ANNUAL MONITORING REPORT
YEAR 3 (2012)

HEATH RIPARIAN BUFFER MITIGATION SITE
CRAVEN COUNTY, NORTH CAROLINA
(EEP Contract No. 002280)

Prepared for:

NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
ECOSYSTEM ENHANCEMENT PROGRAM
RALEIGH, NORTH CAROLINA

Prepared by:

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And

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June 2012

EXECUTIVE SUMMARY

Restoration Systems, LLC completed riparian buffer restoration at the Heath Riparian Buffer Mitigation Site (hereafter referred to as the "Site") through the North Carolina Ecosystem Enhancement Program (NCEEP) Full Delivery Process (RFP 16-001383) to provide 59.45 Riparian Buffer Mitigation Units. The Site is located approximately 3.4 miles southeast of Dover in Craven County within United States Geological Survey Hydrologic Unit and Targeted Local Watershed 03020202080010 (North Carolina Division of Water Quality Subbasin 03-04-08) of the Neuse River Basin. Site streams drain to Core Creek (Stream Index 27-90), which is included on the draft 2008 303(d) list for impaired biological integrity and low dissolved oxygen resulting from agricultural crop production.

Prior to construction, the Site was characterized by ditched agricultural land used for row crop production. Land use practices including the maintenance and removal of vegetation, regular plowing, and use of agricultural chemicals had resulted in degraded water quality.

The goals and objectives of this project focused on improving local water quality, enhancing flood attenuation, and restoring aquatic and riparian habitat. These goals were accomplished by the following.

1. Removing nonpoint sources of pollution associated with agriculture production by a) ceasing the application of agricultural herbicides, pesticides, fertilizers, and other agricultural materials into and adjacent to Site ditches and open waterways and b) providing a vegetative buffer adjacent to ditches and waterways to treat surface runoff that may be laden with sediment and/or agricultural pollutants.
2. Reducing sedimentation/siltation within on-Site and downstream receiving waters by a) increasing retention time for surface waters entering and leaving the Site, b) reducing erosion associated with vegetation maintenance and agricultural plowing to Site ditches, and c) planting a forested vegetative buffer adjacent to Site ditches and waterways.
3. Promoting floodwater attenuation by ripping compacted soils and revegetating the Site to increase frictional resistance on floodwaters crossing the Site.
4. Providing terrestrial wildlife habitat including a forested riparian corridor within an area that was previously cleared and highly dissected by agricultural land use.

This project was constructed in late winter/early spring 2010. Planting of the entire 60.63-acre Site resulted in 59.45 Riparian Buffer Mitigation Units. The Site will be protected by a permanent conservation easement. As a whole, the densities of vegetation plots across the Site were above the required 320 stems per acre with an average of 846 planted stems per acre counting towards riparian buffer success in the Third Monitoring Year (2012). In addition, each individual plot met success criteria based on planted stems alone.

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APPENDICES

1.0 INTRODUCTION

1.1 Location and Setting

Restoration Systems, LLC has completed riparian buffer restoration at the Heath Riparian Buffer Mitigation Site (hereafter referred to as the "Site") through the North Carolina Ecosystem Enhancement Program (NCEEP) Full Delivery Process (RFP 16-001383) to provide 59.45 Riparian Buffer Mitigation Units. The Site is located approximately 3.4 miles southeast of Dover in Craven County (Figure 1, Appendix A). The Site is located in United States Geological Survey Hydrologic Unit and Targeted Local Watershed 03020202080010 (North Carolina Division of Water Quality Subbasin 03-04-08) of the Neuse River Basin (USGS 1974).

Directions to the Site from Kinston, North Carolina:

- Take 70 East for approximately 8 miles
- Take the Dover exit and follow Old 70/Wilson Street for approximately 4.3 miles east
- Turn right over the railroad tracks to wire gate.
- Site coordinates:
    - Latitude 35.19627ºN, Longitude 77.38060ºW (NAD83/WGS84)

1.2 Project Goals and Objectives

The goals and objectives of this project focused on improving local water quality, enhancing flood attenuation, and restoring aquatic and riparian habitat. These goals were accomplished by the following.

1. Removing nonpoint sources of pollution associated with agriculture production by a) ceasing the application of agricultural herbicides, pesticides, fertilizers, and other agricultural materials into and adjacent to Site ditches and open waterways and b) providing a vegetative buffer adjacent to ditches and waterways to treat surface runoff that may be laden with sediment and/or agricultural pollutants.
2. Reducing sedimentation/siltation within on-Site and downstream receiving waters by a) increasing retention time for surface waters entering and leaving the Site, b) reducing erosion associated with vegetation maintenance and agricultural plowing to Site ditches, and c) planting a forested vegetative buffer adjacent to Site ditches and waterways.
3. Promoting floodwater attenuation by ripping compacted soils and revegetating the Site to increase frictional resistance on floodwaters crossing the Site.
4. Providing terrestrial wildlife habitat including a forested riparian corridor within an area that was previously cleared and highly dissected by agricultural land use.

1.3 Project Structure, Restoration Type, and Approach

Prior to construction, the Site was characterized by ditched agricultural land used for row crop production. Land use practices including the maintenance and removal of vegetation, regular plowing, and use of agricultural chemicals had resulted in degraded water quality.

