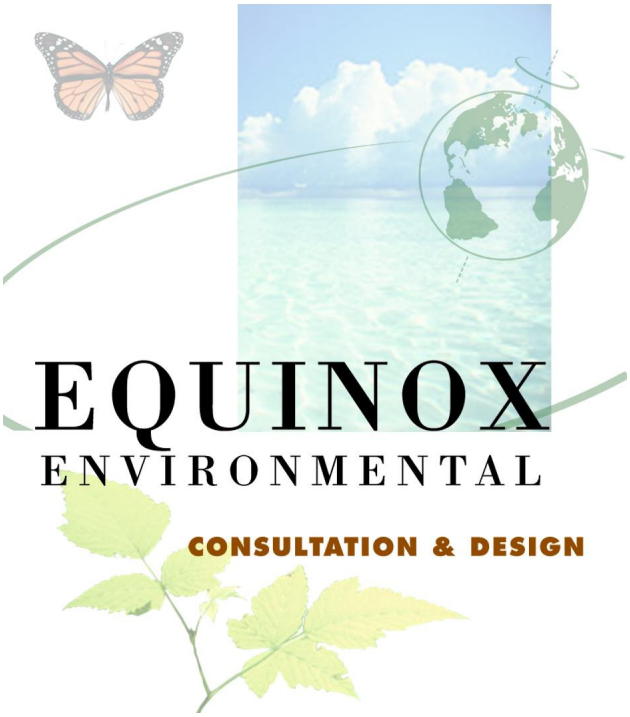
Silas Creek
Stream Restoration
NCEEP Project Number: 00335
Monitoring Year 6
2010 Final Report

Submitted to
North Carolina Ecosystem Enhancement Program
North Carolina Department of Environment and Natural Resources
April 2011

Ecosystem Enhancement PROGRAM

1619 Mail Service Center
Raleigh, NC 27699

Monitoring Firm



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Silas Creek Stream Restoration
2010 Monitoring Report (MY 6)

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Appendices

1.0 EXECUTIVE SUMMARY / PROJECT ABSTRACT

The goals and objectives stated in the Silas Creek Mitigation Report (NCEEP 2002) are as follows:

- Restore 4,715 linear feet of channel dimension, pattern, and profile to the extent possible considering project constraints, watershed characteristics, and data from reference reaches in similar watersheds;
- Improve floodplain functionality by matching floodplain elevation with bankfull stage therefore increasing watershed attenuation and reducing peak flows;
- Establish native floodplain vegetation which will allow treatment of diffuse storm flow and nutrient uptake while establishing part of a wildlife corridor in the watershed;
- Improve the natural aesthetics of the stream corridor; and
- Improve the water quality in the Silas Creek watershed by reducing bank erosion, increasing nutrient storage and uptake, and increasing the dissolved oxygen of the system.

The project was monitored from 2004 to 2008 for hydrology, geomorphology, and vegetative success and overall the project reaches have demonstrated morphological stability with 95% of the mainstem and 99% of the tributary exhibiting stable bank stability respectively, but the invasive plant community has been particularly abundant and aggressive at this site. The extent of invasive climbing vines required treatment to be able to properly assess the vegetation and any supplemental planting needs. Treatment occurred in 2010 and a follow up treatment will occur in 2011. Given the completion of morphological monitoring in 2008/2009, the monitoring in 2010 was limited to the collection of data from those vegetation plots that could be located. Two vegetation plots, VP2 and VP13, could not be relocated and no data was collected from them for monitoring year six (MY6). Vegetation plot 13 was destroyed, presumably because of mowing within the easement area, according to the MY5 report. Steel bollards with signage were cemented into the ground to demarcate the easement boundary to prevent future encroachment within the agreed upon vegetation maintenance line and support long term stewardship. Only one corner pin was located for VP2, but because the orientation of the vegetation plot was unknown, it could not be re-sampled. The MY6 vegetation plot data indicate that the project does not meet the established criterion for planted stem density, which is a minimum survival of 260 planted stems per acre at the end of the five-year monitoring period. Average stem density for planted stems in MY6 is approximately 231 stems per acre. However, natural woody stem recruitment is high and contributes a significant proportion to the overall stem density for the site (≈78%). When planted and natural stems are combined, the average stem density is 1,070 stems per acre, which is well above the minimum established criterion.

