YEAR 2 (2015) ANNUAL MONITORING REPORT

PEPPERWOOD FARM RIPARIAN BUFFER MITIGATION SITE

Wake County, North Carolina
DMS Project ID: 95713
Contract No. 004946, DWR Project No. 2013-1262

Data Collected August-October 2015

Prepared for:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

December 2015

Table of Contents

1.0 Executive Summary……1
2.0 Methodology……2
3.0 References……3

Appendices

Appendix A: Vicinity Map and Background Tables
Figure 1. Vicinity Map
Table 1. Project Components and Mitigation Credits Table
Table 2. Project Activity and Reporting History Table
Table 3. Project Contact Table
Table 4. Project Baseline Information and Attributes Table

Appendix B: Visual Assessment Data
Figure 2. Current Conditions Plan View
Table 5. Vegetation Condition Assessment
Vegetation Plot Photos
Fixed Photo Points

Appendix C: Vegetation Plot Data
Table 6. Vegetation Plot Criteria Attainment Based on Planted Stems
Table 7. CVS Vegetation Plot Metadata
Table 8. Total and Planted Stems by Plot and Species

1.0 Executive Summary

This Year 2 (2015) Annual Monitoring Report describes the Pepperwood Farm Riparian Buffer Mitigation Site (Site) and is designed specifically to assist in fulfilling the North Carolina Division of Mitigation Services (NCDMS) riparian buffer mitigation goals within the Neuse 03020201 Watershed. Completed project activities, reporting history, completion dates, project contacts, and project attributes are summarized in Tables 1-4 (Appendix A). This report (compiled based on the NC Division of Mitigation Services (NCDMS) *Procedural Guidance and Content Requirements for DMS Monitoring Reports* Version 1.5 dated 6/8/12) summarizes data for Year 2 (2015) monitoring.

The Site is located approximately 1 mile northeast of Willow Springs and 4 miles northeast of Fuquay-Varina, in Wake County, North Carolina (Figure 1, Appendix A). The project is situated within the Middle Creek watershed (United States Geological Society (USGS) 14-digit Hydrologic Cataloging Unit (HUC) 03020201120010 of the Neuse River Basin and North Carolina Division of Water Resource (NC DWR) Sub-basin 03-04-03). This sub-basin was identified by the 2010 Neuse River Basin Restoration Priorities (NC DWR) as a Targeted Local Watershed (TLW).

The Site encompasses 12.66 acres and is protected in perpetuity by three conservation easements recorded at the Wake County Register of Deeds on 11/25/2013. The Site protects five unnamed tributaries with direct hydrologic connection to Terrible Creek, DWR Stream Index Number 27-43-15-8-(2) and a Best Usage Classification of C, NSW. Prior to restoration activities, riparian areas were cleared of native forest vegetation, heavily degraded by livestock grazing and hoof shear, maintained for hay production, and subject to raw manure fertilization. Streams were straightened, routinely cleared, and subject to storm water runoff from boarding facilities.

The primary goal of this riparian buffer restoration project is to provide **10.70 Neuse River Riparian Buffer Units** (RBMU). The success of this goal is based on the following.

1. Removing nonpoint sources of pollution associated with agricultural activities including a) removal of horses from riparian areas; b) eliminating the application of fertilizer, pesticides, and other agricultural materials into and adjacent to streams; and c) establishing a vegetative buffer adjacent to streams to treat surface runoff, which may contain pollutants such as sediment and/or agricultural pollutants from the adjacent landscape.
2. Reducing sedimentation onsite and downstream by a) reducing bank erosion associated with vegetation maintenance and b) planting a diverse hardwood vegetative buffer adjacent to Site tributaries.
3. Stabilizing stream banks where necessary by sloping channel banks, and installing erosion control matting and livestakes.
4. Improving aquatic habitat by enhancing stream bed shading and natural detritus input.
5. Providing a terrestrial wildlife corridor and refuge in an area continually being developed for commercial and residential use.
6. Restoring and reestablishing natural community structure, habitat diversity, and functional continuity.
7. Protecting the Site's full potential of stream and riparian buffer functions and values in perpetuity.

Accomplishing this criterion is a multi-year process. Restoration activities outlined in the Pepperwood Farm Mitigation Plan were implemented during February and March of 2014. Activities included the installation of a shallow marsh treatment area, stabilization of stream banks, planting of riparian areas with bare root hardwood seedlings, removal of livestock from riparian areas, and protecting the Site in perpetuity with a conservation easement. Additionally, the Site has been surveyed and marked per NCDMS guidelines by a licensed NC surveyor.

Vegetation Success Criteria
Success of vegetation criteria at the Site indicates successful restoration of riparian areas adjacent to subject streams as well as improvement of overall water quality resulting from the treatment of runoff from agricultural fields. Success criteria are dependent upon the density and growth of planted tree species.

