted?	No. Live	No. Dead		Average Height	Plant Health*	
	Herbaceous or Woodv	(Woody stems	Plants (Woody	Plants (Woody	% Areal	(Woody stems	(Woody stems	
Species Name	Stem?	only)	stems only)	stems only)	Coverage	only)	only)	General Observations
(A. furture) indian bush	SZ	Z	6		1	66° 61	0	
Swamp while ack	SN	λ	2		9	60"	Ш Ш	
NY innorth	Ţ				V			
arthrotan hisoodis	F				2			
Strange wette	I				2			
stove work been	Н				ທ			
mate in the second	H				01			
to the second and the second s	1							
she worke	N S	7	_		5	.+_	ы	
Summer in the mood	-				_			
elm coordina	SM	Z	2		V	24	2-1-	
areen ash seedlings	SM	Z	2		1>	132	<u>o</u> d	
Carex villationate	Ŧ				1			
deer tongue grass	I				_			
onth rush	I				~			
red made seedling	MS	Z	_		V	. 72	d	herber u oves
areen ash	NS.	7			17	56	14	
	Total W	loody Stems:						
Notes: * E = Excellent (Plant is thriving and has li G = Good (Plant is healthy and may haw F = Fair (Plant is moderately healthy and P = Poor (Plant is dying and/or has heav Piへ のめた	ttle to no signs of s some herbivory may have mode y herbivory)	herbivory)) rate herbivory)	\sim		\mathcal{V}		сШ	

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Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot N	umber:	Weather:	. 0.	Percent Are	al Coverage;	240	
		0	- une		-	S		
Circular Plot or Quadrat Plot (Circle one)	Date: 10(1子 (21		ler lype:	Sdoy			
the second se			,			Average	Plant	
	Herbaceous	Planted? (Woodv	No. Live Plants	No. Dead Plants		Height (Woodv	Health* (Woodv	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
Lanner hous	I				100			
A service	-							
	Total W	oody Stems:						

Fall 2012 Vegetation Monitoring

ield Team: M < K <	Sample Plot Nu	imber: 26	Weather: くくろうく	605	Percent Are	al Coverage: (0 O イ		
Circular Plobor Quadrat Plot (Circle	Date:	112	Dominant Cov	er Type:	York			
		Planted?	No. Live	No. Dead		Average Height	Plant Health*	
becies Name	Herbaceous or Woody Stem?	(Woody stems only)	Plants (Woody stems only)	Plants (Woody stems only)	% Areal Coverage	(Woody stems only)	(Woody stems only)	General Observations
and the second	I				49			
arren water dock	: +				17			hew shoots
	Total Wo	oody Stems:						
Fall 2012 Vegetation Monitoring

Field Team: MS KS	Sample Plot Nu E 8 - P 3	umber:	Weather: รัณททห	605	Percent Are	al Coverage: 人	Υ.	
Circular Plot or Quadrat Plot (Circle	Date:	2	Dominant Coy	er Type: را م را ا				
		Planted?	No. Live	No. Dead		Average Height	Plant Health*	
	Herbaceous or Woody	(Woody stems	Plants (Woody	Plants (Woody etome only)	% Areal	(Woody stems	(Woody stems	General Observations
Species Name	Silence N N				SO	20, 16, 14	G B	Solve are viry tail to be Planted
with the wit	I				25	A7		
proposition provinciality	I				6			
indexes hours	H				10			
Solidae on	Ħ				17			
	+				17			
low aldow manle creding	NS N	2			- 1	10	1	
thirds floored for	H				12			
Common Cothlebur	Ħ				~			
Straine nette	H				>			
red maple recolling	SM	Z	G		$\overline{\checkmark}$	۲ ۲ ۱۱، ۲۶	4	
	Total W	oody Stems:						

Fall 2012 Vegetation Monitoring

Contract Polit (Circle Date: Date: Date: Date: Contract Polit (Circle In:0,11/12 Daminant (Dwort Yeers) No. Live No. Live No. Topic Species Name Renood Renood Renood Renood Renood Renood Species Name Nu Nu Average Renood Renood Renood Species Name Nu Nu Z Z H Second C Renood H Nu Z Z L C L Renood H Nu Z Z L L L Renood Nu Z <td< th=""><th>Field Team: < S</th><th>Sample Plot Nu</th><th>umber: 0.00</th><th>Weather: Stunn w</th><th>(00<</th><th>Percent Area</th><th>al Coverage:</th><th></th><th></th></td<>	Field Team: < S	Sample Plot Nu	umber: 0.00	Weather: Stunn w	(00<	Percent Area	al Coverage:		
Hereat Parteric Servicy Services No. Live Servicy Services No. Live Servicy Services No. Live Services N	Cricular Plobor Quadrat Plot (Circle	Date:	1 12.	Dominant Cov	ver Type:	3			
Bereise in sum of the second stand, served stand,			Planted?	No. Live	No. Dead		Average Height	Plant Health*	
WillelnWS γ γ γ β <t< th=""><th>Coorise Name</th><th>Herbaceous or Woody Stem?</th><th>(Woody stems onlv)</th><th>Plants (Woody stems onlv)</th><th>Plants (Woody stems onlv)</th><th>% Areal Coverage</th><th>(Woody stems onlv)</th><th>(Woody stems only)</th><th>General Observations</th></t<>	Coorise Name	Herbaceous or Woody Stem?	(Woody stems onlv)	Plants (Woody stems onlv)	Plants (Woody stems onlv)	% Areal Coverage	(Woody stems onlv)	(Woody stems only)	General Observations
solidação altíciena H = 25 = 25 = 21 = 21 = 21 = 21 = 21 = 21	urillow	s 3	\succ	またの		48	48,	G	
Action H I I $action<$	solidada altíciona	H)		25			
Partole backshife H CI CI jee prie user Sutet) H 3 eupat on um purplement jee prie user Sutet) H 3 3 eupat on um purplement care x Ph 7 7 (3 usug sedge 2) care x Ph 8 21 12" 6 soft rush H 8 21 12" 6 NV astel H 8 21 12" 6 NV astel H 8 8 8 8 NV astel H 8 8 8 8 NV astel H 8 8 8 8 Inditional test H 8 8 8 8 Inditinal test 1 1 1	aster co.	I				0)			
joe prie weed Gunet) H = 3 = eupat arhum puri carex intumescens H = 3 = (3 uay sedge 7 carex spp. H = 5 = (3 uay sedge 7 soft rush H = 5 = 21 12' G = (3 uay sedge 7 red mapt seedlings WS N = 3 = 21 12' G = (3 uay sedge 7 NY aster H = 6 = 2 = 21 12' G = 10 = 10 NY aster H = 10 = 10 = 10 = 10 = 10	ourole lonsachrife	I				17			
Careex intumescens H 3 3 (2 way sedge? Carex Spin H S (2 way sedge? Carex Spin H S S (2 way sedge? Soft Fush H S S (2 way sedge? NV aster H S S S S NV aster H S S S S S NV aster H S S S S S S NV aster H S	100 Due weed	I				С			eupatonum purpurpum
Calex Spin H S I	care intimescens	I				3			
Soft rush H ∇ <	CAVEN SOO.	Ħ				5			(3 way sedge?)
red maple seedlings WS N Z I C NY aster H NY aster NY aster	soft kush	H				5			2
NY aster L ×1 ×1 Image: State of the	red maple seedlings	SM	Z	M		17	12 "	Ŀ	
	NY acter	Т				1 >			
Total Woody Stems: Total Woo	5								
Total Woody Stems: Total Woody Stems:									
Total Woody Stems: Total Woody Stems:									
Total Woody Stems: Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
		Total W	oody Stems:			E AN AR			