As constructed, Site activities restored historic riparian buffer functions by planting the entire 60.63-acre Site with native riparian vegetation. This resulted in 59.45 Riparian Buffer Mitigation Units (Table 1, Appendix B and Figure 2, Appendix A). Approximately 0.63 acres of the Site is surface water associated with Site ditches and 0.55 acres of the Site received no credit due to diffuse flow requirements. These areas were planted; however, the area is not eligible to provide credit. The target natural community consisted of Coastal Plain Bottomland Hardwood Forest (Schafale and Weakley 1990). Table 5 (Appendix C) outlines

woody species planted within the Site. Completed project activities, reporting history, completion dates, project contacts, and background information are summarized in Tables 2-4 (Appendix B).

2.0 MONITORING PLAN

Monitoring of Site restoration efforts will be performed for vegetation components at the Site for five years or until success criteria are fulfilled. After planting was completed, an initial evaluation was performed to verify planting methods were successful and to determine initial species composition and density. Twenty-nine sample vegetation plots (10-meter by 10-meter) were installed within the Site as per guidelines established in CVS-EEP Protocol for Recording Vegetation, Version 4.0 (Lee et al. 2006). In each sample plot, vegetation parameters to be monitored include species composition and species density. Visual observations of the percent cover of shrub and herbaceous species will also be documented by photograph.

2.1 Vegetation Success Criteria

Characteristic Tree Species include woody tree and shrub species planted at the Site (Table 5, Appendix C) or outlined for the appropriate plant community in Schafale and Weakley (1990). An average density of 320 stems per acre of Characteristic Tree Species must be surviving after year 5 monitoring.

2.2 Maintenance and Contingency

In the event that success criteria are not fulfilled, a mechanism for contingency will be implemented. If vegetation success criteria are not achieved based on average density calculations from combined plots over the entire restoration area, supplemental planting may be performed with tree species approved by regulatory agencies. Supplemental planting will be performed as needed until achievement of vegetation success criteria.

2.3 Vegetation Sampling Results and Comparison to Success Criteria

Quantitative sampling of vegetation was conducted in June 2012. Results are provided in Appendix C. Vegetation success criteria for year 3 (320 stems per acre) were exceeded for the 2012 annual monitoring year with an average density of 846 planted stems per acre counting towards riparian buffer success across the Site. In addition, each individual plot met success criteria based on planted stems alone. Average densities of planted stems went up in year 2 in several plots including Plots 1, 3-5, 8, and 10-11. During year 1, browse by deer and rodents on young planted stems was abundant throughout the Site. Several stems within these plots were not counted, or counted as missing in year 1; however, many survived and were doing well in years 2-3. In addition, several stems that were thought to be dead during year 1 monitoring resprouted from the base and were counted during years 2-3 monitoring. Deer browse was prevalent again during year 2 monitoring.

There are several small natural recruits of mimosa (*Albizia julibrissin*) in the vicinity of Plot 10, these stems will be treated with herbicide this summer (2012).

3.0 CONCLUSIONS

As a whole, the densities of vegetation plots across the Site were above the required 320 stems per acre in years 1-3 (2010-2012). In addition, each individual plot met success criteria based on planted stems alone.

Summary of Planted Stem Vegetation Plot Results

Plot	Planted Stems/Acre				
	Year 1 (2010)	Year 2 (2011)	Year 3 (2012)	Year 4 (2013)	Year 5 (2014)
1	890	1053	1053		
2	971	972	972		
3	850	1012	1012		
4	1012	1053	1053		
5	931	1012	1012		
6	850	850	850		
7	1012	972	972		
8	688	769	810		
9	850	850	891		
10	1012	1053	1012		
11	931	1093	1134		
12	850	810	810		
13	728	729	729		
14	890	891	931		
15	850	850	891		
16	728	729	607		
17	931	850	850		
18	728	729	810		
19	728	648	729		
20	1052	1012	1053		
21	1052	1053	1053		
22	931	931	931		
23	1012	972	972		
24	971	972	972		
25	486	445	445		
26	486	486	486		
27	486	486	486		
28	445	445	445		
29	607	567	567		
Average Plots 1-29	**826**	**837**	**846**		

4.0 REFERENCES

Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2006. CVS-EEP Protocol for Recording Vegetation. Version 4.0. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, North Carolina.

North Carolina Division of Water Quality (NCDWQ). 2007. Redbook, Surface Waters and Wetlands Standards. North Carolina Department of Environment and Natural Resources, Division of Water Quality. Raleigh, North Carolina.

North Carolina Division of Water Quality (NCDWQ). 2008a. Draft North Carolina Water Quality Assessment and Impaired Waters List (2008 Integrated 305(b) and 303(d) Report) (online). Available: http://h2o.enr.state.nc.us/tmdl/documents/B.Draft2008303dList.pdf [November 10, 2008]. North Carolina Department of Environment and Natural Resources, Raleigh, North Carolina.

