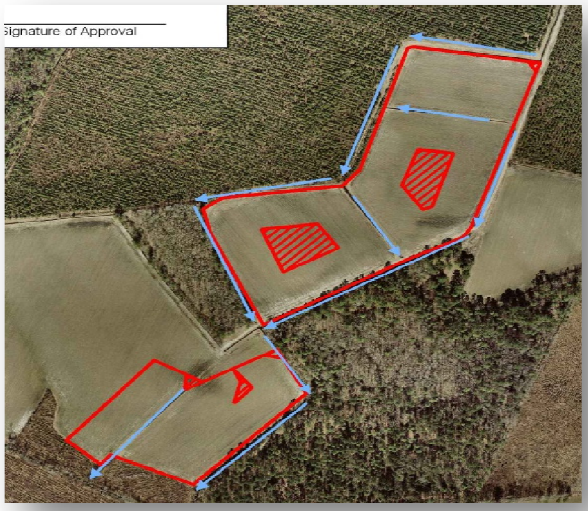
MITIGATION PLAN
and AS-BUILT BASELINE REPORT
VICKI'S THICKET RIPARIAN BUFFER MITIGATION SITE
CRAVEN COUNTY, NORTH CAROLINA
(EEP Contract No. 002283)
[DWQ Reference No. 10-0652]



Prepared for:

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

Prepared by:

Restoration Systems, L.L.C.
1101 Haynes Street, Suite 211
Raleigh, North Carolina 27604

And

Axiom Environmental, Inc.
20 Enterprise Street, Suite 7
Raleigh, North Carolina 27607

August 2010

EXECUTIVE SUMMARY

Restoration Systems, LLC has completed riparian buffer restoration at the Vicki's Thicket 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 28.38 Riparian Buffer Mitigation Units. The Site is located approximately 3.5 miles southeast of Dover in Craven County. 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. 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 31.35-acre Site resulted in **28.38 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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APPENDICES

1.0 INTRODUCTION

1.1 Location and Setting

Restoration Systems, LLC has completed riparian buffer restoration at the Vicki's Thicket 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 28.38 Riparian Buffer Mitigation Units. The Site is located approximately 3.5 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 35.18812ºN, Longitude 77.38613ºW (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 31.35-acre Site with native riparian vegetation. This resulted in 28.38 Riparian Buffer Mitigation Units (Table 1, Appendix B and Figure 2, Appendix A). Riparian Buffer Mitigation Units were verified by North Carolina Division of Water Quality (NCDWQ) representative Lia Myott Gilleski during a field visit conducted on June 17, 2010. A copy of the verification letter is included in Appendix D. Approximately 2.97 acres of the Site exist outside of the 200-foot buffer area. 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-one 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.

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 following Site planting in April 2010. An average of 784 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 high with 6-10 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.

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.

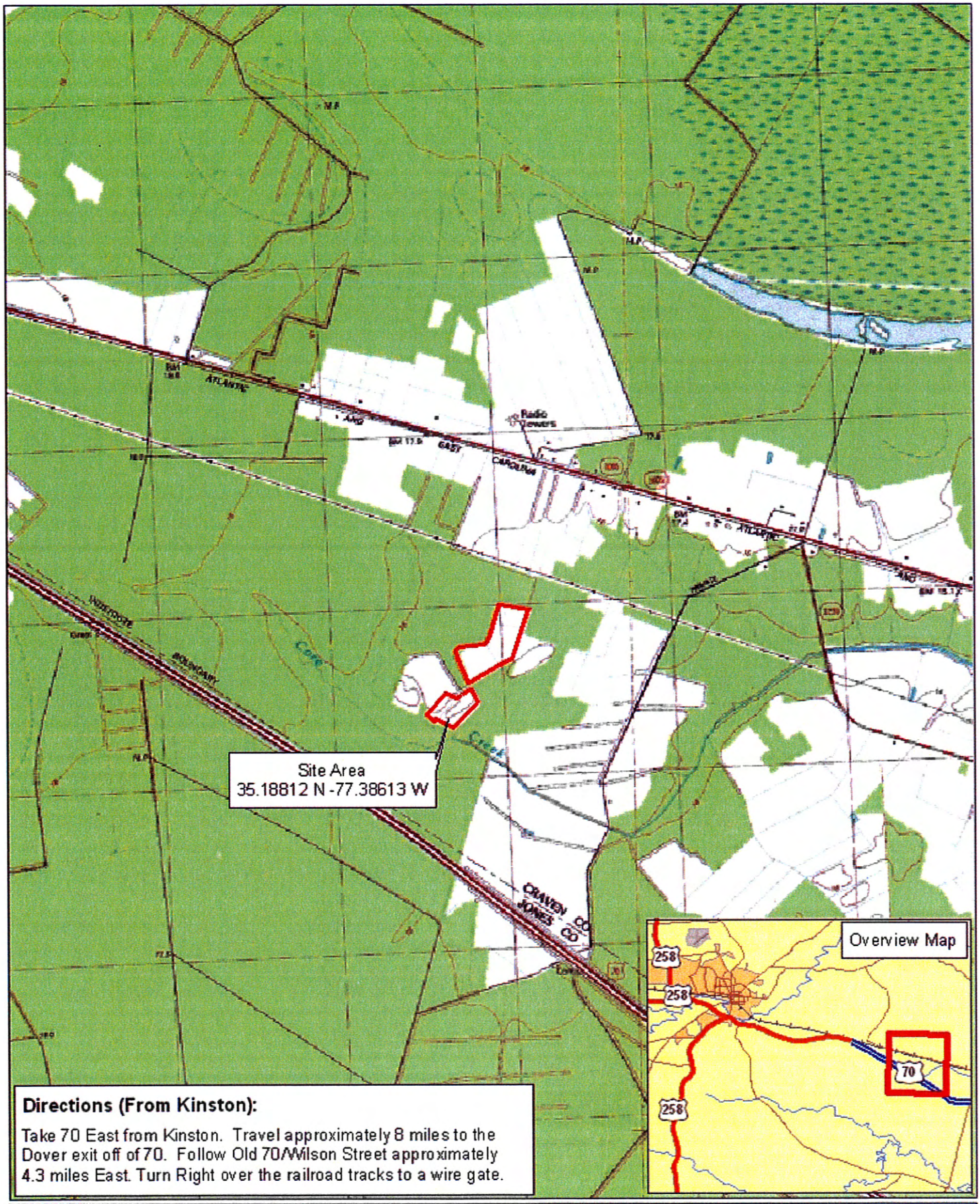
North Carolina Division of Water Quality (NCDWQ). 2008b. Draft Basinwide Planning Program: Neuse River Basinwide Water Quality Plan-June 2008. North Carolina Department of Environment and Natural Resources, Division of Water Quality. Raleigh, North Carolina.