Fall 2012 Vegetation Monitoring

Field Team: Mへ しいく	Sample Plot Ni	umber:	Veather:	602	Percent Are	OD /		
Circular PloPor Quadrat Plot (Circle	Date: Date:	12	Dominant Cov	Ier Type: MUA WI	to			
						Average	Plant	
	Herbaceous	(Woody	Plants	Plants	-	(Woody	(Woody	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
muquort	+				(69			
panicum vication	H				0)			
white heath aster	I				S			
Din oak	N S	Х	M		2	n a	ர டூ∐	
around ive	I				δ			
b lack gym	SM	X	2		-	32	22	
(solidage)	Ŧ				И			
red maple sedling	NS W	Z	9		_	15- 14 12- 14	e 6	
plantado lanceolata	Н				17			
silly dog vood	MS	7	1		17	60	٤	
sycamore	s 3	7	_		シ		2-	,
0								
	Total W	oody Stems:						T T XXX T T XXX T T XXX

Fall 2012 Vegetation Monitoring

Field Team: M < 1 & S	Sample Plot Nu	P.f.O	Weather: Summy	6 O V	Percent Are	al Coverage:		
Circular Plotor Quadrat Plot (Circle	Date:	0	Dominant Cov	ver Type:	white h	(units)		
Snecies Name	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	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
white breats ester	Ŧ				50			
soft rush	-				2			
Pin oak	л З	T	Г		61	1. S.	200	
aster sumplex	t				2			(panicaled)
NY ivonueed	Ţ				12			
care vulpanoidea	Ţ				Ţ			
a Device	Ŧ				151			timethy (2)
purple loosestrife	I				٢			
suprana milk weed	I				< >			
bidens corroacta	I							
Data and Demos New Com	H.				17			
elebrannia grainnifalia	I				2			
hadden hunder wood	t				~			
avvois Irat Leav Houmb	л				< >			
Euratorium ourpure um	I				17			
	Total W	oody Stems:						

Fall 2012 Vegetation Monitoring

MS/KS			Sunny S	° 0 S		al cuveraye		
Circular Plot or Quadrat Plot (Circle	Date:		Dominant Cov	/er Type:		1000	1 with	his of a for
	Herbaceous	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areal	Average Height (Woody stems	Plant Health* (Woody stems	
Species Name	Stem?	(Áluo	stems only)	stems only)	Coverage	ίλιυο	ouiyi	General Observations
hered canary grass	- I				39			
NY TONUERO	H	*			5			
pumple lossethife	Ŧ				-			
suame interest	S M	>		Ŧ	17	146	n.	crevery creation
henry dog bane	I				17			
Enerse weed	Н				3			
ALCONTRACTOR	ŚŴ	7	2			シュティー・	يد.	
horthern bushe weed	+				~			
wild mint	Ť				in Ta			
solidado sa	¥				2			
tjos	H				w I			
den assa	SM	λ	-		× 17	"CH	4	
rarex vulpanoidea					5			
-								
age and the second second	Total We	oody Stems:						

Fall 2012 Vegetation Monitoring

						oody sterns.	I OTAI W	
			S				I	poluminum hudrosisevoides
			17				Н	Pupoterium autored m
			7				H	and minerate ca
			-				Н	arrow leaf tear thumb
			2				Н	white heath astor
			7				I	NY Ironweed
			7				Ч	Dilusonum pemsyllanicum
			98				н	reed ranam arass
General Observations	stems only)	stems only)	% Areal Coverage	(Woody stems only)	Woody (Woody stems only)	stems only)	or Woody Stem?	Species Name
	Plant Health* (Woody	Average Height (Woody)	No. Dead Plants	No. Live Plants	Planted? (Woodv	Herbaceous	
			grand	er Type: Conany	Dominant Cov	2	Date: (0) \$ {	Ciccular Plot or Quadrat Plot (Circle one)
		al Coverage:	Percent Area	00	Weather: S	L 2	Sample Plot NI ECレー P	Field Team: MS / KS
		Constants	Dornont Aron		1010-44-0-	and the second sec	Description of a billion	

Field Team:	Sample Plot Nu	Imber:	Weather:	200	Percent Are	al Coverage:		
Circular Plotor Quadrat Plot (Circle	Date:	-	Dominant Co	ver Type:				
one) 2.0'	10/18/	2			thm of his	9105	4.5	
		Planted?	No. Live	No. Dead		Average Height Moodv	Plant Health* Moodv	
Species Name	nerbaceous or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
reed conam arms	Ŧ	1 1			15			
	SM	Υ	01		5	46" 36" 25 36 24 28 30 30" 24 48	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
black aum	NS N	Y	2		1	5.5 5.5	ي بر	
horse nette	±			-	б	1		
Silty dogwood	ŴS	γ	1		17	32	2-	
NY tronuced	H				0			
the are it	t				60			
white heath astor	t				6			
	Total W	oody Stems:						
Nictor.								

Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot Nu	umber:	Weather:		Percent Area	al Coverage:		
N KS	EUI-P	44	SCUNS	200		1001		
Circular Plot or Quadrat Plot (Circle	Date: \0 \&	12	Dominant Co	re Type:	COMBAN	S. C.C.		
)		Average	Plant	
	Herhaceous	Planted?	No. Live Plants	No. Dead Plants		Height	Health* (Woodv	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
musinaly principal municipal	I				S			
bidens coronata	Ŧ				10			
reed canges ares	H				Sa			
arrow leaf tear thumb	Ŧ				1			
ourble loosestrife	Н				20			
arthreen hissed	Ŧ			¥	1			
soft rush	Ŧ				2			
polyaonium budroviseroide	t S				_			
blue vervoin	Н							
Summo milk weed	Ĩ				イン			
	Total Wo	oody Stems:						North Renter Strate Strate
Notes:								

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

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Fail 2012 Vegetation Monitoring

Field Team:	Sample Plot N	umber:	Weather:	(Percent Area	al Coverage:		
NS KS	1 - L	1	Dominant Con	a US ar Tyna:				
Circular Plot or Quadrat Plot (Circle one)	Date:	2		The The	50rt			
	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody efems only)	% Areal Coverane	Average Height (Woody stems onlv)	Plant Health* (Woody stems onlv)	General Observations
Species Name	t Hand				8			
Scool and al	. A				5			
polyaon ou m permalivani cum	#				2			
sombucas canadensis	SM	Y	_		1	و. حر	Ŀ	
stinaina nettle	#				_			
black mustard	Ŧ				-			
	л З	7	_		17	38	<u>ц</u>	ionered by muguant
2# an index of the # 2	t				1			
Concerce bot to marching								
	Total V	Voody Stems:						

<u>Notes:</u> * 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 moderate herbivory) P = Poor (Plant is dying and/or has heavy herbivory)

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Fall 2012 Vegetation Monitoring

Field Team:	Sample Plot N	umber:	Weather:	(Percent Area	al Coverage:		Ĺ
(+ T < M	AD - F	970	50000	SOa		bare	artr	10 b
Circular Plot or Quadrat Plot (Circle one) 2 0	Date: IO / IR	21		OLY OLANO	571			
		Disntado	No Live	Dead	Ċ	Average Heicht	Plant Health*	
Cnaciae Nama	Herbaceous or Woody Stem?	(Woody stems onlv)	Plants (Woody stems only)	Plants (Woody stems only)	% Areal Coverage	(Woody stems onlv)	(Woody stems onlv)	General Observations
strougo dette	I				50			
arent burk dock	. ±				5			
around w	Ŧ				20			
DOLINA ONUM PRIMIPOLICE	±				5			
Polyaconum bud rapiperoids	Ħ				5			
Stilt and se (nounse)	I				1			
along and the	Đ				2			
	t							
Liden Frondoca	= =				71			
	23	Z	2		17	ō ==	a_	
box elder maple	NS N	Z	_		17	1,8,1	9-	
while smake root	Ŧ				1			
A MA	SM	Z	2		_	20 24 21		
pear seed lings	MS	Z	19		2	24' 26 23'	20 20 29 40 20 29 40	
white vervain	H				1			
Mru Hifton voce	ŚŴ	Z	7		2	10	Р	
Carex internegens	T I							
AND COVALEDIUS	Total W	oody Stems:						
Notes: 10CMS4 hone v * E = Excellent (Plant is thriving and has li	WS ittle to no signs of	N herbivory)	.7	5 douro.	17	"H	4	
G = Good (Friant is nearing and may nave F = Fair (Plant is moderately healthy and P = Poor (Plant is dying and/or has heav	e sonie neruvory, 1 may have moder 1y herbivory)	ر rate herbivory	0	Silver m	iap le	3	ature	
				red. m	0,016	\sim		Contract 80%
				red 0	10			