An average density of 320 stems per acre of planted species must be surviving after five monitoring years in accordance with NC Division of Water Resources Administrative Code 15A NCAC 02B.0242 (*Neuse River Basin: Nutrient Sensitive Waters Management Strategy*).

2.0 Methodology

Monitoring of vegetation restoration efforts will follow Level 2 *CVS-DMS Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008) and will be conducted between June 1 and October 30. Site monitoring will be conducted at thirteen (13) vegetation monitoring plots representing 3.6% of the 10.7 acres of restored buffer. Monitoring reports will be reported to the NC DMS annually for a minimum of 5 years or until success criteria are fulfilled. Monitoring parameters will include species composition and density. Visual observations to ascertain the degree of shrub and herbaceous species, including overtopping of seedlings will be documented with photos and included in the annual monitoring report (Appendix C).

Year 2 (2015) monitoring data was collected in July 2015 by Axiom Environmental, and established an average density of 445 planted stems per acre (excluding livestakes) on Site with all CVS monitoring plots exceeding success criteria based on planted stems except plot 4 (Appendix C). The dominant tree species identified at the Site included *Fraxinus pennsylvanica, Liquidambar styraciflua, Liriodendron tulipifera, Ulmus americana, Quercus michauxii,* and *Quercus pagoda*. In summary, the Site is in compliance with success criteria for vegetation in Monitoring Year 2 (2015).

3.0 References

Griffith, G.E., J.M. Omernik, J.A. Comstock, M.P. Schafale, W.H. McNab, D.R. Lenat, T.F. MacPherson, J.B. Glover, and V.B. Shelbourne. 2002. Ecoregions of North Carolina and South Carolina. U.S. Geological Survey, Reston, Virginia.

Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-DMS Protocol for Recording Vegetation. Version 4.2. North Carolina Department of Environmental Quality, Division of Mitigation Services. Raleigh, North Carolina.

North Carolina Division of Water Resources (NCDWR). 2014. Final North Carolina Water Quality Assessment and Impaired Waters List (2014 303(d) Report) (online). Available: http://portal.ncdenr.org/web/wq/ps/mtu/assessment [March 2014]. North Carolina Department of Environmental Quality, Raleigh, North Carolina.

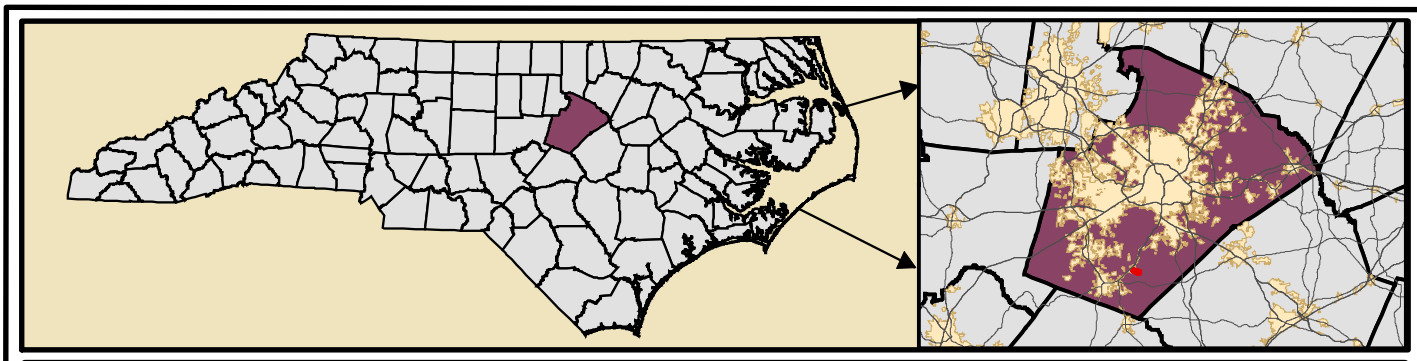
North Carolina Division of Water Resources (NCDWR). 2010. Final North Carolina Water Quality Assessment and Impaired Waters List (2010 Integrated 305(b) and 303(d) Report) (online). Available: http://h2o.enr.state.nc.us/tmdl/documents/draft_2010_Cat_5.pdf [February 1, 2011]. North Carolina Department of Environmental Quality, Raleigh, North Carolina.