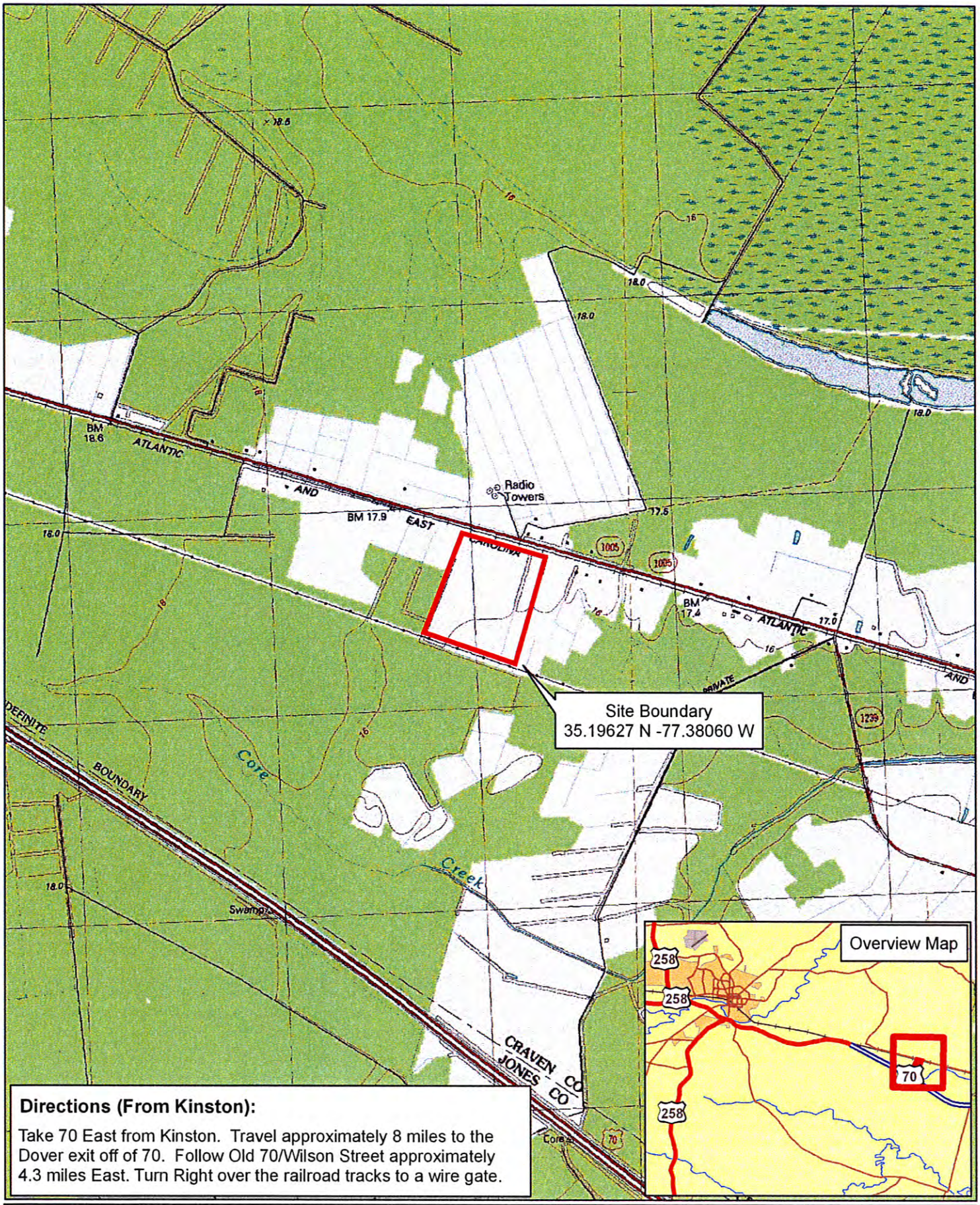
North Carolina Division of Water Quality (NCDWQ). 2008b. Draft Basinwide Planning Program: Neuse River Basinwide Water Quality Plan-June 2008. North Carolina Department of Environment and Natural Resources, Division of Water Quality. Raleigh, North Carolina.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, North Carolina Department of Environment, Health, and Natural Resources. Raleigh, North Carolina.

United States Geological Survey (USGS). 1974. Hydrologic Unit Map - 1974. State of North Carolina.

Appendix A.
Figures

Figure 1. Site Location
Figure 2. Monitoring Plan View



Directions (From Kinston):

Take 70 East from Kinston. Travel approximately 8 miles to the Dover exit off of 70. Follow Old 70/Wilson Street approximately 4.3 miles East. Turn Right over the railroad tracks to a wire gate.