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Fall 2012 Vegetation Monitoring

Contract Plant (Clore) Date: Description Dominant Cover Type: Plant (Clore) Dominant (Clore) Plant (Clore) H H H H H H H H Plant (Clore) H H H H H H H H Plant (Clore) H H H H H H H Plant (Clore) M H H H H H Plant (Clore) M H H H H H Plant (Clore) M H H H	Field Team: ∕M ≲ /	Sample Plot NI 元	umber:	Weather:	0 s	Percent Are	al Coverage.		
Amongane Intervention No. Less and antipactions No. Less and antipactions No. Less and antipactions Panter Height antipactions Panter Height antipactions Panter Height antipactions Panter Amongane Panter Height antipactions Panter Amongane Panter Height antipactions Panter Amongane Panter Height antipactions Panter Amongane	Circular Plot or Quadrat Plot (Circle	Date:	0	Dominant Cov	/er Type: Dolugan	ídds W			
Process team H	and	Herbaceous or Woody Stem?	Planted? (Woody stems	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverage	Average Height (Woody stems onlv)	Plant Health* (Woody stems onlv)	General Observations
H H I	Polus Adino en a	I	(fun)	16		13		ĥ	dead : annears to be dominated by
margate laborativité H I ID ID <thi< td=""><td>the watafp</td><td>I</td><td></td><td></td><td></td><td></td><td></td><td></td><td>1 percitionicum</td></thi<>	the watafp	I							1 percitionicum
Induction the method of the section of the secti	1 hossection fe	Ŧ				0)			
elm certing WS N P I I P I reed cancerging content WS N Z T S F F river bireh WS N I Z I S F F green asin WS N I Z Z F F pilc wort H N Z Z Z F F bild constructed H N Z Z Z F F build constructed H N Z <td>horse mettle</td> <td>7</td> <td></td> <td></td> <td></td> <td>N</td> <td></td> <td></td> <td></td>	horse mettle	7				N			
read canary grace H S S S S S river bireh wS N Z I $\frac{5}{26}$ F $\frac{5}{26}$ F green asin wS N I Z I $\frac{5}{26}$ F green asin wS N I Z F F green asin H N Z I Z F pilc wort H N Z I Z F bilders Octobeluk H I I I I bilders Oronata H I I I I wuguoput H I Z I I I I muguoput H I Z I	elm scedling	SM	Z	b			19" 12" 6" 13" 15" 14" 10" 9" 14	ĻĻ	
river birchWSNZI 3^{6} Fgreen asinWSNIZPgreen asinHNIZPpile wortHNIZPblack mustardHIIINblack mustardHNIINbudens coronataHIINbudens coronataHIINbudens coronataHIINbudens connataHIINbudens connataHIIIbudens connataHIIIbudensIIIIbudensIIIIbudensIIIIbudensIIII		T				5			
green asth WS N I ZI $^{\circ}$ F pilc wort H H I I I I pilc wort H H I I I I bilc wort H I I I I I bilderns cocklebuur H I I I I I bilderns coronata H I I I I I wuguont + H I I I I I muguont + H I I I I I Muguont + H I I I I I Muguont + H I I I I I	river birch	N N	Z	2		_	36	11	
pile wort H I	areen ash	SM	Z			1	2	Į1	
Common cocklebur H I	b bile wort	I							
black mustarial 14 1 1 bidens coronata 1 1 1 muguort 1 2 1 muguort 1 2 1 muguort 1 1 1	comman cockle but	Ŧ				1			
bidens coronata H H Z I I I I I I I I I I I I I I I I I	black inustard	14				V			
Muguadurt H 2 2 2	bidens coronata	Ţ				_			
Total Woody Stems:	+ your f	I				2			
Total Woody Stems:	5								
Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
		Total W	oody Stems:						

overhanging willow

Fall 2012 Vegetation Monitoring

Field Team: M S (ビ S	Sample Plot Nu 円の - の	umber: FØF	Weather: くんかひひ	<0 <	Percent Are	al Coverage:	puna	
Crcular Plot or Quadrat Plot (Circle	Date:	2	Dominant Cov	ver Type:	-	5 -		
one) 2.0.	191101	J	X	ed cana	20	CD AS	Diant	
		Planted?	No. Live	No. Dead)	Height	Health*	
Species Name	Herbaceous or Woody Stem?	(Woody stems onlv)	Plants (Woody stems onlv)	Plants (Woody stems only)	% Areal Coverage	(Woody stems only)	(Woody stems only)	General Observations
aren art	5	Z			807.	25'	L	
Dear	SM	Z)		\leq	4+~	11	
n oak	SZ	Z	_		17		4	
an oak	N S	\succ	2		1	36	R	
reed canany arass	I				35			
D C S SAL	I				1			
	Ţ				2			
·								
	Total W	oody Stems:						
Notes: * E = Evcellent (Plant is thriving and has lit	ittle to no signs of	herbivorv)				001		

Canopy = 80% green ash

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

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Fall 2012 Vegetation Monitoring

id leam:	Sample Plot Nu	Imber:	Weather:		Percent Are:	al Coverage:			_
VIS / C S	Date:	-	Dominant Cov	er Type:					
	10/18/	2	IaDai	acse hi	Suc				_
		Planted?	No. Live	No. Dead Diante	*	Average Height /woodv	Plant Health* Woodv		
ecies Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations	
scion astrono	I				Ы8				
olya chim hudrasideroid	H				8				
Juasnum hudropiser	Ţ				2				
amineae SP	Н				× (
Wander +	Н				<i>2</i>				
urble loosethife	Ŧ				<>				
	Total W	oody Stems:						The second s	

Fall 2012 Vegetation Monitoring

Field Team; MS / KC	Sample Plot N	umber:	Weather: S นททท	(0)	Percent Are	al Coverage:		
Circular Plot or Quadrat Plot (Circle one) 2.0'	Date: 0 1 8	2	Dominant Cov	er Type:				
	Herbaceous or Woody	Planted? (Woody stems	No. Live Plants (Woody	No. Dead Plants (Woody	% Areat	Average Height (Woody stems	Plant Health* (Woody stems	General Ohservations
Species Name					(0)	límo	límo	
Veed canam arass	土				10			
paly aprim hudropiperoider	+				Ч			
parson hemlocik	Ħ				S			
bidens coronata	H				-			
stinging nette	H				10			
De lise on the memory on ICUM	H				5			
alant burduck	Н				4			
white smake root	Ħ				1			
	Total W	oody Stems:						