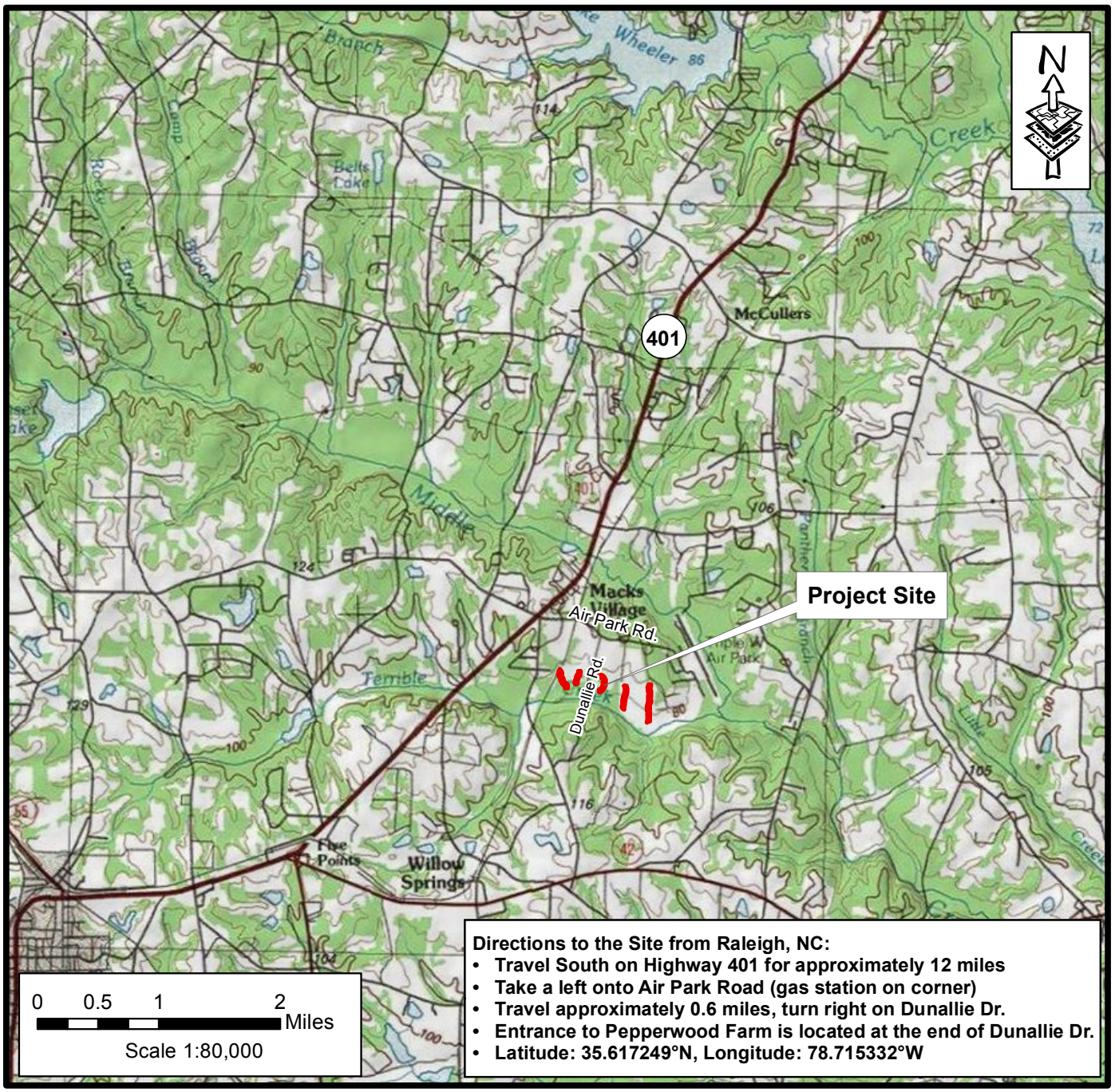
North Carolina Division of Water Resources (NCDWR). 2010. River Restoration Priorities Executive Summary (online). Available: http://portal.ncdenr.org/c/document_library/get_file?uuid=665be84c-cf93-477b-918c-1993778ef11f&groupId=60329 [March 2014]. North Carolina Department of Environmental Quality, 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 Environmental Quality. Raleigh, North Carolina.

Appendix A: Vicinity Map and Background Tables

Figure 1. Vicinity Map
Table 1. Project Components and Mitigation Credits Table
Table 2. Project Activity and Reporting History Table
Table 3. Project Contact Table
Table 4. Project Baseline Information and Attributes Table





Directions to the Site from Raleigh, NC:

- **Travel South on Highway 401 for approximately 12 miles**
- **Take a left onto Air Park Road (gas station on corner)**
- **Travel approximately 0.6 miles, turn right on Dunallie Dr.**
- **Entrance to Pepperwood Farm is located at the end of Dunallie Dr.**
- **Latitude: 35.617249°N, Longitude: 78.715332°W**

Prepared by:	Prepared for:	VICINITY MAP PEPPERWOOD FARM RIPARIAN BUFFER MITIGATION SITE Wake County, North Carolina	Dwn. By: KRJ Date: Oct 2014 Project: 10-001	FIGURE 1

Axiom Environmental, Inc.

RESTORATION SYSTEMS | LLC

Table 1: Project Components and Mitigation Credits
Pepperwood Farm Riparian Buffer Mitigation Site, Wake County NC DMS Project ID 95713

Mitigation Credits				
Neuse Riparian Buffer				
Existing Acreage	**Restoration/ Mit. Ratio**	**Restoration Acreage**	**Mitigation / Acre**	**Comment**
.30	n/a	n/a	n/a	Existing forested area – excluded from credit determination
10.70	Restoration (1:1)	10.70	43,560 sq. ft. / acre	Cessation of current land use practices, removing invasive species, and planting with native forest vegetation.