Problems with vegetation consist of damage from climbing, non-native invasive vegetation and some unavoidable collateral effects to non-target species as a result of the treatment that was integrated. The monitoring in 2011 will help determine the degree of supplemental planting necessary once invasive suppression is complete.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting

information formerly found in these reports can be found in the mitigation and restoration plan documents available on EEP's website. All raw data supporting tables and figures in the appendices is available from EEP upon request.

2.0 Methodology

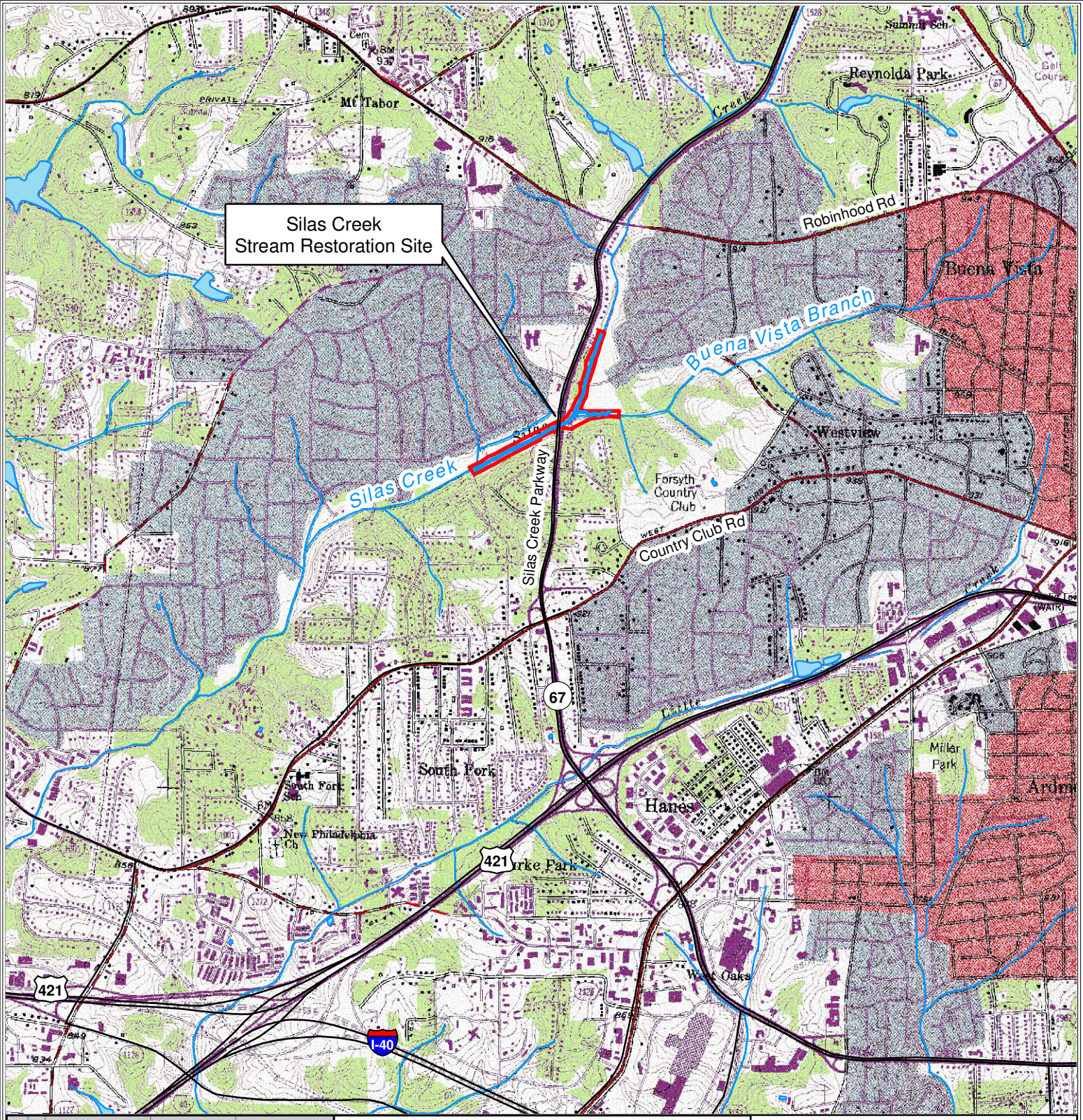
Vegetation monitoring data were collected following the standard CVS-EEP Protocol for Recording Vegetation, Level II (Lee et al. 2008).

3.0 References

Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation. Version 4.2.

NCEEP (North Carolina Ecosystem Enhancement Program). November 2002. Silas Creek Restoration Project Winston-Salem, North Carolina. Mitigation Report. Raleigh, NC.