Fall 2012 Vegetation Monitoring

		General Ohearuations											
		Plant Health* (Woody stems	(6										
Coverage:	SC	Average Height (Woody stems	límo										
Percent Area	6	% Areal	99	Ň									
60 S	er Type: DOLNES	No. Dead Plants (Woody											
Neather: S ປ/ກ n ບ	Dominant Cove	No. Live Plants (Woody											
	2	Planted? (Woody stems					,						oody Stems:
Sample Plot NL $E_6 - P$	Date: (0 (1 & (Herbaceous or Woody	H H	Ŧ									Total We
Field Team: MS KC	Circular Plobor Quadrat Plot (Circle		opecies Name	dock (rumex sp.)				14					

Fall 2012 Vegetation Monitoring

			55	General Observations	mostly, dead	olead									1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
		Plant Health*	(Woody	stems only)											8
DO /	0 0	Average Heinht	(Woody	stems only)											
Percent Area	in li			% Areal Coverage	99	17									
<0<	er Type:	No Dead	Plants	(Woody stems only)											
	Dominant Cove	No Liva	Plants	(Woody stems only)											
mber:	2	Diantodo	(Moody	stems only)											ody Stems:
Sample Plot Nu $f(A - P)$	Date: 10 1 &		Herbaceous	or Woody Stem?											Total Wo
Field Team:	Circular Plotor Quadrat Plot (Circle			Species Name	JUDUNESE NODS	poison hemiock	-								

Fall 2012 Vegetation Monitoring

Field Team: MS / KS	Sample Plot Nr	umber: ער	Weather: Sunny	01	Percent Are	al Coverage:		
Circular Plotser Quadrat Plot (Circle	Date:	5	Dominant Cov	ver Type:		•		
		2				Average	Plant	
	Herbaceous	Planted? (Woody	No. Live Plants	No. Dead Plants		Height (Woody stome	Health* (Woody	
Species Name	or woody Stem?	stems only)	(woody stems only)	stems only)	% Arear Coverage	only)	(Aluo	General Observations
Indig bush	S NI	Z	2		0	8'9'	G	
reed canary arass	I				tz			
white heath astor	Ţ				20			
DUVDIC 100 Sectin Fe	Ţ				20			
pile wort	I							
arthroxen hyspodis	t							
N7 Wohnced	Ţ				_			
mola a oni m a confutivant cum	H				3			
arrow leaf tear thumbs	I				2			
(mi)d with t	Ţ				4			
not they hugh weed	Ŧ							
solidage rugesa	H				2			
soft rush	Н				2			
button bush	SM	7	2		_	18H7 11ES	У_ Ц	
blue vervain	++				_			
rarex vul panoided	H				5			
timothy above	H				2			
serie (in the	Total W	oody Stems:						
Materi								

Field Team: KS	Sample Plot NI	umber:	Weather: SUNNY	705	Percent Area	al Coverage:		
Circular Plotor Quadrat Plot (Circle one) 2.0'	Date: \O(\&	12	Dominant Cov	ier Type: ערככט	Cana	1		
Suecios Name	Herbaceous or Woody Stem?	Planted? (Woody stems	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverade	Average Height (Woody stems onlv)	Plant Health* (Woody stems onlv)	General Observations
speckled alder	. N 3	7	1	<i>K</i> so so	71	46		
indigo bush	SM	Z			Ŵ	8,5'	راج	
purple looseth fe	t				01			
reed canara arass	T				66			
bile wort	H				3			
polugonin pringitanicum	Ť				2			
ave outload tearthumb	H				5			
polyaonem hudropiper	ĥ				2			
swame milkweed	H				イン			
arthraken husbodis	٢				γ			
soft rush	H				2			
blue vervein	1-1				17			
white health astar	+				2			
dead stem (unk)	NS	2			17	SF		
	Total W	oody Stems:			When an a			

Fall 2012 Vegetation Monitoring

Operation Dominant Color for the function Dominant Color for the function Dominant Color for the function Reference Text (Left (1)) Planued? No. Live	Field Team: MS/ Ł<	Sample Plot Nu	S	Weather: Sบบกที่ ป	70,	Percent Area	al Coverage		
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MughaertH25NMughaertH25HVeded Conarg grassHHVeduas alleghanenaisHHPollygenum spp.HSJunite heart- astierHSJunite heart- astierHSJunite heart- astierHSJunite heart- astierHSJunite heart- astierHSJunite heart- astierHSJunite freedHSAurenteef tearthuminLLuZCAurenteef tearthuminHAurenteef tearthuminHAurentee huge usedHAurentee huge usedHAurentee huge usedHAurentee huge usedHAurentee huge serviceHAurentee huge serviceHAu	Crocios Namo	Herbaceous or Woody Stem?	Planted? (Woody stems onlv)	No. Live Plants (Woody stems onlv)	No. Dead Plants (Woody stems onlv)	% Areal Coverade	Average Height (Woody stems onlv)	Plant Health* (Woody stems onlv)	General Observations
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Pocies Marine	I		H		25			
redure allegbanenas H $	reed canany arass	H				40			
pollygenum sp. H S	rubus alleahonion315	I				1			
Indicate hearth agier H S <td>poluachilm spr</td> <td>Ţ</td> <td></td> <td></td> <td></td> <td>5</td> <td></td> <td></td> <td></td>	poluachilm spr	Ţ				5			
indiago bushWSN310 2^{26} 6 6duranteaf tearthumHSSHSduranteaf tearthumHZZSsoft rushHZZSnorthern bugte usedHZZSnorthern bugte usedHZZSnorthern bugte usedHZZSnorthern bugte usedHZZSnorthern bugte usedHZZSfurues sp.HZZSfurues sp.HZZSfurues sp.HZZSfurues sp.HZZSfurues sp.HZZSfurues sp.HZZSfurues sp.HZZSfurues sp.HZZSfurues sp.HZZSfurues sp.HZZZfurues sp.HZZZfurues sp.HZZZfurues sp.HZZZfurues sp.HZZfurues sp.HZZfurues sp.HZZfurues sp.HZfurues sp.HZfurues sp.HZfurues sp.HZfurues sp.HZfurues sp.H <td>white heath actor</td> <td>t</td> <td></td> <td></td> <td></td> <td>Ь</td> <td></td> <td></td> <td></td>	white heath actor	t				Ь			
Overwite af fearitumic H S S S S Soft rush H S S S S now them bugle used H S S S S now them bugle used H S S S S now them bugle used H S S S S purple looseshift H S S S S purple looseshift H S S S S purple looseshift H S S S S S function S S S S S S S S function S S S S S S S S function S S S S S S S S function S <t< td=""><td>here hush</td><td>N 3</td><td>Z</td><td>m</td><td></td><td>10</td><td>20' 6'</td><td>5</td><td></td></t<>	here hush	N 3	Z	m		10	20' 6'	5	
Saft rush. H 2 1 2 Nav them blagt weed H 1 2 1 2 1 2 2 2 2 2	atron leaf tearthumb	Т				6			
nov-them bugle weed H $\leq I$ $\leq I$ $\leq I$ correx sp. H $\leq S$ $\leq I$ $\leq I$ purple looseshift H $\leq I$ $\leq I$ $\leq I$ funues sp. H $\leq I$ $\leq I$ $\leq I$ $\leq I$ unues sp. H $\leq I$ $\leq I$ $\leq I$ $\leq I$ unues sp. H $\leq I$ $\leq I$ $\leq I$ $\leq I$ unues sp. H $\leq I$ $\leq I$ $\leq I$ $\leq I$ unues sp. H $\leq I$ $\leq I$ $\leq I$ $\leq I$ unues sp. $\leq I$ $\leq I$ $\leq I$ $\leq I$ $\leq I$ unues sp. H $\leq I$ $\leq I$ $\leq I$ $\leq I$ unues sp. H $\leq I$ $\leq I$ $\leq I$ $\leq I$ unues sp. H $\leq I$ $\leq I$ $\leq I$ $\leq I$ unues sp. H $\leq I$ $\leq I$ $\leq I$ $\leq I$ I I I I I $\leq I$ I I I I I I I I <t< td=""><td>soft rush</td><td>Ţ</td><td></td><td></td><td></td><td>2</td><td></td><td></td><td></td></t<>	soft rush	Ţ				2			
Correx SP. H S S S Purcple looseshrift H I I I Purcple looseshrift H S S S FilumUS Sp. H S S S S S FilumUS Sp. H S S S S S S S FilumUS Sp. H S	novthern black weed	Т				17			
Purcple loos estrift H I I I I I El lunus sp. H N ZI N N N El lunus sp. H N ZI N N N Image: Sp. H N ZI N N N Image: Sp. H N N N N N Image: Sp. H N N N N N Image: Sp. H N N N N N N Image: Sp.	CAVEX SO.	I				5			
Elyinos Sp. H 21 21 21 21 21 21 21		Ţ				1			
Total Woody Stems: Total Woody Stems:	Eliminas so.	I				17			
Total Woody Stems: Total Woody Stems: Image: Contract of the second stems of the seco									
Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
Total Woody Stems:									
	The second s	Total W	oody Stems:						