Restoration Systems, LLC
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Figure 1: Site Location

Heath Riparian Buffer Mitigation Site
Craven County, NC

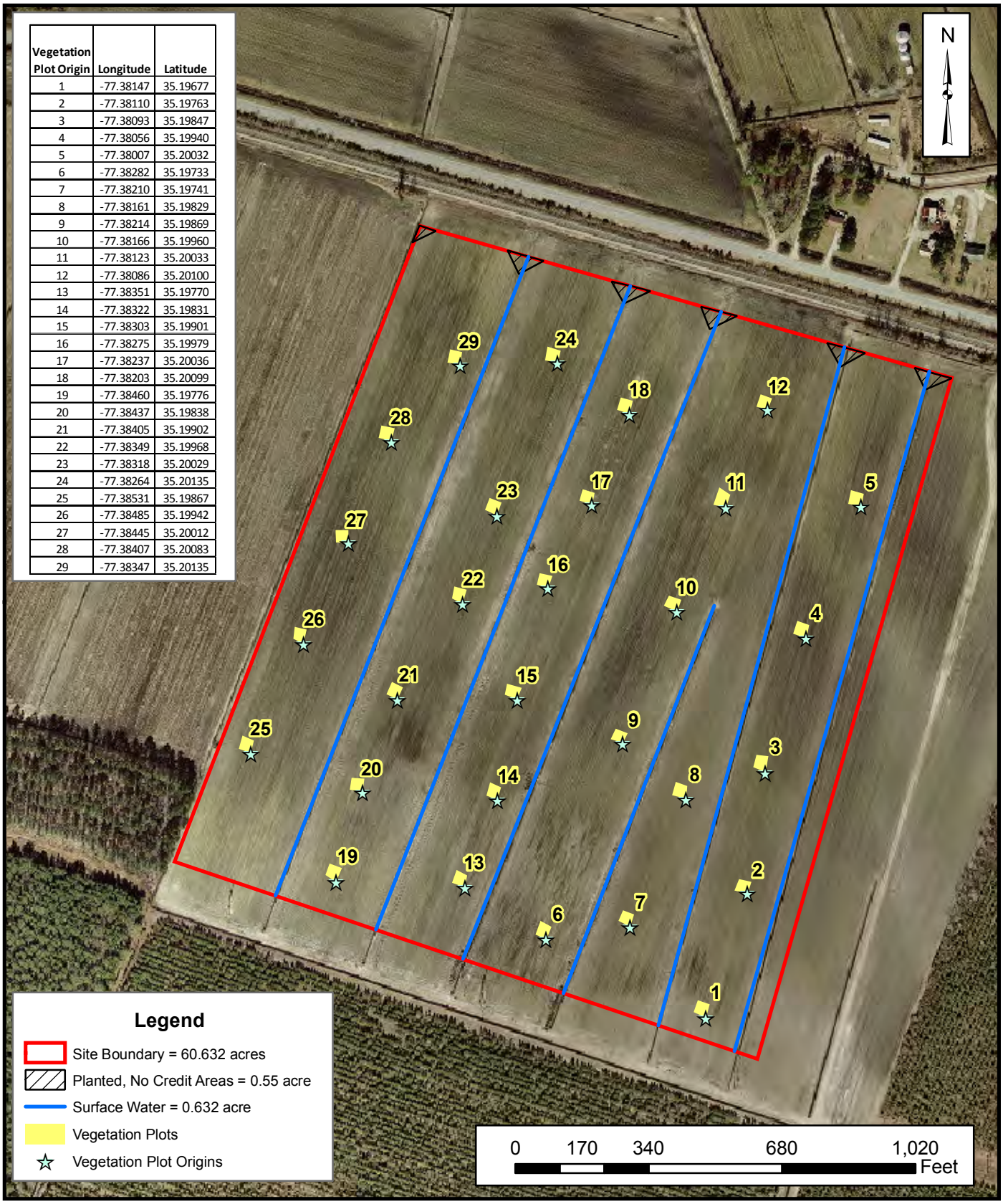
1:24,000

N

0 470 940 1,880 2,820 3,760

Feet

Vegetation Plot Origin	Longitude	Latitude
1	-77.38147	35.19677
2	-77.38110	35.19763
3	-77.38093	35.19847
4	-77.38056	35.19940
5	-77.38007	35.20032
6	-77.38282	35.19733
7	-77.38210	35.19741
8	-77.38161	35.19829
9	-77.38214	35.19869
10	-77.38166	35.19960
11	-77.38123	35.20033
12	-77.38086	35.20100
13	-77.38351	35.19770
14	-77.38322	35.19831
15	-77.38303	35.19901
16	-77.38275	35.19979
17	-77.38237	35.20036
18	-77.38203	35.20099
19	-77.38460	35.19776
20	-77.38437	35.19838
21	-77.38405	35.19902
22	-77.38349	35.19968
23	-77.38318	35.20029
24	-77.38264	35.20135
25	-77.38531	35.19867
26	-77.38485	35.19942
27	-77.38445	35.20012
28	-77.38407	35.20083
29	-77.38347	35.20135



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MONITORING PLAN VIEW
HEATH
RIPARIAN BUFFER MITIGATION SITE
Craven County, North Carolina

Dwn. by: CLF

Date: Aug 2010

Project: 10-001

FIGURE 2

Appendix B.
General Tables

Table 1. Site Restoration Structures and Objectives
Table 2. Project Activity and Reporting History
Table 3. Project Contacts Table
Table 4. Project Attributes Table

Table 1. Site Restoration Structures and Objectives

Component Summation	
Restoration Level	Riparian buffer mitigation was completed by planting the entire 60-acre Site with native forest vegetation; credit was received for 59.45 acres of the Site.
Riparian Buffer Restoration	
59.45 Buffer Mitigation Units	

