MITIGATION PLAN
and AS-BUILT BASELINE REPORT

FOX RUN RIPARIAN BUFFER MITIGATION SITE
PITT COUNTY, NORTH CAROLINA
(EEP Contract No. 002281)

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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November 2010

EXECUTIVE SUMMARY

Restoration Systems, LLC has completed riparian buffer restoration at the Fox Run 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 43.72 Riparian Buffer Mitigation Units. The Site is located approximately 2.5 miles southeast of Farmville in western Pitt County. The Site is located in United States Geological Survey Hydrologic Unit and Targeted Local Watershed 03020203070030 (North Carolina Division of Water Quality Subbasin 03-04-07) of the Neuse River Basin. Site streams drain to Little Contentnea Creek (Stream Index 27-86-26), which is included on the draft 2008 and 2010 303(d) lists 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/planted on March 8, 2010. Planting of the entire 46.46-acre Site resulted in 43.72 Riparian Buffer Mitigation Units. The Site will be protected by a permanent conservation easement. Baseline measurements/evaluations indicate that Site vegetation compares favorably to plans as set forth in the detailed restoration plan.

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1.0 INTRODUCTION

1.1 Location and Setting

Restoration Systems, LLC has completed riparian buffer restoration at the Fox Run 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 43.72 Riparian Buffer Mitigation Units. The Site is located approximately 2.5 miles southeast of Farmville in western Pitt County (Figure 1, Appendix A). The Site is located in United States Geological Survey Hydrologic Unit and Targeted Local Watershed 03020203070030 (North Carolina Division of Water Quality Subbasin 03-04-07) of the Neuse River Basin (USGS 1974).

Directions to the Site from Farmville, North Carolina:

- Take Maye-Turnage Road east
- After passing Chinquapin Road the Site is ~ 2 miles ahead on left
- Site coordinates:
    - Latitude 35.5702°N, Longitude 77.54272°W (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 46.46-acre Site with native riparian vegetation. This resulted in 43.72 Riparian Buffer Mitigation Units (Table 1, Appendix B and Figure 2, Appendix A). Approximately 2.32 acres of the Site is surface water associated with Site ditches and 0.42 acres of the Site exist outside of the 200-foot buffer area or within areas of nondiffuse flow. 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 of 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-five 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.

3.0 SUCCESS CRITERIA

Characteristic Tree Species include woody tree and shrub species planted at the Site 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 throughout the site.

4.0 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.

5.0 BASELINE SAMPLING RESULTS

Quantitative sampling of vegetation was conducted in April, 2010. An average of 783 planted stems per acre was recorded within vegetation plots. In addition, stems counts within each individual plot were well-above the required 320 stems per acre and species diversity was good with 3-9 species per plot. Results are provided in Appendix C.

6.0 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.