Notes. * 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 moderate herbivory) P = Poor (Plant is dying and/or has heavy herbivory)

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Fall 2012 Vegetation Monitoring

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Field Team: M < L <	Sample Plot Nu	S 6	Weather: Sストトタ	20's	Percent Area	al Coverage		
Circular Plobor Quadrat Plot (Circle	Date: 0/1 X	12	Dominant Cov	rer Type: V 2 C 0	0400	2	3300	
	Herbaceous or Woody Stom?	Planted? (Woody stems	No. Live Plants (Woody stems only)	No. Dead Plants (Woody stems only)	% Areal Coverade	Average Height (Woody stems onlv)	Plant Health* (Woody stems onlv)	General Observations
Species Name		(Allio			89			
reed canary grass	E				4			
purple loosont to	t T				ĥ			
lathon lice to the	SM	7	2		+	69 . 78 .	a 4	buck rub
Parts and cum	Ŧ				ſ			
polggener prover	t				6			
navious reas	, aut				8			
us normality	e				2			
to the second	÷				_			
will ow so	5M	T	_		17	r\$,	ш	
dead stem	SW5	7	-		1	su		
	Total W	loody Stems:						

Fall 2012 Vegetation Monitoring

Field Team: ハヘトレハ	Sample Plot N	Umber: A	Weather:	201	Percent Area	al Coverage:		
Circular Plot or Quadrat Plot (Circle	Date:		Dominant Cov	fer Type:				
one) 20'	1011	2		reed	J N N N N	SCO	5	
		Chatad	No Livo	No Deed)	Avefage Heicht	Plant Health*	
	Herbaceous	(Woody	Plants	Plants		(Woody	(Woody	
Species Name	or Woody Stem?	stems only)	(Woody stems only)	(Woody stems only)	% Areal Coverage	stems only)	stems only)	General Observations
soft rush	1				M			
reed canamy grass	I				15			
blue vervain	4				2			
indian bush	SM	Z	_		-	:	LL.	
stinaina nette	I				2			
arrowleaf tearthumb	I				S			
munined boncel vericum	t				0			
burble longehife	Ŧ				2			
		Ē						
	8							
	Total W	oody Stems:						
Notae.								

Fall 2012 Vegetation Monitoring

Total V	Voody Stems:						
uleat tearthnimb H							
rush H				_			
e heath aster H							
Iraxon hispidus H				6			
oak WS	7			17	381	2	
H He He				¥			
k mustard H				5			
ize weed H				_			
H H				20			
wort H				V			
dago rigosa H				10			
canary grass H				40			
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
- Plotor Quadrat Plot (Circle Date: 0 /1 &	12	Dominant Cŏv	ier Type: Veed	canan	0102	5	
sam: K S = E - F	Number:	Weather: ろunnu	201	Percent Are	al Coverage		
	-	1 A F 11		Durant Ass	Contraction In		

Appendix D

Photograph Logs (Spring, Fall, and Coordinates)

2012 Spring Photo Log

Spring 2012 Vegetation Survey



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 C1plot 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.

Spring 2012 Vegetation Survey



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.

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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
F4-P14	467407 056	625590 036
E1-P15	465767 364	628175 753
E1 D16	465620.846	628220.150
C2 D17	403039.040	626402 000
C2 D40	407000.053	020493.288
03-218	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 E2 D25	467461.863	626926 579
E3-P36	467081 15	626439 288
E3-P37	467127 884	626606 713
F3-P38	467338 196	626969 492
E3-P30	467372 071	627173 871
E3 P40	467/47 704	627274 704
E3-F40	407417.731	027571.701
E3-P41	40/414.841	02/003.231
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
FC1-P53	465306 312	628618 5/0
EC1-P54	465250 316	628510 556
E2 P55	+05253.510	62020319.000
L2-F00		
E2 DEC	465880.106	628005 400
E2-P56	465880.106	628085.488
E2-P56 E2-P57	465880.106 466131.932 466698.918	628085.488 627981.799

Location Description	Easting	Northing
E7-P1	468161.482	626085.06
E7-P2	467982.22	626124.04
E7-P3	467817.375	626186.58
C3-P4	467569.142	626197.94
C3-P5	467643.819	626147.55
C3-P6	467641.609	626432.81
C1-P7	467014.226	627723.96
C1-P8	466878.436	627740.22
C1-P9	466634.82	627766
C1-P10	466277.072	627631.98
C1-P11	466113.722	627665.09
C1-P12	465757.272	627949.1
C2-P13	466407.854	626133.42
C2-P14	466197.015	626402.86
C2-P15	466114,193	626748.55
C2-P16	466295 534	626908 66
C2 D17	466164 109	626005.00
52 D40	400104.108	020995.85
E3-P18	46/534.588	62/452.64
E3-P19	467489.607	627320.07
E3-P20	467436.324	627128.67
E3-P21	467285.397	626669.76
E3-P22	467061.877	626427.89
E3-P23	467103.712	626603.65
E3-P24	467271.924	626733.45
E3-P25	467351.392	626866.80
E3-P26	467379.853	627106.46
E3-P27	467411.505	627448.76
E9-P28	465455.598	628537.44
E9-P29	465483.407	628617.78
E9-P30	465349.576	628419.46
E9-P31	465301.367	628300.24
E9-P32	465155.798	628066.44
E9-P33	465105.565	628034.68
C2-P34	466230.531	626613.15
E8-P35	468111.127	626308.53
E8-P36	468030.547	626417.51
E8-P37	467889.667	626442.53
E8-P38	467869.959	626694.24
E7-P39	467910.585	626921.03
EC1-P40	464687.162	628683.40
EC1-P41	464819.548	628649.13
EC1-P42	465006.951	628528.56
EC1-P43	465124.309	628574.38
EC1-P44	465392.999	628620.98
A1-P45	464760 114	628218 5
45-P/6	465742 447	627007 60
E5 D47	403742.447	625002 44
LJ-F4/	40/022.099	020902.41
ED-P48	467403.667	625810.15
E4-P49	467384.156	625602.17
E4-P50	467208.321	625556.2
E4-P51	467812.421	625714.87
E4-P52	467914.848	625755.79
E2-P53	467237.547	627841.89
E2-P54	467028.46	627925.99
	466900.95	628044 92
E2-P55		
E2-P55 E2-P56	466637 758	628015 67
E2-P55 E2-P56 E1-P57	466637.758	628015.67

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.

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.							

Table 1 Geotechnical Boring Locations

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.

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 accura	acy.						