Component Summation	
Restoration Level	**Neuse Riparian Buffer Credits (sq. ft.)**
Restoration	10.70 acres = 466,092 sq. ft.
Totals	10.70 acres = 466,092 sq. ft.

Table 2: Project Activity and Reporting History
Pepperwood Farm Riparian Buffer Mitigation Site, Wake County NC DMS Project ID 95713

Activity or Report	Data Collection Complete	Completion or Delivery
CE Document	NA	August 13th, 2013
Conservation Easement	NA	November 25th, 2013
Mitigation Plan	NA	January 30th, 2014
Earthwork	NA	March 5th, 2014
Bare Root Planting	NA	March 13th, 2014
Baseline Monitoring Document	March 2014	May 5th, 2014
Year 1 (2014) Annual Monitoring Report	October 2014	October 20th, 2014
Year 2 (2015) Annual Monitoring Report	October 2015	December 2015

Table 3: Project Contact Table
Pepperwood Farm Riparian Buffer Mitigation Site, Wake County NC DMS Project ID 95713

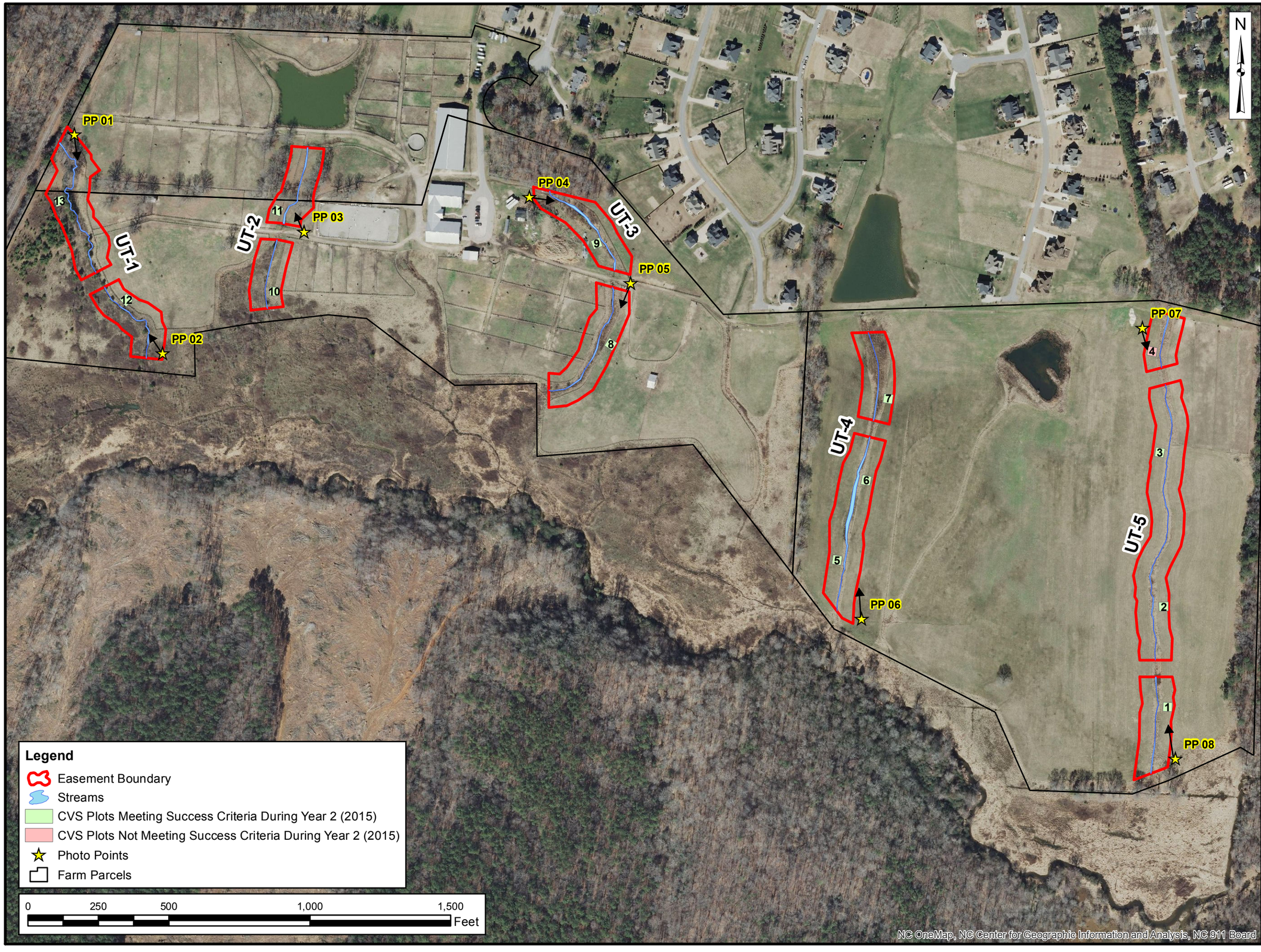
	Firm	POC & Address
Full Delivery Provider	Restoration Systems, LLC	1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604 George Howard and John Preyer 919.755.9490
Designer:	Restoration Systems, LLC	Raymond Holz: 919.755.9490 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604
Earthwork Contractor:	Land Mechanics, Inc.	Lloyd Glover; 919.422.3392 780 Landmark Road Willow Spring, NC 27592-7756
Planting Contractor:	Carolina Silvics	Mary-Margaret McKinney 252.333.9852 908 Indian Trail Road Edenton, NC 27932
Seeding Contractor:	Land Mechanics, Inc.	Lloyd Glover; 919.422.3392 780 Landmark Road Willow Spring, NC 27592-7756
Nursery Stock Suppliers:	ArborGen	1.888.888.7158
Baseline Data Collection	Axiom Environmental, Inc.	Grant Lewis; 919.215.1693 218 Snow Ave. Raleigh, NC 27603
Vegetation Monitoring:	Axiom Environmental, Inc.	Grant Lewis; 919.215.1693 218 Snow Ave. Raleigh, NC 27603