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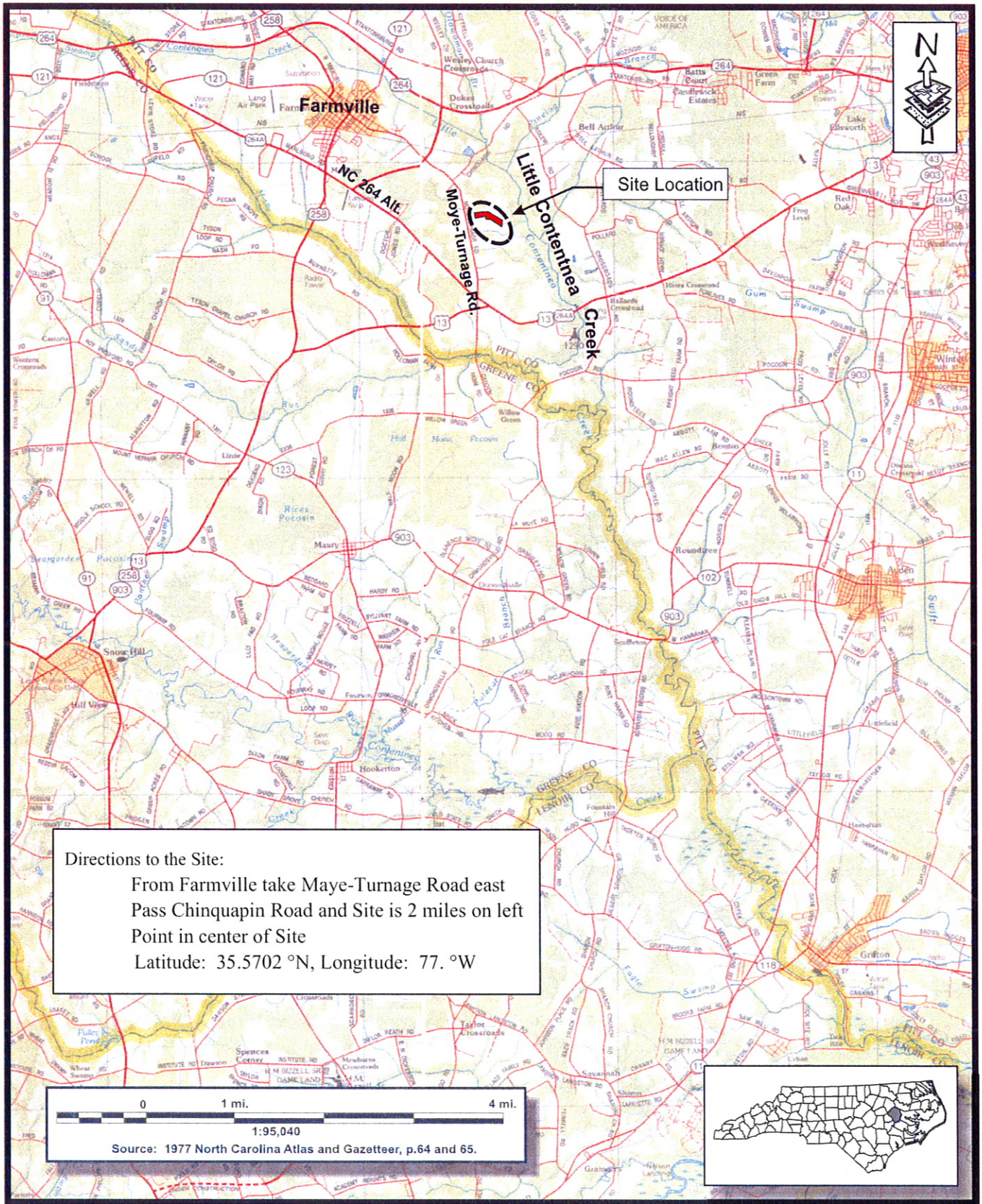
Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, North Carolina Department of Environment, Health, and Natural Resources. Raleigh, North Carolina.