Table 2 Soil Profile Locations

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 submittal 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 redoxomprophic 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		•				•	Locations	3	•	•							
in inches	C1	C2	C3	EC1	E1	E2 East	E2 West	E3 North	E3 South	E4	E5	E6	E7				
1 2		5YR 4/2 silt, dense root material	5YR 4/3 silt clay loam w/									5YR 3/2 silt clay					
3			root material	5YR 4/2	7.5YR 4/3 silt (w/ large amount of	4/3 arge of	5YR 3/2 clay loam, numerous rhizomes	5YR 3/2 fine silt	5YR 3/2 fine silt	5YR 3/2	5YR 3/2 silt clay loam,	loam w/ trace sand	5YR 3/2 silt clay loam				
6	clay loam w/ very faint 5YR ¾	2.5 YR 3/2 silt clay loam w/		w/ 5YR 4/4 mottles						silt clay Ioam	numerou s roots						
7	SYR 3/3 5YR 3/3 clay loam w/ 2.5 YR clay loam w very fain w/ 2.5 YR clay loam w abundant 5YR 5YR 3/4 mottles mottles 5YR 4/3 clay loam w/very faint 5YR 5YR 4/4 mottles 5YR	mottles very faint 5YR 3/4 mottles 5YR 3/3 clay loam W/ abundant 5YR 3/4 mottles 2.5 YR clay loam w/ very faint 2.5 YR 3/4 mottles	mottles	5YR 4/3 silt clay			-			5YR 3/3 silt clay w/			5YR 3/2 silt clay loam w/ trace				
8						c fa 5	loam w/ faint 5YR 4/4					5YR 4/4 silt clav				than prior stratum)	
10				mottles		5YR 4/2 silt								5YR 3/2 silt clay			
11			5YR 3/3 clay loam 2.5 YR clay loam w/ very faint w/ 2.5YR 3/4 abundant 5YR 3/4 mottles			clay	5YR 3/2 silt clay w/ faint 5YR						trace sand				
12				w/ abundant 5YR ³ /	w/ abundant 5YR ¾	w/ abundant 5YR ¾	w/ abundant 5YR ³ /	bundant VR 3/					4/4 mottles		5YR 3/2		5YR 4/3 silt clay
13				5YR 4/3 silt clay loam					clay (w/ trace sand)	5YR3/3	loam	ioani w sanu					
15			5YR 4/3 mottles 5YR 4/2			5YR 4/3 silt	silt	silt clay loam			5YR 3/3						
16		5YR ¾ silt clay loam	silt clay		w/ 15% 5YR 4/4 Mottles		5YR 4/3 silt clay	clay					sandy loam				
17					Motios	5YR 2.5/1 silt clay	loam w/ very faint 5YR ¾				5YR 3/3	5YR 3/3 Silt sand					
19	clay loam			5YR 4/2 silt			mottles				Sircolay						

Depth	Locations												
in inches	C1	C2	C3	EC1	E1	E2 East	E2 West	E3 North	E3 South	E4	E5	E6	E7
20				clay w/ 10% 5YR 4/4 mottles									
					clay w/								
22					abundant 5YR 4/4 mottles							5YR 3/3 silt clay loam w/ traces	
23					monioo	5YR 3/2 silt clay						faint 5YR 4/6	
25	5YR 4/3												5YR 3/2
26	Ciay IOan						5yr 3/3 silt clay loam					7.5 YR 4/2 silt	loam with 10YR
27							w/ 50 percent	5YR 4/3 silt				3/6 mottles - abundant 40-50	2.5/1 organic material
28							mottles	faint 5YR 4/4 mottles	5YR 3/1 silt			percent of matrix	matorial
29					5/46 4/2 silt			and t race sand	5YR ³ / ₄ mottles				
30					clay loam w/	5YR 4/3				5YR3/3 silt clay			
31	clay w/ 30 percent	5YR 4/4 silt clay loam	26-36	5UR 3/1 silt	5YR ³ / ₄ mottles w/	clay loam	5YR 3/3 silt clay			loam w/ faint 5YR ¾ and 10YR	5YR 4/4	7.5 YR 4/2 with	
32	5YR 4/6 mottles		5YR 3/3 silt sand	clay w/ 25% 5YR ³ ⁄ ₄ mottles	trace angular sand		loam w/60 % 5YR 4/4 mottles			5/2 mottles	silt clay	2.5YR 3/6 abundant mottles.	
33		5YR4/4 silt					5YR 4/2 silt clay	EVP 2/1 oilt		5VR 3/3 silt		silt clay w/ trace sand	5YR 3/2
34	5YR 4/4 w/30% 5YR	w/ 20% 5YR 5/1					ioam w/ abundant	clay		clay loam w/ faint		depth of refusal	silt clay Ioam
35	4/6 mottles. silt clay –	mottles. Soil very				5YR 4/3 w/	mottles			5YR 3/3 and 10YR		at 34"	
36	and crumbly	dense and crumbly				4/4 mottles				5/2 mottles			

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

Table 4 Soil Saturation and Groundwater Levels Observed at Geotechnical Boring Locations

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.

Aroa		Saturation					
Alea	Depth Range (inches)	Percentage	Munsell Color	Saturation			
C1	None Observed			> 24"			
C2	None Observed			> 24"			
C3	6 - 24"	1%	5 YR 5/8	> 24"			
	6 - 12"	5%	5 YR 4/6				
E1	12 - 18"	1%	5 YR 4/6	> 24"			
E3	None Observed			> 24"			
E6*	None Observed		> 24"				
Notes: * Due to prior disturbances near location E6, several other borings were collected within an							
adjacent to	b E6. The findings were	similar (i.e., no redo	ximorphic features, saturati	on greater than 24			
inches).							

Table 5 Soil Profiles Wetland/Agricultural Borings

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:

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

Table 6 Plastic Index of	of	Soils
--------------------------	----	-------

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

micronutrients can be toxic to plants at excessive levels.

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.

Soil Test Ontinum Dange of Nutriante*									
Soil Test	Optimum Range of Nutrients*	C1	C2	C3					
Macronutrient	s – 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									
Iron	Critical Level 1.0; High >100	553.9	467.1	371.40					
Notes:									
* Values based on Rutgers, 2012.									
** Optimum ref	ers to optimum fertility.								
**Micronutrient level" should	categories are less well defined than macronutrient categories be considered deficient; values above "high" should be cons	. Values idered a	below the warning.	e "critical Certain					

Table 7 Macronutrient and Micronutrient of On Site Soils

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 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

		РНС	DTOGRAPHIC LOG
Photo No. 1	Date: 5/24/2012		J
Directio Taken: N/A	n Photo		
Description:			
Scientis the ma device	t operating nual coring		



		PHOTOGRAPHIC LOG
Photo No. 3	Date: 5/34/2012	
Directio	on Photo	
Taken:		
Descrip	tion:	
Scientist cored s Core n wrapped foil and plastic	s subsampled oil material. naterial was in aluminum placed in a bucket for	
travel.		MASTER AND





Photo No. 6	Date: 4/24/2012	
Directio	on Photo	
Taken:		
North		
Dessio		
Descrip	tion:	
Pipe o origin l E6 location	f unknown ocated near sampling	

ATTACHMENT B

DATA SHEETS AND LABORATORY DATA

			P	Pedon Description				
Sampling C/C P.O	Location	". Avea	CI	Date 5 21/12	Veather:	ZOT	Time: 1300	
Describe	1/ 50	2		Landscape Position:				
Depth to	Saturati	on or Free Wat	ler:	Vegetative Cover: OI VOI SS				
Parent M	aterial:	my your	re loning alluvium	Hydric Soil: Yes	B	Hydric Soil Indicato	JL:	
Soil Class	and	(subgroup taxe Si PL	on): (Calm	HGM Wetland Class:				
Horizon	Depth	Matrix Color/Colors	Redox Concentrations	Redox Depletions	Texture	Structure	Horizon Boundary	Roots
	. 4		Percent/size/color/location/type	Percent/size/color/location	% Rock frags & size	Grade/size/shape	Distinctness & topo	Size & abundance
	0-6	5 yr 4/3	1	١	Si H (f	the sandtsilt Blocky		med.
	81-0	Sur 44	1	1	Silt (S	silt wi some a	(lary)	many
	18-24	5WY 3/4	١	١	Silt (s	it wi some a	واهم)	none
		2						
			N 40.59	0110	(411)	6		