Table 2. Project Activity and Reporting History

Activity or Report	Data Collection Complete	Completion or Delivery
Final Restoration Plan	--	April 2010
Site Planting	--	Late winter/early spring 2010
Mitigation Plan	April 2010	August 2010
Year 1 Monitoring	September 2010	October 2010
Year 2 Monitoring	August 2011	August 2011
Year 3 Monitoring	June 2012	June 2012

Table 3. Project Contacts Table

Designer	Restoration Systems, LLC 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604 (919) 755-9490
Planting Contractor	Carolina Silvics 908 Indian Trail Road Edenton, North Carolina 27932 Dwight McKinney (252) 482-8491
Monitoring Performer	Axiom Environmental, Inc. 218 Snow Avenue Raleigh, North Carolina 27603 Grant Lewis (919) 215-1693

Table 4. Project Attribute Table

Project County	Craven County, North Carolina
Physiographic Region	Coastal Plain
Ecoregion	Carolina Flatwoods and Mid-Atlantic Floodplains/Low Terrace
Project River Basin	Neuse
USGS 14-digit HUC	03020202080010
NCDWQ Subbasin	03-04-08
Within EEP Watershed Plan Extent?	Yes-Targeted Local Watershed
WRC Class	Warm
% of project easement fenced	0 %
Beaver activity observed during design phase	No

Appendix C.
Vegetation Data

Table 5. Planted Woody Species
Vegetation Survey Data Tables
Vegetation Monitoring Plot Photographs

Table 5. Planted Woody Vegetation

Species	Quantity
American elm (*Ulmus americana*)	6300
Black gum (*Nyssa sylvatica*)	3200
Green ash (*Fraxinus pennsylvanica*)	9500
Ironwood (*Carpinus caroliniana*)	3200
Mockernut hickory (*Carya tomentosa*)	6300
Sugarberry (*Celtis laevigata*)	3200
Swamp chestnut oak (*Quercus michauxii*)	9500
Sweetbay magnolia (*Magnolia virginiana*)	3200
Water oak (*Quercus nigra*)	6300
Willow oak (*Quercus phellos*)	9500
TOTAL	**60,200**

CVS Database Output

Living planted stems, excluding live stakes, per acre: Negative (red) numbers indicate the project failed to reach requirements in a particular year.

Project Code	Project Name	River Basin	Year 1	Year 2	Year 3
Heath	Heath	Neuse	826.12	838.68	847.05

Total stems, including planted stems of all kinds (including live stakes) and natural/volunteer stems:

Project Code	Project Name	River Basin	Year 1	Year 2	Year 3
Heath	Heath	Neuse	909.8449629	1024.273317	1327.089816

Vigor

Vigor	Count	Percent
0	1	0.2
2	19	3
3	255	40.9
4	333	53.5
Missing	15	2.4

Damage

Damage	Count	Percent Of Stems
(no damage)	521	83.6
Deer	78	12.5
Diseased	12	1.9
Unknown	5	0.8
Insects	5	0.8
Human Trampled	1	0.2
(other damage)	1	0.2

Vigor by Species

Species	CommonName	4	3	2	1	0	Missing	Unknown
Carya ovata	shagbark hickory		1					
Celtis laevigata	sugarberry	3	6	1				
Fraxinus pennsylvanica	green ash	49	50	5			3	
Nyssa sylvatica	blackgum	10	34	1		1	3	
Persea palustris	swamp bay	1						
Quercus michauxii	swamp chestnut oak	83	54	6			1	
Quercus nigra	water oak	53	13				2	
Quercus phellos	willow oak	78	28				1	
Carpinus caroliniana	American hornbeam	23	3					
Quercus	oak	11	3				2	
Quercus rubra	northern red oak		1					
Carya	hickory		8					
Magnolia virginiana	sweetbay	6	3	1			2	
Nyssa	tupelo		2	3				
Platanus occidentalis	American sycamore	1						
Ulmus	elm		6					
Ulmus americana	American elm	14	43	2			1	
Unknown		1						
18	**17**	**333**	**255**	**19**		**1**	**15**	

Damage by Species

Species	CommonName	Count of Damage Categories	(no damage)	Deer	Diseased	Human Trampled	Insects	Unknown	(other damage)
Carpinus caroliniana	American hornbeam	1	25	1					
Carya	hickory	0	8						
Carya ovata	shagbark hickory	0	1						
Celtis laevigata	sugarberry	3	7	2				1	
Fraxinus pennsylvanica	green ash	37	70	37					
Magnolia virginiana	sweetbay	1	11			1			
Nyssa	tupelo	2	3	2					
Nyssa sylvatica	blackgum	8	41	7				1	
Persea palustris	swamp bay	0	1						
Platanus occidentalis	American sycamore	0	1						
Quercus	oak	0	16						
Quercus michauxii	swamp chestnut oak	23	121	4	12		5	1	1
Quercus nigra	water oak	1	67	1					
Quercus phellos	willow oak	4	103	4					
Quercus rubra	northern red oak	0	1						
Ulmus	elm	0	6						
Ulmus americana	American elm	22	38	20				2	
Unknown		0	1						
18	**17**	**102**	**521**	**78**	**12**	**1**	**5**	**5**	**1**