Table 4: Project Baseline Information & Attributes Table
Pepperwood Farm Riparian Buffer Mitigation Site, Wake County NC DMS Project ID 95713

Project Information			
Project Name	Pepperwood Farm		
County	Wake		
Project Area (acres)	12.66		
Project Coordinates (latitude and longitude)	35.617249ºN, -78.715332ºW (NAD83/WGS84)		
Project Watershed Summary Information			
Physiographic Province	Northern Outer Piedmont		
River Basin	Neuse		
USGS Hydrologic Unit 8-digit	3020201	USGS Hydrologic Unit14-digit	3020201120010
DWR Sub-basin	3/4/2003		
Project Drainage Area, Total Outfall (acres)	285.45		
Project Drainage Area Percentage of Impervious Area	> 5%		
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States – Section 404	No		
Waters of the United States – Section 401	No		
Endangered Species Act	No		
Historic Preservation Act	No		
Coastal Zone Management Act [CZMA/Coastal Area Management Act (CAMA)]	No		
FEMA Floodplain Compliance	No		
Essential Fisheries Habitat	No		

Appendix B: Visual Assessment Data

Figure 2. Current Conditions Plan View
Table 5. Vegetation Condition Assessment
Vegetation Plot Photos
Fixed Photo Points



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

PEPPERWOOD FARM

RIPARIAN BUFFER MITIGATION SITE

Wake County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Notes:

1. Background imagery source: 2013 CGIA orthoimagery

Drawn by:	KRJ
Date:	Dec 2015
Scale:	As shown
Project No.:	10-001

FIGURE

2

Pepperwood

Table 5 Vegetation Condition Assessment

Planted Acreage[1] **10.7**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of planted woody and herbaceous material on stream banks	0.1 acres	N/A	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on visual observations and MY2 stem count criteria.	0.1 acres	N/A	0	0.00	0.0%
			Total		0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	N/A	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%

Easement Acreage[2] **12.66**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	Presence of invasives species	1000 SF	N/A	0	0.00	0.0%
5. Easement Encroachment Areas[3]	Encroachment	none	N/A	0	0.00	0.0%

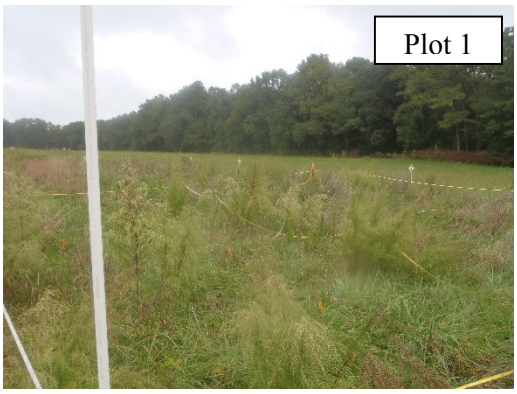
1 = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

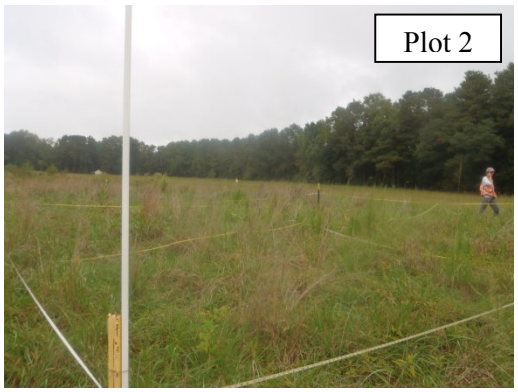
2 = The acreage within the easement boundaries.