Soil Investigation Results

GPS W 74.55740

B-1

			Pedon Description				
Sampling Location	" Area	(2	Date: 5/21/12	Weather:	205	Time: 200	
Describer: KBS /	LM		Landscape Position:				
Depth to Saturati	ion or Free Wat	ter:	Vegetative Cover:				
Parent Material:	prown t	fine learny alluvium	Hydric Soil: Yes (N	6	Hydric Soil Indicato	Ľ	
Soil Classification	(subgroup tax	m): 0,0,10	HGM Wetland Class:				
Horizon Depth	Matrix Color/Colors	Redox Concentrations	Redox Depletions	Texture	Structure	Horizon Boundary	Roots
<u>, 5</u>		Percent/size/color/location/type	Percent/size/color/location	% Rock frags &	Grade/size/shape	Distinctness & topo	Size & abundance
9-0	TSUV 3/4	1	١	Clay	(clay whome silt		fine
6-24	5 yr 43	١)	clay/	(clayand si 11) Blocky		fante
		SPS W	40.55212 74.59254		(111)		

B-2

									20			1						I
						Roots	Size & abundance	MANY	few +					ť	14	· · · · · · · · · · · · · · · · · · ·		
t t	Time: 10-00					Horizon Boundary	Distinctness & topo						-				. 7	
58827	5,57 09		1	Hydric Soll Indianto		Structure	Grade/size/shape	granuar	B100H						* •	ing allowed		10.47 . AP. 1
• • •	Weather: KAW			No		Texture	% Rock frags &	Silt/Clay	Si HAMAN	1		and the second	5	•		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	-	11.1
STLIC STLIC edon Description	Date: 05/21/2	Landscape Position:	Vegetative Cover:	Hydric Soil: (Yes)	HGM Wetland Class:	Redox Depletions	Percent/size/color/location		18° 3	5 3	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	* :		4				a state
tecon N	rea (3 👞			e loamn alluvium	:[10	Redox Concentrations	Percent/size/color/location/type	2/2	1.1 5y2 5/ 8 12							4	100	and the second
	ation di	5 / LATM	tion or Free Wat	Brown Fin	n (subgroup tax	Matrix Color/Colore	,	SYR 413	454K3/4				1 - 1 - 1 - 14	at a	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	5 41 5	212 S 113	
	Sampling Locatic	Describer:	Depth to Saturat	Parent Material:	Soil Classification	Horizon Depth	14	0-9	6-2					-	-6 ₉ 4	9-0 -		A Contraction of the
XX	in an			1. A.	-		1. · · ·		and the second	1	1 22	1	in the	an in	ante	-	Sec.	

		Landscape Position:	IK.	Hydric Soil Indicator:	HGM Wetland Class:	Roots	Size & abundance	few	None	Mehre	hone.		
Pedon Description	Time: レイ・ 00					Horizon Boundary	Distinctness & topo						
	70,					Structure	Grade/size/shape	granular	blocky	bi octes	chocky		
	Veather:			Hydric Soil: Ves No		Texture	% Rock frags & size	bug	Sandr	Sand +	Clay w/ trace		
	Date: 5 21 12		Vegetative Cover; r USN , UN			Redox Depletions	Percent/size/color/location			50 N 5% black BHUMB- Charcoal Spees	or ash?)		
	s Location:	S/LAM	s Saturation or Free Water:	haterial: and brown fine loamy allunium	n): Q.M	Redox Concentrations	Percent/size/color/location/type	ø	EWY Y/ ~ ~5%.	Guryle ~ 1% (al	æ		
					Sification (subgroup taxo	Matrix Color/Colors		5453/4	5 yr 3/4	Sur 3/4	5 yr 3/4		
						Depth		9-0	6-12	12-18	18-24		
	Sampling	Describe	Depth to	Parent N	Soil Class	Horizon							

(2, pS 40.55807 (116)
			THIMB			Roots	Size & abundance	some/ Medium	Nouis	 		 			
	Time: 0900		T SYOAN			Horizon Boundary	Distinctness & topo								
	100-65°F		00SESTRAFE /	Hydric Soil Indicato		Structure	Grade/size/shape	GRANULAR	GAANULAL		A A A				1
	Weather: RAH N		KPLE L	ç		Texture	% Rock frags &	size MA	2/2					E	
edon Description	Date: 05/21/12	Landscape Position:	Vegetative Cover:	Hydric Soil: Yes A (M)	HGM Wetland Class:	Redox Depletions	Percent/size/color/location						0.000		
W 74.58855		un/kas	ï	FINE LOANN ALLING	H: LONIN	Redox Concentrations	Percent/size/color/location/type	N/A	N/A						
GPS	Е Т З	MONTA	in or Free Wat	BLOWN	AND SII	Matrix Color/Colors		5YR 314	5-yr.3/4						
5	Location	1150	Saturatio	laterial:	2010L	Depth		9-0	6-24		-				
	Sampling	Describe	Depth to	Parent N	Soil Class	Horizon									

Soil Investigation Results

1.....

Sampling L	ocation	<u> </u>	G	Pate: 101/10	Weather:		Time:	
	4	و		514112	rain	60 5	11:00	
Describer:	583	/LAM		Landscape Position:				
Depth to Si	aturati	on or Free Wat	ïa	Vegetative Cover:	500			
Parent Mat Ded a	terial:	Prown -	fine loamy alluvium	Hydric Soll: Yes	6	Hydric Soil Indicato	Ľ	
Soil Classifi 20W/ 0	ication UN d	(subgroup taxo	an): 0 d.MY	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	7	7.5yr This			51H+ Finct	granular		Serve
6	21-	Szkryz.r			t H +	granular		Nove
-	5-18	7.Sur 3/4			sand	blocky		ADAE
	42-8	1/5 yr 3/4			Sand	blocky		hone
			CIBS (40.55 1 54	1011			