Appendix A
Project Vicinity Map and Background Tables



Directions: From Raleigh, proceed west on I-40 towards Winston- Salem. Take Exit 188 onto I-40/US421 South towards Winston-Salem. Take the Silas Creek Parkway/NC-67 west exit. The project site is located in Shaffner Park, just north of Country Club Road. Reach 1, Reach 2, and Buena Vista Branch are located east of Silas Creek Parkway. Reach 3 is west of Silas Creek Parkway.

Figure 1 - Vicinity Map

Silas Creek
Stream Restoration Site
Project No. 00335

Forsyth County, North Carolina

N

EQUINOX ENVIRONMENTAL CONSULTATION & DESIGN

Ecosystem Enhancement PROGRAM

0 0.25 0.5 1 Mi

7.5 Minute Series Winston-Salem Quadrangle

Table 1a. Project Components
Silas Creek / Project No. 00335

Project Component or Reach ID	Existing Feet	Restoration Level	Approach	Footage*	Stationing**	Mitigation Ratio	Mitigation Units	BMP Elements	Comment
Silas Creek - Reach 1	999 lf	EI	P3	999 lf	10+00 - 19+50	1.5	666	N/A	Cut new floodplain, restoration of incised channel
Silas Creek - Reach 2	897 lf	EI	P3	897 lf	19+50 - 29+50	1.5	598	N/A	Cut new floodplain, restoration of incised channel
Silas Creek - Reach 3	1,771 lf	EI	P3	1,771 lf	29+50 - 49+00	1.5	1,181	N/A	Cut new floodplain, restoration of incised channel
Buena Vista Branch	782 lf	R	P2 & P3	782 lf	10+00 - 19+00	1.0	782	N/A	Change dimension, pattern, and profile

N/A - Item does not apply.
*Linear footage is derived from October 2003 As-Built survey.
**Stationing is derived from the 2003 As-Built Plan/Monitoring Plan View Sheets

R = Restoration
EI = Enhancement
P2 = Priority 2
P3 = Priority 3

Table 1b. Component Summations
Silas Creek / Project No. 00335

Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-Ripar (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	782						
Enhancement							
Enhancement I	3,667						
Enhancement II							
Creation							
Preservation							
HQ Preservation							
		0	0				
Totals	**4,449**	**0.0**		**0.0**	**0.0**	**0.0**	**BMP Count**
MU Totals	**3,227**	**0.0**		**0.0**	**0.0**	**0.0**	**0**

Non-Applicable
- Item unknown.

Table 2. Project Activity and Reporting History
Silas Creek / Project No. 00335
Elapsed Time Since Grading Complete: 7 yrs 6 months
Elapsed Time Since Planting Complete: 7 yrs 3 months
Number of Reporting Years: 6

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Restoration Plan	-	-
Final Design - Construction Plans	-	-
Construction	N/A	Fall 2003
Live Stakes and Bare Root Trees Planted	N/A	Jan-04
Mitigation Plan / As-built (Year 0 Monitoring - Baseline)	Fall 2003	Fall 2003
Year 1 Monitoring	Oct-04	Feb-05
Year 2 Monitoring	Sep-05	Apr-06
Year 3 Monitoring	Oct-06	Dec-06
Year 4 Monitoring	Aug-07	Sep-07
Year 5 Monitoring	Apr-09	Jun-09
Year 6 Monitoring	Sep-10	Apr-11

- Information unavailable.
N/A - Item does not apply.