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

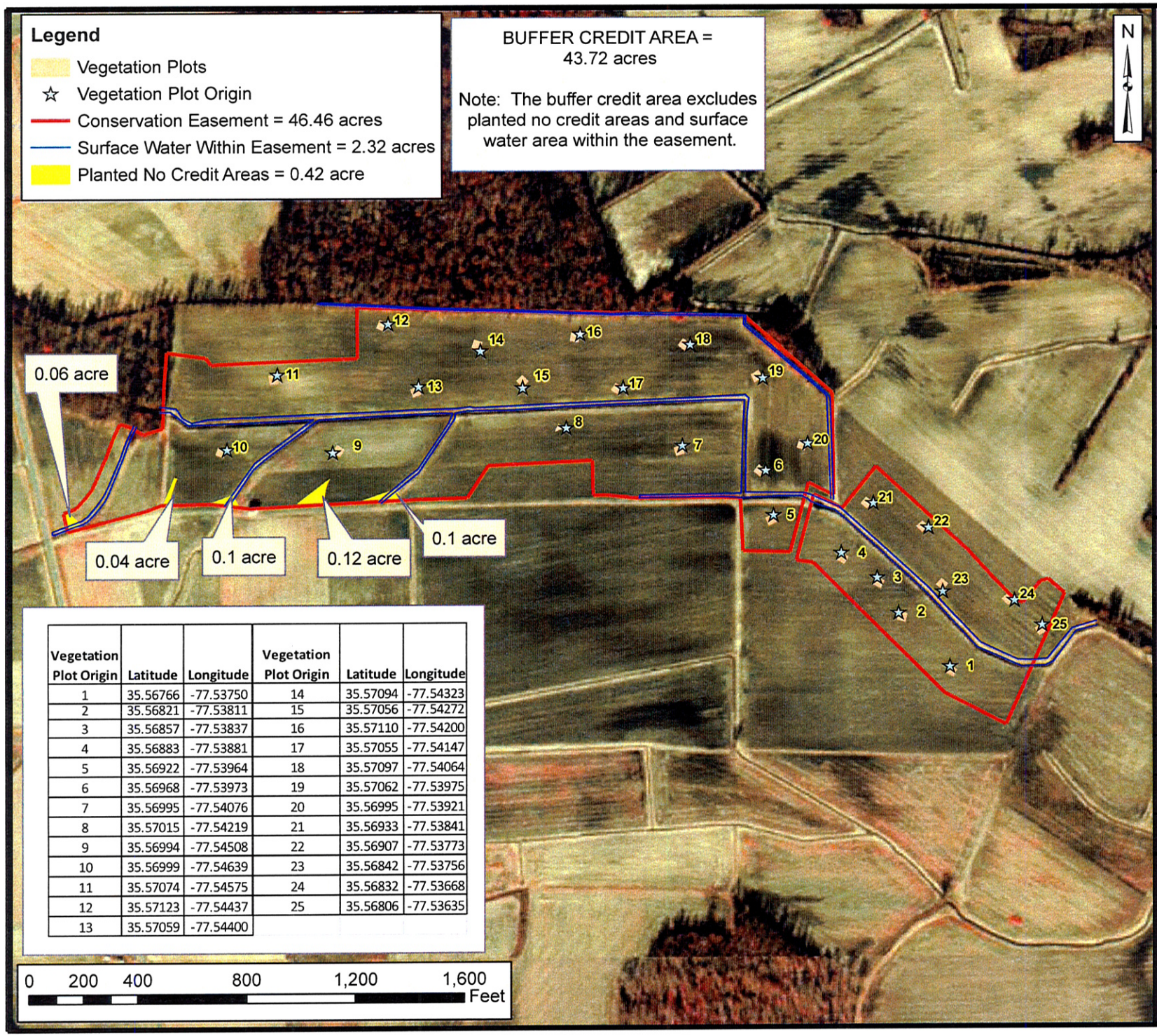


2126 Rowland Pond Drive
Willow Spring, NC 27592
(919) 215-1693
(919) 341-3839 fax
Axiom Environmental, Inc.

SITE LOCATION
FOX RUN BUFFER RESTORATION SITE
Pitt County, North Carolina

Dwn. by:	WGL
Ckd by:	WGL
Date:	Nov 2008
Project:	05-002.49

FIGURE 1



Vegetation Plot Origin	Latitude	Longitude	Vegetation Plot Origin	Latitude	Longitude
1	35.56766	-77.53750	14	35.57094	-77.54323
2	35.56821	-77.53811	15	35.57056	-77.54272
3	35.56857	-77.53837	16	35.57110	-77.54200
4	35.56883	-77.53881	17	35.57055	-77.54147
5	35.56922	-77.53964	18	35.57097	-77.54064
6	35.56968	-77.53973	19	35.57062	-77.53975
7	35.56995	-77.54076	20	35.56995	-77.53921
8	35.57015	-77.54219	21	35.56933	-77.53841
9	35.56994	-77.54508	22	35.56907	-77.53773
10	35.56999	-77.54639	23	35.56842	-77.53756
11	35.57074	-77.54575	24	35.56832	-77.53668
12	35.57123	-77.54437	25	35.56806	-77.53635
13	35.57059	-77.54400			

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

FOX RUN RIPARIAN BUFFER MITIGATION SITE

Pitt County, NC

Title:

MONITORING PLAN VIEW

Drawn by: CLF

Date: NOV 2010

Scale: 1:5700

Project No.: 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 46.46-acre Site with native forest vegetation; credit was received for 43.72 acres of the Site.
Riparian Buffer Restoration	
43.72 Buffer Mitigation Units	

Table 2. Project Activity and Reporting History

Activity or Report	Data Collection Complete	Completion or Delivery
Final Restoration Plan	--	November 2010
Site Planting	--	Late winter/early spring 2010
Asbuilt Mitigation Plan	April 2010	November 2010