Soil Investigation Results

40.55 154 (113) 74.88733

AECOM
Finderne, NJ
LABORATORY TESTING DATA SUMMARY

BORING	SAMPLE	DEPTH					IDENTIFIC	ATION TE	STS				REMARKS
			WATER	LIQUID	PLASTIC	PLAS.	USCS	SIEVE	HYDRO.	TOTAL	DRY	SPECIFIC	
NO.	NO.		CONTENT	LIMIT	LIMIT	INDEX	SYMB.	MINUS	% MINUS	UNIT	UNIT	GRAVITY	
							(1)	NO. 200	2 µm	WEIGHT	WEIGHT		
		(ft)	(%)	(-)	(-)	(-)	10-12 10-12	(%)	(%)	(pcf)	(pcf)	(-)	
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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0																	IER	0												COM			UTION	6/7/20
-	EC1 LOW		0.0	10.0	0.1	3.1	7.7	89.2	26	4.75	0.02	0.00					ERCENT FIN	•						0.001	99°5	96.8	93.8	91.8	89.2	AE			ZE DISTRIB erne, NJ	siev1a.xls
	EC1 UP		0.0	0.0	0.1	1.2	4.5	94.2	25	4.75	0.01	0.00					Ы						0.007	0.001	2.66	98.8	97.2	95.8	94.2	ense, LLC		5-12001	RTICLE SIZ	
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	C1 UP	0.0	0.0	5.2	0.1	0.5	4.7	94.8	21	4.75	0.01	0.00					PE						0.001	0.001	99.7	99.4	98.9	98.0	94.8	nse, LLC		-12001	RTICLE SIZ Find	
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	C3 UP		0.0	0.0	9.7	0.3	0.5	8.9	90.3	21	4.75	0.02	0.00					Ы						0.007	0.00T	9.66	99.2	98.4	96.3	90.3	inse, LLC		-12001	RTICLE SI	
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	E2W LOW		0.0	0.0	8.6	0.0	2.2	6.4	91.4	24	4.75	0.01	0.00					RCENT FINE								1000	99.3	97.7	96.2	94.9	91.4				CE DISTRIBU erne, NJ	siev1e.xls
	E2W UP		0.0	0.0	6.6	0.0	1.1	5.4	93.4	19	4.75	0.01	0.00					B								100.0	6.99	98.8	97.0	95.5	93.4	ense, LLC		-12001	RTICLE SIZ Find	
Symbol	Boring	Sample	Depth % +3"	% Gravel	% SAND	%C SAND	%M SAND	%F SAND	% FINES	% -2μ	D100 (mm)	D ₆₀ (mm)	D ₃₀ (mm)	D ₁₀ (mm)	ദ	ŋ	Particle	Size		(zieve #)	4	3"	1 1/2"	3/4"	3/8"	4 (20	40	60	100	200	TerraSe		7966	ΡA	
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TerraSense, LLC				Date Received: 2012-05-29	
Greg Thomas				Date Reported: 2012-06-19	
Totowa, NJ 07512					
g_thomas@terrasens	elab.con	n			
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Results and Int	erpret	ations			
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Lime Requireme The Lime Requireme is used to determi buffering capacity (LRI near 7.0). Macronutrients Phosphorous: Potassium: Magnesium: Calcium: by Micronutrients Zinc(Zn) 7.25 (Adequate) Special Tests Re Organic matter by	ent Inde ment Inde ine the a of soil a <u>(poun</u> 141 87 318 2211 Mehlich (parts 6 esuits	x: 7.70 dex (LRI) is a measu ppropriate amount of and a lower rate of I dds per acre) (Above Optimum) (Above Optim	re of the buffering ca of limestone, when ne imestone amendment P K Manganese(Mn) 92.15 (High) rganic Matter= 4.2% Interpretation depen	Below Optimum Below	Abov Opt
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ITGERS Soil Testing Laboratory Rutgers, The State University ASB II New Jersey Agricultural 57 US Highway 1 South **Experiment Station** New Brunswick, NJ 08901-8554 **Soil Test Report** Lab #: 2012-19112 TerraSense, LLC Date Received: 2012-05-29 Date Reported: 2012-06-19 Greg Thomas 45 H Commerce Way Totowa, NJ 07512 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) v Ontimum Ontimum (Below Optimum) **Phosphorous:** 51 Ρ Potassium: 128 (Below Optimum) к Magnesium: 386 (Above Optimum) Mg Calcium: 2362 (Above Optimum) Ca Very Low Medium Hiel by Mehlich 3 extraction Micronutrients (parts per million) Manganese(Mn) Iron(Fe) Zinc(Zn) Copper(Cu) Boron(B) 467.10 (High) 7.12 (Adequate) 4.89 (Adequate) 186.10 (High) 0.73 (Low) **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 Test Report for Lab # 2012-19112 Page 1/2 RULIMS-ST V3.0

RUTGERS

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 #: 2012-19113

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)

					Below Optimum	Optimum	Above Opt.
Phosphorous:	94	(Optimum)		Р			
Potassium:	141	(Below Optimu	m)	к			
Magnesium:	489	(Above Optimu	m)	Mg			
Calcium:	3165	(Above Optimu	m)	Ca			
					Very Low Medium	High	Very High
by	Mehlich	3 extraction					
Micronutrients	(parts	per million)					
Zinc(Zn)	C	opper(Cu)	Manganes	e(Mn)	Boron(B)	Iron(Fe)	
9.96 (Adequate)	6.	.33 (Adequate)	197.10 (H	igh)	0.89 (Adequat	e) 371.40 (Hig	h)
Special Tests R	<u>esults</u>						
Organic matter by	dichrom	ate oxidation-	Organic Matter=	3.8%	Organic Carbon= 2.	2%	
			Interpretation	depends	on soil texture for		
Inorganic Nitroge	n- Nitra	te-N: 6 ppm	Ammonium-N: 2	ppm			

Soil Test Report for Lab # 2012-19113 Page 1/2 RULIMS-ST V3.0

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 120mile 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



Figure 2 County Road Map



Figure 3 Aerial Planting Zone Location Map



Figure 4 Soils Map

Soil Map—Somerset County, New Jersey (Finderne Farm Mitigation Site Soil Map)



Web Soil Survey 2.1 National Cooperative Soil Survey

	MAP LEGEND			MAP INFORMATION		
Area of In	terest (AOI)	۵	Very Stony Spot	Map Scale: 1:15,400 if printed on A size (8.5" × 11") sheet.		
	Area of Interest (AOI)	¥	Wet Spot	The soil surveys that comprise your AOI were mapped at 1:24,000.	ĺ	
Soils	Soil Map Units	▲ Special	Other	Please rely on the bar scale on each map sheet for accurate map measurements.	ĺ	
Special (1)	Point Features Blowout Borrow Pit	<u>20</u>	Gully Short Steep Slope	Source of Map: Natural Resources Conservation Service Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov Coordinate System: UTM Zone 18N NAD83		
×	Clay Spot	Political F	Other Political Features	This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.		
* ×	Closed Depression Gravel Pit	O Water Fea	Cities atures	Soil Survey Area: Somerset County, New Jersey Survey Area Data: Version 9, Aug 18, 2008		
	Gravelly Spot		Oceans	Date(s) aerial images were photographed: 8/13/2006	ĺ	
0	Landfill	\sim	Streams and Canals	The orthophoto or other base map on which the soil lines were	ĺ	
٨	▲ Lava Flow		ation	compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting		
علم	ملد Marsh or swamp	+++	Rails	of map unit boundaries may be evident.). Df	
*	Mine or Quarry	~	Interstate Highways			
۲	Miscellaneous Water	\sim	US Routes		ĺ	
۲	Perennial Water	$\sim\sim$	Major Roads		ĺ	
~	Rock Outcrop	\sim	Local Roads		ĺ	
+	Saline Spot				ĺ	
:-:	Sandy Spot				ĺ	
=	Severely Eroded Spot				ĺ	
\$	Sinkhole				ĺ	
3	Slide or Slip				ĺ	
ø	Sodic Spot				ĺ	
3	Spoil Area				ĺ	
	Stony Cnot				Í	



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 Inter	est	1,035.1	100.0%			

Figure 5 Vegetation Monitoring Finderne Farm Mitigation Site (includes Soil Boring Locations and Site Photo Locations)





- Spring 2012 Vegetation Plot Location ٠
- 2012 Soil Boring Location
- 2012 Soil Profile Location

UNION

MIDDLESE

SOMERSET

Emergent Wetland Stream Bank Planting

Planting Area

- Wetland Forest
- 200 400

800

Feet

Wetland Scrub Shrub

3. C = Creation Riparian Forest (Boundary Estimated) C = Creation
 A photograph was taken at each vegetation plot location.
 New Jersey State Plane Coordinate System NAD83, U.S. Survey Feet.
 Aerial Photography Source: New Jersey 2010 National Agricultural Imagery Program (NAIP) Orthophotography, Web Map Service (WMS).

HUNTERDON

2012 Vegetation Monitoring Finderne Farm Mitigation Site

Date: November 2012 Project Number: 60267303

Figure 5