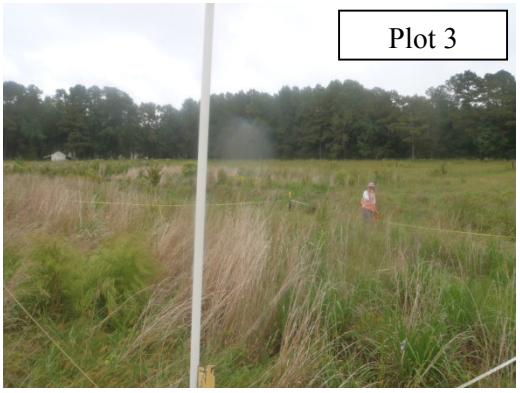
3 = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1,2 or 3) as well as a parallel tally in item 5.

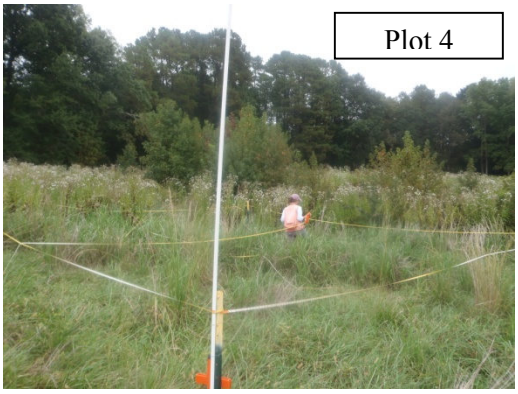
4 = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern spcies are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by DMS such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likley trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly ealry in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolzing invasives polygons, particulalry for situations where the conditon for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

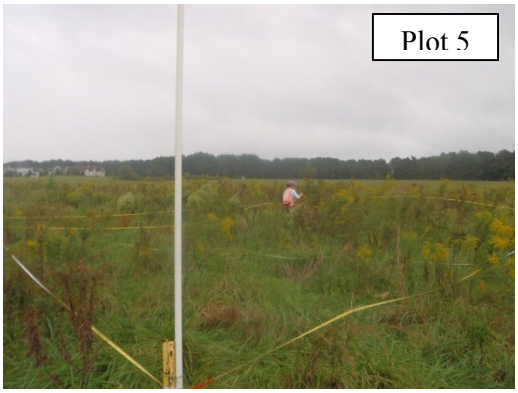
Pepperwood Farm
Vegetation Monitoring Photographs
Taken October 2015