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

Table 4. Project Attribute Table

Project County	Pitt County, North Carolina
Physiographic Region	Coastal Plain
Ecoregion	Southeastern Plains
Project River Basin	Neuse
USGS 14-digit HUC	03020203070030
NCDWQ Subbasin	03-04-07
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*)	7500
Black gum (*Nyssa sylvatica*)	2500
Elderberry (*Sambucus canadensis*)	2500
Loblolly pine (*Pinus taeda*)	7500
Northern red oak (*Quercus rubra*)	5000
River birch (*Betula nigra*)	2500
Sugarberry (*Celtis laevigata*)	2500
Swamp chestnut oak (*Quercus michauxii*)	7500
Sycamore (*Platanus occidentalis*)	3200
Willow oak (*Quercus phellos*)	7500
TOTAL	**50,000**

Planted Stems by Plot (Note: no natural recruits were present during baseline measurements)

Species	Common Name	Stems	# plots	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
Betula nigra	river birch	37	12	3.08	4	4	1			4		6	4	3						1					5	1	3	
Celtis laevigata	sugarberry	14	8	1.75		1			3		2				2				2					1				2
Nyssa sylvatica	blackgum	34	12	2.83	2		5	3	2			4		2		1									3	3	5	3
Pinus taeda	loblolly pine	80	24	3.33	4	3	4	5	2	5	3	2	3	1	3	3	2	1	3	4	6	3	4		5	1	5	3
Platanus occidentalis	American sycamore	42	14	3				1	1				1	1			3	4	9		2	4	4		3	4	2	3
Quercus	oak	16	7	2.29	2								4	3		1	4										1	1
Quercus michauxii	swamp chestnut oak	52	18	2.89	2	1	1	5		2	8	2		2	5			1	1	1	4	6			6		1	3
Quercus nigra	water oak	1	1	1						1																		
Quercus phellos	willow oak	59	15	3.93	1	7	6		12		6	5		1	3	1	3			3		1	5			4	1	
Quercus rubra	northern red oak	96	20	4.8	2	2		1		6	1		4		2	7	5	6	2	8	4		6	13	4	5	1	3
Sambucus canadensis	Common Elderberry	14	8	1.75		2	3						1	2										2	1		1	2
Ulmus americana	American elm	34	9	3.78				4		2			4	1	9	3	3	7		1								
Unknown		5	5	1						1	1					1				1		1						
13	**12**	**484**	**13**		**17**	**20**	**20**	**19**	**20**	**21**	**21**	**19**	**21**	**16**	**24**	**17**	**20**	**19**	**17**	**19**	**16**	**15**	**19**	**16**	**27**	**18**	**20**	**20**

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 0 (baseline)
Fox Run	Fox Run	Neuse	783.47

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

Project Code	Project Name	River Basin	Year 0 (baseline)
Fox Run	Fox Run	Neuse	783.4714049

Vigor

vigor	Count	Percent
1	7	1.4
2	74	15.3
3	307	63.4
4	96	19.8

Vigor by Species

Species	CommonName	4	3	2	1	0	Missing	Unknown
Betula nigra	river birch	6	16	12	3			
Celtis laevigata	sugarberry	3	10	1				
Nyssa sylvatica	blackgum	19	13	1	1			
Pinus taeda	loblolly pine	8	63	9				
Quercus michauxii	swamp chestnut oak	7	40	4	1			
Quercus nigra	water oak		1					
Quercus phellos	willow oak	9	38	12				
Sambucus canadensis	Common Elderberry	1	7	6				
Quercus	oak			15	1			
Quercus rubra	northern red oak	30	58	8				
Platanus occidentalis	American sycamore	9	32	1				
Ulmus americana	American elm	4	29	1				
Unknown				4	1			
13	**12**	**96**	**307**	**74**	**7**			

Damage

Damage	Count	Percent Of Stems
(no damage)	403	83.3
Unknown	81	16.7

Damage by Species

Species	CommonName	# Damage Categories	(no damage)	Unknown
Betula nigra	river birch	15	22	15
Celtis laevigata	sugarberry	1	13	1
Nyssa sylvatica	blackgum	2	32	2
Pinus taeda	loblolly pine	9	71	9
Platanus occidentalis	American sycamore	1	41	1
Quercus	oak	16		16
Quercus michauxii	swamp chestnut oak	5	47	5
Quercus nigra	water oak	0	1	
Quercus phellos	willow oak	12	47	12
Quercus rubra	northern red oak	8	88	8
Sambucus canadensis	Common Elderberry	6	8	6
Ulmus americana	American elm	1	33	1
Unknown		5		5