Table 3. Project Contacts Silas Creek / Project No. 00335	
Designer Primary Project Design POC	Buck Engineering / Michael Baker Corp. 1152 Executive Circle, Suite 100 Cary, NC 27511 Will Harmon 919-463-5488
Construction Contractor Construction Contractor POC	North State Environmental 2889 Lowery Street Winston-Salem, NC 27101 Darryl Westmoreland 336-725-2010
Survey Contractor Survey Contractor POC	Unknown Unknown
Planting Contractor Planting Contractor POC	North State Environmental 2889 Lowery Street Winston-Salem, NC 27101 Darryl Westmoreland 336-725-2010
Seeding Contractor Planting Contractor POC	Unknown Unknown
Seed Mix Sources	Unknown
Nursery Stock Suppliers	Unknown
Monitoring Performers (Y1) - 2004	Buck Engineering / Michael Baker Corp. 1152 Executive Circle, Suite 100 Cary, NC 27511
Stream Monitoring POC Vegetation Monitoring POC	Will Harmon 919-463-5488
Monitoring Performers (Y2) - 2005	EcoLogic Associates, P.C. 4321-A South Elm-Eugene Street Greensboro, NC 27406
Stream Monitoring POC	Kyle Hoover 336-355-1108
Vegetation Monitoring POC	Moni Bates 336-355-1108
Monitoring Performers (Y3) - 2006	URS Corporation – North Carolina 1600 Perimeter Park Drive, Suite 400 Morrisville, NC 27560
Stream Monitoring POC Vegetation Monitoring POC	Kathleen McKeithan 919-461-1597
Monitoring Performers (Y4) - 2007	URS Corporation – North Carolina 1600 Perimeter Park Drive, Suite 400 Morrisville, NC 27560
Stream Monitoring POC Vegetation Monitoring POC	Kathleen McKeithan 919-461-1597
Monitoring Performers (Y5) - 2008	URS Corporation – North Carolina 1600 Perimeter Park Drive, Suite 400 Morrisville, NC 27560
Stream Monitoring POC Vegetation Monitoring POC	Kathleen McKeithan 919-461-1597
Monitoring Performers (Y6) - 2010	Equinox Environmental Consultation & Design, Inc. 37 Haywood Street, Suite 100 Asheville, North Carolina 28801
Stream Monitoring POC	Steve Melton (828) 253-6856
Vegetation Monitoring POC	Win Taylor (828) 253-6856

Unknown - Information was unknown at time of report submittal.

Table 4. Project Attributes Silas Creek / Project No. 00335		
Project County	Forsyth	
Physiographic Region	Piedmont	
Ecoregion	Northern Inner Piedmont (45b)	
Project River Basin	Yadkin	
USGS HUC for Project (14 digit)	3040101170040	
NCDWQ Sub-Basin for Project	03-07-04	
Within Extent of EEP Watershed Plan	Yadkin-Pee Dee River Basin Watershed Restoration Plan	
WRC Class (Warm, Cool, Cold)	Warm	
% of Project Easement Fenced or Demarcated	0%	
Beaver Activity Observed During Design Phase	-	
Restoration Component Attributes		
	Silas Creek	Buena Vista Branch
Drainage Area (sq.mi.)	7.2	1.4
Stream Order	Third	First
Restored Length (feet)	3,667	782
Perennial or Intermittent	Perennial	Perennial
Watershed Type	Urban	
Watershed LULC Distribution	-	-
Watershed Impervious Cover	>25%	
NCDWQ AU / Index Number	12-94-10	
NCDWQ Classification	C	
303d Listed	No	
Upstream of 303d Listed Segment	No	
Reasons for 303d Listing or Stressor	N/A	
Total Acreage of Easement	15.29	
Total Vegetated Acreage within Easement	-	
Total Planted Acreage as Part of Restoration	-	
Rosgen Classification of Pre-Existing	B4c	E4
Rosgen Classification of As-Built	B4c	E4
Valley Type	-	-
Valley Slope	-	-
Valley Side Slope Range	-	-
Valley Toe Slope Range	-	-
Cowardin Classification	N/A	
Trout Waters Designation	No	
Species of Concern, Endangered, Etc.	No	
Dominant Soil Series and Characteristics		
Series	Wehadkee, Chewacla, Urban land	
Depth	-	
Clay%	-	
K	-	
T	-	

- Information unavailable.
N/A - Item does not apply.

Appendix B
Vegetation Plot Data

Figure 2. Vegetation Current Condition Plan View

Prepared for			Prepared by
Ecosystem Enhancement Program	**Project:** Silas Creek Year 6 Monitoring Forsyth County, North Carolina	Notes: 1) Base Map Data Provided by NCEEP 2) 2005 Aerial Photo 3) Locations & orientation depicted for vegetation plots are approximate.	EQUINOX ENVIRONMENTAL CONSULTATION & DESIGN
	Sheet 1 of 1		
	Date	Project Number	
	November 2010	NCEEP # 00335	

Table 5. CVS Vegetation Plot Metadata Silas Creek / Project No. 00335	
Report Prepared By	Sarah Marcinko
Date Prepared	9/24/2010 15:36
Database Name	Silas Ck-v2.2.7.mdb
Database Location	Z:\ES\NRI&M\EEP Monitoring\Silas Creek\Data
Computer Name	D16TNK71
File Size	45977600
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, Planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, Total Stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and Spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	335
Project Name	Silas Creek
Description	Stream Restoration
River Basin	Yadkin
Length(ft)	
Stream-to-Edge Width (ft)	
Area (sq m)	
Required Plots (calculated)	
Sampled Plots	5