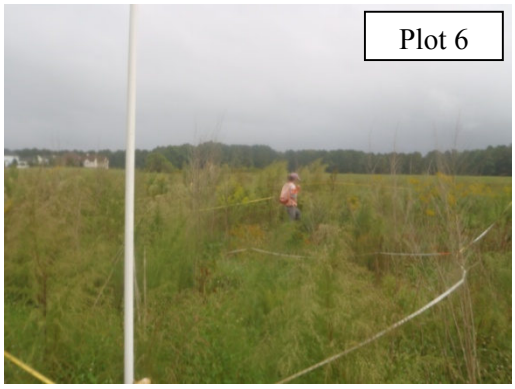


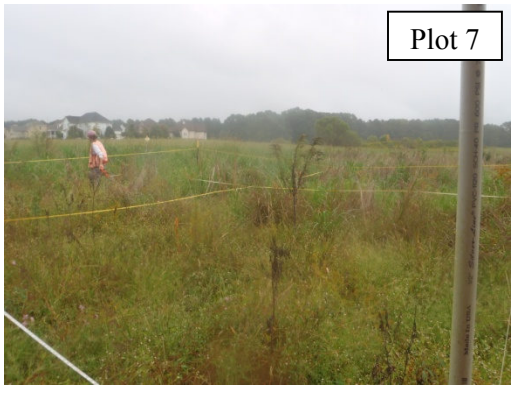




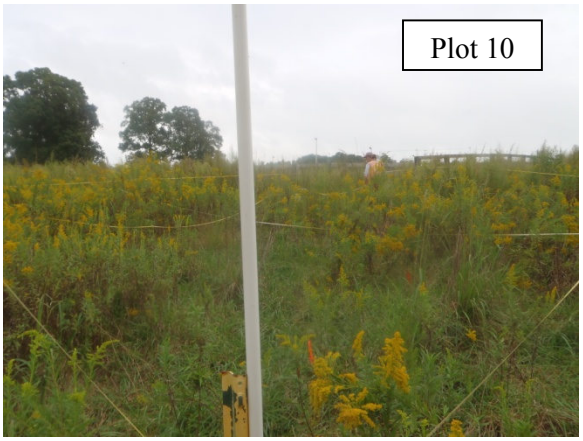


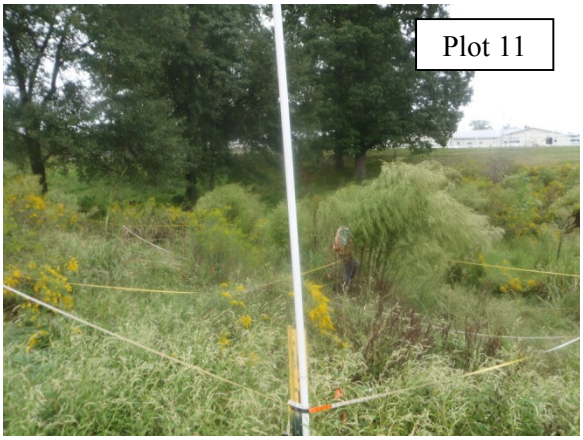


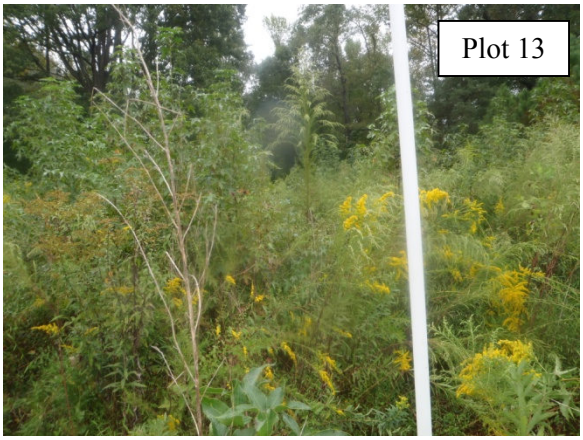




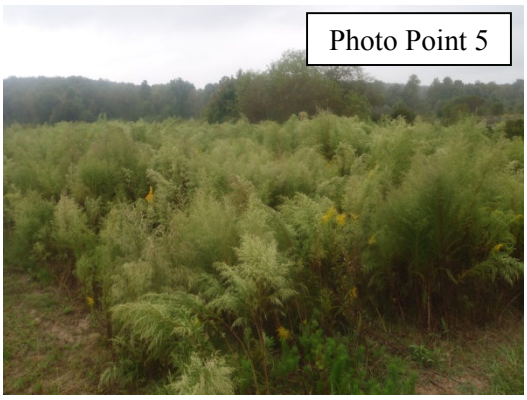
Pepperwood Farm
Vegetation Monitoring Photographs
Taken October 2015
(continued)







Pepperwood Farm
Fixed Photo Points
Taken October 2015



Appendix C: Vegetation Plot Data

Table 6. Vegetation Plot Criteria Attainment Based on Planted Stems
Table 7. CVS Vegetation Plot Metadata
Table 8. Total and Planted Stems by Plot and Species

Table 6. Vegetation Plot Criteria Attainment Based on Planted Stems
Pepperwood Farm Riparian Buffer Mitigation Site, Wake County NC DMS Project ID 95713

Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	92%
2	Yes	
3	Yes	
4	No	
5	Yes	
6	Yes	
7	Yes	
8	Yes	
9	Yes	
10	Yes	
11	Yes	
12	Yes	
13	Yes	

Table 7. CVS Vegetation Plot Metadata
Pepperwood Farm Riparian Buffer Mitigation Site, Wake County NC DMS Project ID 95713

Report Prepared By	Corri Faquin
Date Prepared	10/8/2015 14:33
database name	RS-Pepperwood-2015-A-v2.3.1.mdb
database location	S:\CVS database\2015
computer name	KEENAN-PC
file size	47423488
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	95713
project Name	Pepperwood
River basin	Neuse
Sampled Plots	13

Table 8. Planted and Total Stems by Plot and Species
DMS Project Code 95713. Project Name: Pepperwood