Damage by Plot

plot	Count of Damage Categories	(no damage)	Deer	Diseased	Human Trampled	Insects	Unknown	(other damage)
Heath-AXE-0001-year:3	4	22	2			1	1	
Heath-AXE-0002-year:3	1	24	1					
Heath-AXE-0003-year:3	6	19	3	2			1	
Heath-AXE-0004-year:3	2	24	1		1			
Heath-AXE-0005-year:3	3	23		3				
Heath-AXE-0006-year:3	0	22						
Heath-AXE-0007-year:3	0	26						
Heath-AXE-0008-year:3	4	16	4					
Heath-AXE-0009-year:3	3	20	3					
Heath-AXE-0010-year:3	2	25	2					
Heath-AXE-0011-year:3	1	27		1				
Heath-AXE-0012-year:3	3	17	2				1	
Heath-AXE-0013-year:3	4	14	4					
Heath-AXE-0014-year:3	0	23						
Heath-AXE-0015-year:3	5	17	1	1		1	1	1
Heath-AXE-0016-year:3	2	16	2					
Heath-AXE-0017-year:3	9	13	9					
Heath-AXE-0018-year:3	4	16	4					
Heath-AXE-0019-year:3	8	10	5	1		2		
Heath-AXE-0020-year:3	9	17	9					
Heath-AXE-0021-year:3	5	21	5					
Heath-AXE-0022-year:3	7	16	6			1		
Heath-AXE-0023-year:3	5	22	2	2			1	
Heath-AXE-0024-year:3	2	23		2				
Heath-AXE-0025-year:3	2	9	2					
Heath-AXE-0026-year:3	1	11	1					
Heath-AXE-0027-year:3	4	8	4					
Heath-AXE-0028-year:3	5	6	5					
Heath-AXE-0029-year:3	1	14	1					
29	**102**	**521**	**78**	**12**	**1**	**5**	**5**	**1**

Plot Information

Plot	Plot Level	Year	Planted Living Stems	Planted Living Stems EXCLUDING Live Stakes	Dead/Missing Stems	Natural (Volunteer) Stems	Total Living Stems	Total Living Stems EXCLUDING Live Stakes	Planted Living Stems per ACRE	Planted Living Stems EXCLUDING Live Stakes PER ACRE	Natural (Volunteer) Stems PER ACRE	Total Living Stems PER ACRE	Total Living Stems EXCLUDING Live Stakes PER ACRE	# species
0001	2	3	26	26	0	18	44	44	1052	1052	728	1781	1781	7
0002	2	3	24	24	1	32	56	56	971	971	1295	2266	2266	7
0003	2	3	25	25	0	10	35	35	1012	1012	405	1416	1416	6
0004	2	3	26	26	0	9	35	35	1052	1052	364	1416	1416	7
0005	2	3	25	25	1	22	47	47	1012	1012	890	1902	1902	5
0006	2	3	21	21	1	23	44	44	850	850	931	1781	1781	7
0007	2	3	24	24	2	23	47	47	971	971	931	1902	1902	10
0008	2	3	20	20	0	12	32	32	809	809	486	1295	1295	7
0009	2	3	22	22	1	12	34	34	890	890	486	1376	1376	7
0010	2	3	26	26	1	23	49	49	1052	1052	931	1983	1983	5
0011	2	3	28	28	0	6	34	34	1133	1133	243	1376	1376	4
0012	2	3	20	20	0	10	30	30	809	809	405	1214	1214	7
0013	2	3	18	18	0	24	42	42	728	728	971	1700	1700	6
0014	2	3	23	23	0	15	38	38	931	931	607	1538	1538	6
0015	2	3	22	22	0	7	29	29	890	890	283	1174	1174	7
0016	2	3	15	15	3	2	17	17	607	607	81	688	688	5
0017	2	3	21	21	1	2	23	23	850	850	81	931	931	6
0018	2	3	20	20	0	3	23	23	809	809	121	931	931	6
0019	2	3	18	18	0	20	38	38	728	728	809	1538	1538	5
0020	2	3	26	26	0	16	42	42	1052	1052	647	1700	1700	7
0021	2	3	26	26	0	13	39	39	1052	1052	526	1578	1578	5
0023	2	3	23	23	0	2	25	25	931	931	81	1012	1012	7
0023	2	3	24	24	3	1	25	25	971	971	40	1012	1012	6

Plot Information (continued)

Plot	Plot Level	Year	Planted Living Stems	Planted Living Stems EXCLUDING Live Stakes	Dead/Missing Stems	Natural (Volunteer) Stems	Total Living Stems	Total Living Stems EXCLUDING Live Stakes	Planted Living Stems per ACRE	Planted Living Stems EXCLUDING Live Stakes PER ACRE	Natural (Volunteer) Stems PER ACRE	Total Living Stems PER ACRE	Total Living Stems EXCLUDING Live Stakes PER ACRE	# species
0024	2	3	24	24	1	5	29	29	971	971	202	1174	1174	6
0025	2	3	11	11	0	20	31	31	445	445	809	1255	1255	5
0026	2	3	12	12	0	5	17	17	486	486	202	688	688	4
0027	2	3	12	12	0	6	18	18	486	486	243	728	728	6
0028	2	3	11	11	0	3	14	14	445	445	121	567	567	3
0029	2	3	14	14	1	0	14	14	567	567	0	567	567	7