Table 6. Planted and Total Stem Counts (Species by Plot with Annual Means)
Silas Creek / Project No. 00335

			Current Plot Data (MY6 2010)															Annual Means											
			E335-01-0003			E335-01-0006			E335-01-0008			E335-01-0010			E335-01-0014			MY6 (2010)			MY5 (2008)			MY4 (2007)			MY3 (2006)		
Scientific Name	Common Name	Species Type	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T
Acer floridanum	Southern sugar maple	Tree									2					1	2		1	4		6	6					7	7
Acer negundo var. negundo	Boxelder	Tree						1									12			13									69
Ailanthus altissima	Tree of heaven	Tree																											3
Albizia julibrissin	Silktree	Shrub Tree																											25
Alnus serrulata	Hazel alder	Shrub Tree		1	1					1	1								2	2		3	3					3	3
Aronia arbutifolia	Red chokeberry	Shrub																										1	1
Asimina triloba	Pawpaw	Shrub Tree									1			1						2									
Betula nigra	River birch	Tree						21					10	12		2	3		12	36		17	17		2	2		28	72
Carya cordiformis	Bitternut hickory	Tree																											1
Carya ovata	Shagbark hickory	Tree			1											1	1		1	2		1	1					2	2
Cornus amomum	Silky dogwood	Shrub		2	2			1											2	3		12	12					15	15
Fraxinus pennsylvanica	Green ash	Tree			8			2			1			3			5			19		1	1					1	46
Juglans nigra	black walnut	Tree															1			1									
Juniperus virginiana var. virginiana	Eastern redcedar	Tree						2									1			3									
Liquidambar styraciflua	Sweetgum	Tree			29			12			10						5			56									43
Liriodendron tulipifera var. tulipifera	Tulip-tree	Tree			1						2			2			3			8									4
Morus alba	White mulberry	Shrub Tree																											1
Nyssa sylvatica	Blackgum	Tree								1	1								1	1		1	1						
Ostrya virginiana	Hophornbeam	Shrub Tree															1			1									
Pinus serotina	Pond pine	Tree																											2
Pinus virginiana	Virginia pine	Tree																											12
Platanus occidentalis var. occidentalis	Sycamore	Tree		3	3		2	2		5	5		2	3		2	3		14	16		17	17		2	2		24	34
Prunus serotina var. serotina	Black cherry	Shrub Tree			1						2									3									
Quercus phellos	Willow oak	Tree					1	1		1	1		3	3			1		5	6		9	9					12	15
Rhus copallinum var. copallinum	Flameleaf sumac	Shrub Tree									1									1									
Rhus glabra	Smooth sumac	Shrub Tree									3									3									
Robinia pseudoacacia	Black locust	Tree																											4
Sambucus canadensis	Common elderberry	Shrub Tree																				1	1						1
Morella cerifera	Wax myrtle	Shrub Tree								2	2								2	2									
Carpinus caroliniana	American hornbeam	Shrub Tree																											1
Carya	Hickory	Tree																				1	1						
Lindera benzoin	Northern spicebush	Shrub Tree																										1	1
Myrica	Sweetgale	Shrub																				2	2					2	3
Prunus	Plum	Shrub Tree									1						2			3									
	Stem count		0	6	46	0	3	42	0	10	33	0	15	24	0	6	40	0	40	185	0	71	71	0	4	4	0	96	365
	Size (ares)		1			1			1			1			1			7			7			1			7		
	Size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.17			0.17			0.02			0.17		
	Species count		0	3	8	0	2	8	0	5	14	0	3	6	0	4	13	0	9	21	0	12	12	0	2	2	0	11	23
	Stems per ACRE		0	242.8	1862	0	121.4	1700	0	404.7	1335	0	607	971.2	0	242.8	1619	0	231.2	1070	0	410.5	410.5	0	161.9	161.9	0	555	2110

Vegetation Monitoring Plot 3
Monitoring Year 6 – September 16, 2010

Vegetation Monitoring Plot 6
Monitoring Year 6 – September 16, 2010

Vegetation Monitoring Plot 8
Monitoring Year 6 – September 16, 2010

Vegetation Monitoring Plot 10
Monitoring Year 6 – September 16, 2010

Vegetation Monitoring Plot 14
Monitoring Year 6 – September 16, 2010