			Current Plot Data (MY2 2015)																						
			123-01-0001			123-01-0002			123-01-0003			123-01-0004			123-01-0005			123-01-0006			123-01-0007			123-01-0008		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree			1																				
Baccharis	baccharis	Shrub									1														
Baccharis halimifolia	eastern baccharis	Shrub																							
Betula nigra	river birch	Tree	1	1	1	1	1	1										1	1	9					
Carpinus caroliniana	American hornbeam	Tree													2	2	2								
Carya	hickory	Tree																							
Carya cordiformis	bitternut hickory	Tree										2	2	2											
Carya ovata	shagbark hickory	Tree																							
Celtis	hackberry	Tree																							
Celtis laevigata	sugarberry	Tree	1	1	1																				
Diospyros virginiana	common persimmon	Tree																		1					
DONTKNOW: unsure record																									
Fraxinus pennsylvanica	green ash	Tree	3	3	3	1	1	1	4	4	4	2	2	2	2	2	2	3	3	3					
Liquidambar styraciflua	sweetgum	Tree			1									2						2			4		
Liriodendron tulipifera	tuliptree	Tree	2	2	2	1	1	1	5	5	5	1	1	1	1	1	1								
Morella cerifera	wax myrtle	shrub																							
Platanus occidentalis	American sycamore	Tree																							
Prunus serotina	black cherry	Tree						2			1														
Quercus	oak	Tree							2	2	2														
Quercus michauxii	swamp chestnut oak	Tree	1	1	1	3	3	3	3	3	3	1	1	1				1	1	1					
Quercus pagoda	cherrybark oak	Tree	1	1	1										2	2	2	3	3	3	4	4	4	7	7	7
Quercus phellos	willow oak	Tree																						1	1	1
Ulmus alata	winged elm	Tree																		5					
Ulmus americana	American elm	Tree	3	3	3	5	5	5							3	3	3	5	5	7	6	6	6	1	1	1
	Stem count		12	12	14	11	11	13	14	14	16	6	6	8	10	10	10	13	13	31	10	10	14	9	9	9
	size (ares)		1			1			1			1			1			1			1			1		
	size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
	Species count		7	7	9	5	5	6	4	4	6	4	4	5	5	5	5	5	5	8	2	2	3	3	3	3
	Stems per ACRE		485.6	485.6	566.6	445.2	445.2	526.1	566.6	566.6	647.5	242.8	242.8	323.7	404.7	404.7	404.7	526.1	526.1	1255	404.7	404.7	566.6	364.2	364.2	364.2

Color for Density

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

PnoLS = Planted excluding livestakes

P-all = Planting including livestakes

T = All planted and natural recruits including livestakes

T includes natural recruits

Table 8. Planted and Total Stems by Plot and Species (continued)
DMS Project Code 95713. Project Name: Pepperwood

			Current Plot Data (MY2 2015)															Annual Means								
			123-01-0009			123-01-0010			123-01-0011			123-01-0012			123-01-0013			MY2 (2015)			MY1 (2014)			MY0 (2014)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree																		1			1			
Baccharis	baccharis	Shrub						3												4						
Baccharis halimifolia	eastern baccharis	Shrub															3			3			3			
Betula nigra	river birch	Tree																3	3	11	4	4	4	42	42	42
Carpinus caroliniana	American hornbeam	Tree	2	2	2	1	1	1	2	2	2							7	7	7	13	13	13	8	8	8
Carya	hickory	Tree																						5	5	5
Carya cordiformis	bitternut hickory	Tree				1	1	1										3	3	3	5	5	5	6	6	6
Carya ovata	shagbark hickory	Tree																						3	3	3
Celtis	hackberry	Tree																						1	1	1
Celtis laevigata	sugarberry	Tree	2	2	2				1	1	1	3	3	3	1	1	1	8	8	8	14	14	14	25	25	25
Diospyros virginiana	common persimmon	Tree						1						2						4			3			
DONTKNOW: unsure record																					1	1	1	3	3	3
Fraxinus pennsylvanica	green ash	Tree				2	2	2				3	3	3				20	20	20	19	19	19	23	23	23
Liquidambar styraciflua	sweetgum	Tree						2			2			1			70			84			116			
Liriodendron tulipifera	tuliptree	Tree							1	1	1						1	11	11	12	16	16	17	17	17	17
Morella cerifera	wax myrtle	shrub																					1			
Platanus occidentalis	American sycamore	Tree																						3	3	3
Prunus serotina	black cherry	Tree																		3			2			
Quercus	oak	Tree	1	1	1	2	2	2										5	5	5	9	9	9	24	24	24
Quercus michauxii	swamp chestnut oak	Tree				1	1	1	1	1	1	3	3	3	1	1	1	15	15	15	15	15	15	9	9	9
Quercus pagoda	cherrybark oak	Tree	1	1	1				2	2	2				5	5	5	25	25	25	21	21	21	16	16	16
Quercus phellos	willow oak	Tree																1	1	1	2	2	2	4	4	4
Ulmus alata	winged elm	Tree																		5			3	1	1	1
Ulmus americana	American elm	Tree	5	5	5	7	7	7	7	7	7	1	1	1	2	2	2	45	45	47	45	45	45	17	17	17
		Stem count	11	11	11	14	14	20	14	14	16	10	10	13	9	9	83	143	143	258	164	164	294	207	207	207
		size (ares)	1			1			1			1			1			13			13			13		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.32			0.32			0.32		
		Species count	5	5	5	6	6	9	6	6	7	4	4	6	4	4	7	11	11	18	12	12	19	17	17	17
		Stems per ACRE	445.2	445.2	445.2	566.6	566.6	809.4	566.6	566.6	647.5	404.7	404.7	526.1	364.2	364.2	3359	445.2	445.2	803.1	510.5	510.5	915.2	644.4	644.4	644.4

Color for Density
Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

PnoLS = Planted excluding livestakes
P-all = Planting including livestakes
T = All planted and natural recruits including livestakes
T includes natural recruits