Heath 2012 (Year 3) Total Planted Stems (No Livestakes) by Plot and Species

Type	Species	CommonName	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
tree	***Carpinus caroliniana***	**American hornbeam**	2	8		1	4	3	2		1		2	2																	1
tree	***Carya***	**hickory**						1	1	1	2						2					1									
tree	***Carya ovata***	**shagbark hickory**							1																						
tree	***Celtis laevigata***	**sugarberry**					1			4				1	1		3														
tree	***Fraxinus pennsylvanica***	**green ash**		2	3	5	1	2	4	2	7	5		2	3	1		1	4	4	5	3	11	8	10	2	4	2	5	5	3
tree	***Magnolia virginiana***	**sweetbay**	1	2		2	1											1						1			1				1
tree	***Nyssa***	**tupelo**							1										4												
tree	***Nyssa sylvatica***	**blackgum**			2			3	1	6	5	9	6	3			3		3	4											
tree	***Persea palustris***	**swamp bay**																				1									
tree	***Platanus occidentalis***	**American sycamore**						1																							
tree	***Quercus***	**oak**	1			1			1							2		1	1	1				1	1	1			1		2
tree	***Quercus michauxii***	**swamp chestnut oak**	11	6	8	8	18	4	1	2	2	2	3	3	2	4	9	10	3	6	9	3	3	4	7	13	1		1		
tree	***Quercus nigra***	**water oak**	3	3					10	3	1			2			1		6	1	1	6	5	5	3	5	2	3	1	4	1
tree	***Quercus phellos***	**willow oak**	3	1	7	3		7	2	2	4	9	17	7	4	11	3	2		4	1	2	3	2	1	2		3	1		5
tree	***Quercus rubra***	**northern red oak**															1														
tree	***Ulmus***	**elm**			2										1	3															
tree	***Ulmus americana***	**American elm**	5	2	3	6									7	2					2	10	4	2	2	1	3	4	3	2	1
unknown	Unknown											1																			
Totals		**Stem count**	26	24	25	26	25	21	24	20	22	26	28	20	18	23	22	15	21	20	18	26	26	23	24	24	11	12	12	11	14
		Species count	7	7	6	7	5	7	10	7	7	5	4	7	6	6	7	5	6	6	5	7	5	7	6	6	5	4	6	3	7
		Stems per ACRE	1053	972	1012	1053	1012	850	972	810	891	1053	1134	810	729	931	891	607	850	810	729	1053	1053	931	972	972	445	486	486	445	567
Riparian Buffer Success Criteria		**Stem count**	26	24	25	26	25	21	24	20	22	25	28	20	18	23	22	15	21	20	18	26	26	23	24	24	11	12	12	11	14
		Species count	7	7	6	7	5	7	10	7	7	4	4	7	6	6	7	5	6	6	5	7	5	7	6	6	5	4	6	3	7
		Stems per ACRE	1053	972	1012	1053	1012	850	972	810	891	1012	1134	810	729	931	891	607	850	810	729	1053	1053	931	972	972	445	486	486	445	567

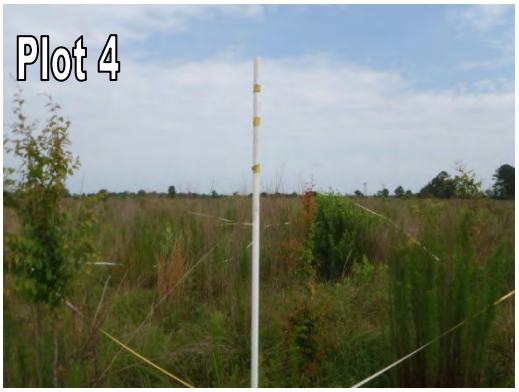
***Bolded** hardwood tree species are counted toward riparian buffer success criteria.

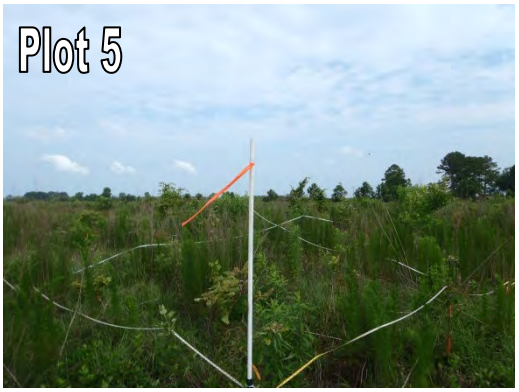
Heath 2012 (Year 3) Total Stems Planted and Natural Recruit by Plot and Species