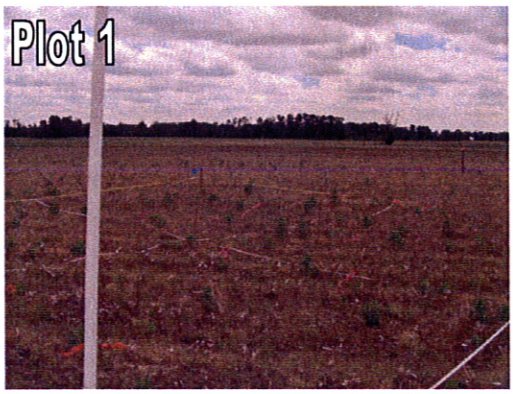
Damage by Plot

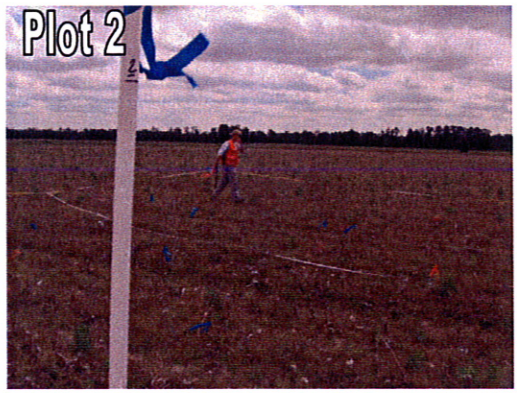
plot	Count of Damage Categories	(no damage)	Unknown
1	5	12	5
2	10	10	10
3	2	18	2
4	0	19	
5	3	17	3
6	4	17	4
7	5	16	5
8	5	14	5
9	6	15	6
10	9	7	9
11	5	19	5
12	3	14	3
13	6	14	6
14	2	17	2
15	0	17	
16	3	16	3
17	0	16	
18	1	14	1
19	1	18	1
20	2	14	2
21	1	26	1
22	1	17	1
23	3	17	3
24	2	18	2
25	2	21	2
25	**81**	**403**	**81**

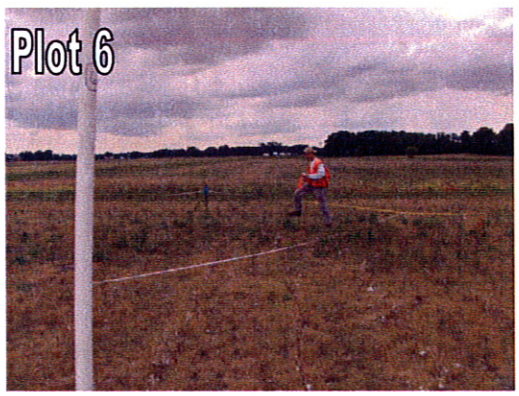
Plot Information

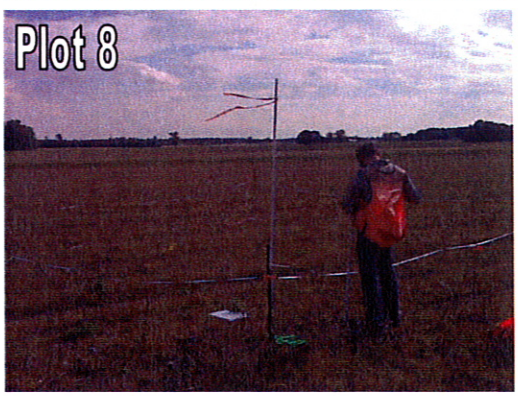
Plot	Plot Level	Year	Planted Living Stems	Planted Living Stems EXCLUDING Live Stakes	Dead/Missing Stems	Natural (Volunteer) Stems	Total Living Stems	Total Living Stems EXCLUDING Live Stakes	Planted Living Stems per ACRE	Planted Living Stems EXCLUDING Live Stakes PER ACRE	Natural (Volunteer) Stems PER ACRE	Total Living Stems PER ACRE	Total Living Stems EXCLUDING Live Stakes PER ACRE	# species
1	2	0	17	17	0	0	17	17	688	688	0	688	688	7
2	2	0	16	16	0	0	16	16	647	647	0	647	647	9
3	2	0	24	24	0	0	24	24	971	971	0	971	971	6
4	2	0	17	17	0	0	17	17	688	688	0	688	688	7
5	2	0	20	20	0	0	20	20	809	809	0	809	809	6
6	2	0	19	19	0	0	19	19	769	769	0	769	769	5
7	2	0	17	17	0	0	17	17	688	688	0	688	688	5
8	2	0	19	19	0	0	19	19	769	769	0	769	769	7
9	2	0	16	16	0	0	16	16	647	647	0	647	647	4
10	2	0	15	15	0	0	15	15	607	607	0	607	607	5
11	2	0	19	19	0	0	19	19	769	769	0	769	769	4
12	2	0	20	20	0	0	20	20	809	809	0	809	809	7
13	2	0	16	16	0	0	16	16	647	647	0	647	647	3
14	2	0	27	27	0	0	27	27	1093	1093	0	1093	1093	7
15	2	0	18	18	0	0	18	18	728	728	0	728	728	6
16	2	0	20	20	0	0	20	20	809	809	0	809	809	9
17	2	0	20	20	0	0	20	20	809	809	0	809	809	8
18	2	0	23	23	0	0	23	23	931	931	0	931	931	6
19	2	0	20	20	0	0	20	20	809	809	0	809	809	6
20	2	0	19	19	0	0	19	19	769	769	0	769	769	6
21	2	0	20	20	0	0	20	20	809	809	0	809	809	5
22	2	0	21	21	0	0	21	21	850	850	0	850	850	7
23	2	0	21	21	0	0	21	21	850	850	0	850	850	6
24	2	0	19	19	0	0	19	19	769	769	0	769	769	5
25	2	0	21	21	0	0	21	21	850	850	0	850	850	7

Fox Run
Baseline
Vegetation Monitoring Plot Photos
Taken April 2010









Fox Run
Baseline
Vegetation Monitoring Plot Photos
Taken April 2010
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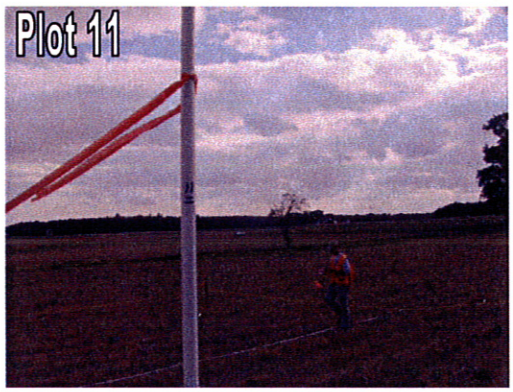
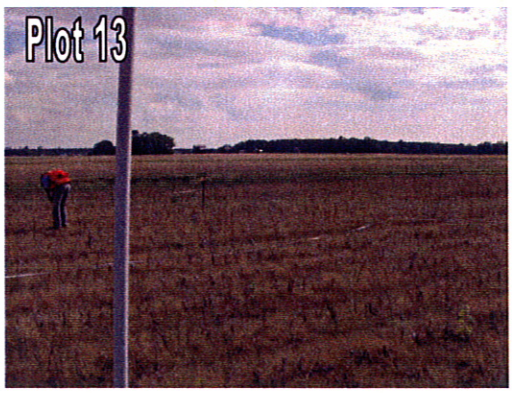
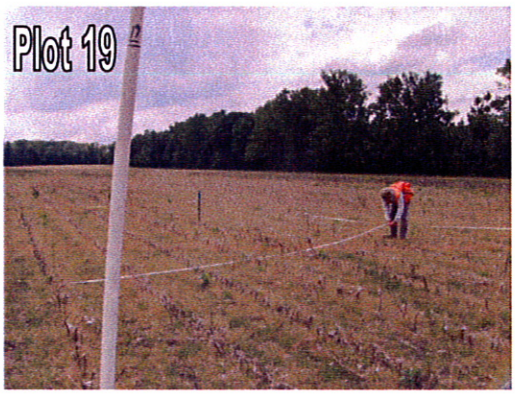
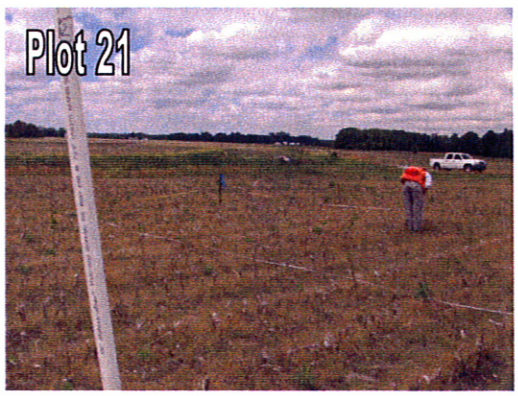