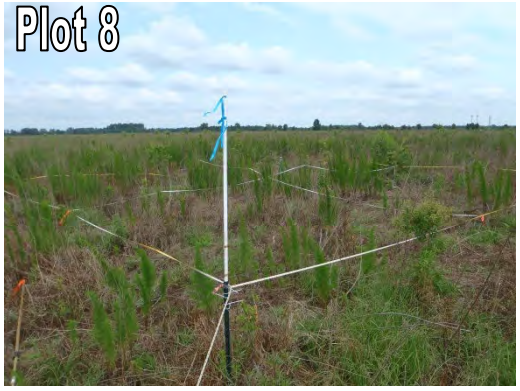
Type	Species	CommonName	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
tree	**Acer rubrum**	**red maple**		1		1		1		1													1				3	1			
tree	Albizia julibrissin	silktree										15																			
shrub	Baccharis halimifolia	eastern baccharis	10	3	8	8	13	19	22	9	9	8	6	5	19	7	3	2	2	3	2	9	11	1		5	2	2	3	3	
tree	**Carpinus caroliniana**	**American hornbeam**	2	8		1	4	3	2		1		2	2																	1
tree	**Carya**	**hickory**			1			1	1	1	2						2					1								
tree	**Carya ovata**	**shagbark hickory**							1																						
tree	**Celtis laevigata**	**sugarberry**					1			4				1	1		3														
tree	**Fraxinus pennsylvanica**	**green ash**		2	3	5	1	2	4	2	7	5		2	3	1		1	4	4	5	3	11	8	10	2	4	2	5	5	3
shrub	Ilex	holly					1																								
shrub	Ilex opaca	American holly												1		1															
tree	**Liquidambar styraciflua**	**sweetgum**	1											1		4					6										
tree	**Magnolia virginiana**	**sweetbay**	1	2		2	1											1						1			1				1
tree	**Nyssa**	**tupelo**							1										4												
tree	**Nyssa sylvatica**	**blackgum**			2			3	2	6	5	9	6	3			3		3	4											
tree	**Persea palustris**	**swamp bay**																				1									
tree	Pinus taeda	loblolly pine	7		1		1	3		2	3			3	5	3	4				12	7	1	1	1		15	2	3		
tree	**Platanus occidentalis**	**American sycamore**						1																							
tree	**Prunus serotina**	**black cherry**					2																								
tree	**Quercus**	**oak**	1			1			1							2		1	1	1				1	1	1			1		2
tree	**Quercus michauxii**	**swamp chestnut oak**	11	6	8	8	18	4	1	2	2	2	3	3	2	4	9	10	3	6	9	3	3	4	7	13	1		1		
tree	**Quercus nigra**	**water oak**	3	3					10	3	1			2			1		6	1	1	6	5	5	3	5	2	3	1	4	1
tree	**Quercus phellos**	**willow oak**	3	1	7	3		7	2	2	4	9	17	7	4	11	3	2		4	1	2	3	2	1	2		3	1		5
tree	**Quercus rubra**	**northern red oak**															1														
shrub	Rhus copallinum	flameleaf sumac		28			5		1																						
tree	**Ulmus**	**elm**			2										1	3															
tree	**Ulmus americana**	**American elm**	5	2	3	6									7	2					2	10	4	2	2	1	3	4	3	2	1
unknown	Unknown											1																			
Totals		**Stem count**	44	56	35	35	47	44	48	32	34	49	34	30	42	38	29	17	23	23	38	42	39	25	25	29	31	17	18	14	14
		Species count	10	10	9	9	10	10	12	10	9	7	5	11	8	10	9	6	7	7	8	9	8	9	7	7	8	7	8	4	7
		Stems per ACRE	1781	2267	1417	1417	1903	1781	1943	1296	1377	1984	1377	1215	1700	1538	1174	688	931	931	1538	1700	1579	1012	1012	1174	1255	688	729	567	567
Riparian Buffer Success Criteria		**Stem count**	27	25	26	27	27	22	25	21	22	25	28	21	18	27	22	15	21	20	24	26	27	23	24	24	14	13	12	11	14
		Species count	8	8	7	8	6	8	10	8	7	4	4	8	6	7	7	5	6	6	6	7	6	7	6	6	6	5	6	3	7
		Stems per ACRE	1093	1012	1053	1093	1093	891	1012	850	891	1012	1134	850	729	1093	891	607	850	810	972	1053	1093	931	972	972	567	526	486	445	567

***Bolded** hardwood tree species are counted toward riparian buffer success criteria.

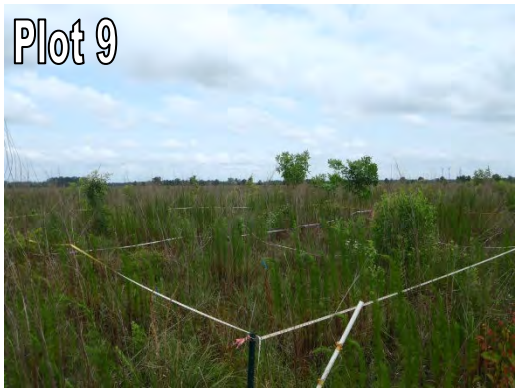
Heath
Year 3 (2012)
Vegetation Monitoring Plot Photos
Taken June 2012







Heath
Year 3 (2012)
Vegetation Monitoring Plot Photos
Taken June 2012
(continued)



Heath
Year 3 (2012)
Vegetation Monitoring Plot Photos
Taken June 2012
(continued)

Plot 17

Plot 18

No photo available

Plot 19

Plot 20

Plot 21

Plot 22

Plot 23

Plot 24

Heath
Year 3 (2012)
Vegetation Monitoring Plot Photos
Taken June 2012
(continued)