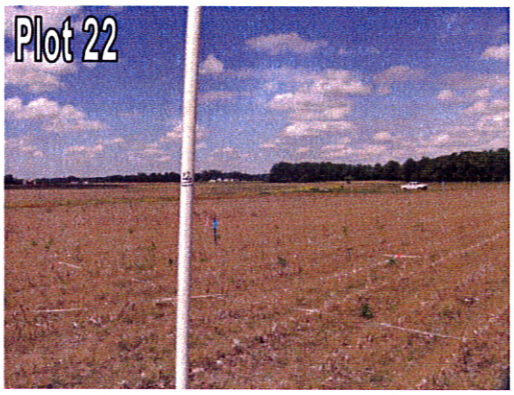


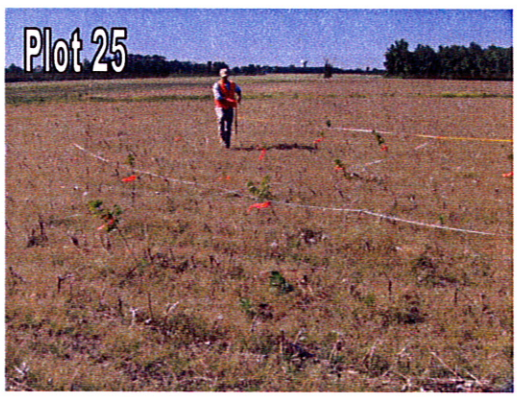
Fox Run
Baseline
Vegetation Monitoring Plot Photos
Taken April 2010
(continued)





Fox Run
Baseline
Vegetation Monitoring Plot Photos
Taken April 2010
(continued)





Appendix D.
NCDWQ Restoration Approval Letter

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Water Quality
Coleen H. Sullins
Director

Beverly Eaves Perdue
Governor

Dee Freeman
Secretary

November 17, 2010

Pitt County
DWQ #: 10-0690

Mr. Tim Baumgartner
EEP Full Delivery Section
1652 Mail Service Center
Raleigh, NC 27604

Re: Fox Run Preliminary Restoration Approval

Dear Mr. Baumgartner:

The Division of Water Quality received a draft restoration plan for the Fox Run Riparian Buffer Mitigation Site on November 8, 2010. On October 26, 2010, Chris Pullinger conducted a site visit to the above referenced site. By copy of this correspondence, DWQ approves the concept presented in the restoration plan and that it is expected to produce 43.72 acres of nutrient offset credit for Tar-Pamlico 8-digit HUC 03020203. The As-built report will provide a more accurate credit accounting.

Please copy DWQ with the As-built report and yearly monitoring reports, referencing the DWQ number.

Please feel free to contact Lia Myott Gilleski at (919) 733-1786 if you have any questions regarding this correspondence.

Sincerely,

Lia M. Gilleski
for Ian McMillan, Acting Supervisor
401 Oversight/Express Review Program

Cc (w/out encl.) File Copy (Lia M. Gilleski)
Chris Pullinger – DWQ WaRO
John Huisman – DWQ Nonpoint Source Planning Unit
Cyndi Karoly – DWQ Wetlands and Stormwater Branch

401 Oversight/Express Review Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
Location: 2321 Crabtree Blvd., Raleigh, North Carolina 27604
Phone: 919-733-1786 \ FAX: 919-733-6893
Internet: http://h2o.enr.state.nc.us/ncwetlands/

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