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



Restoration Systems, LLC
1101 Haynes St. Suite 211
Raleigh, NC 27604
tel: 919.755.9490

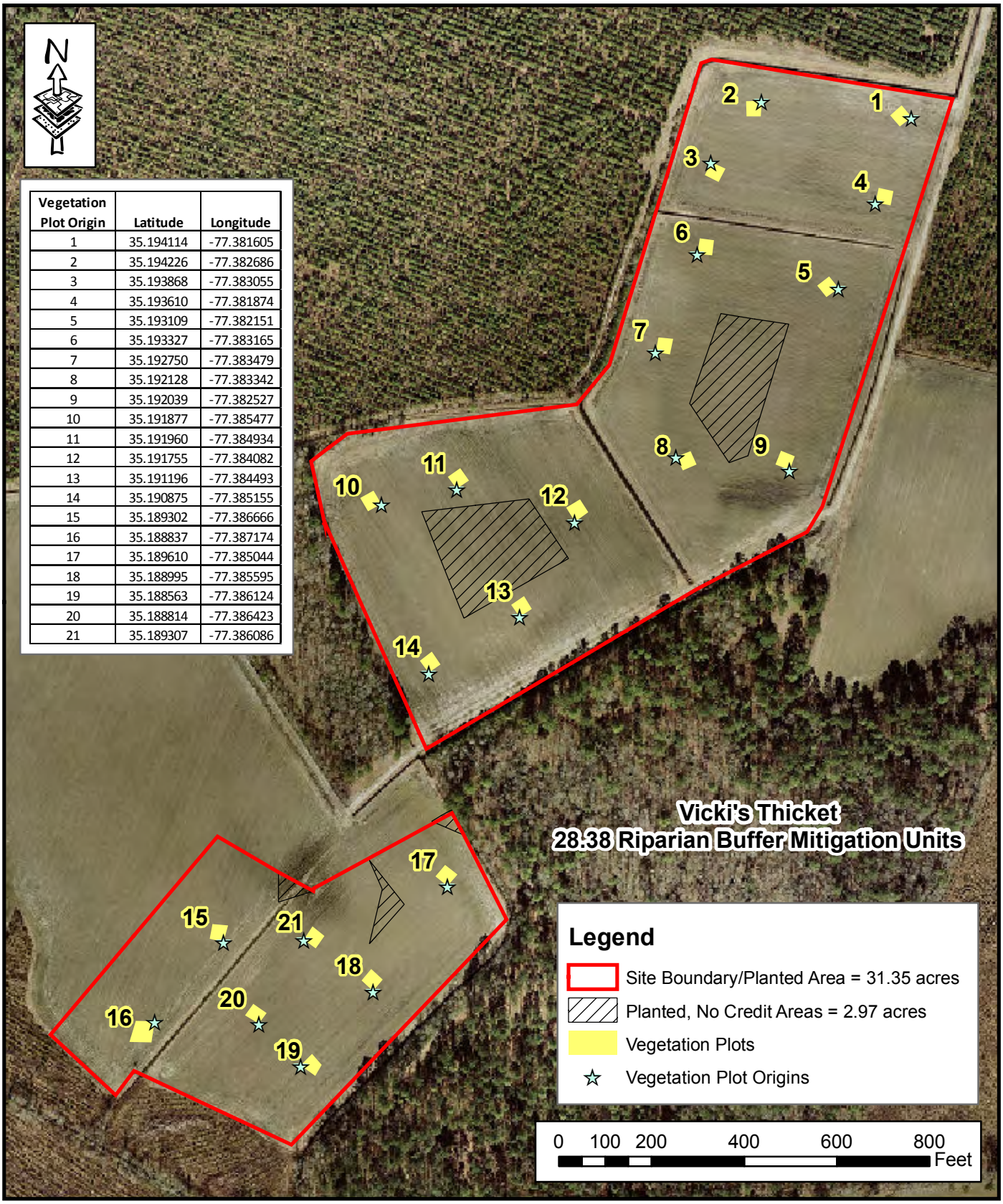
Figure 1: Site Location

Vicki's Thicket Riparian Buffer Mitigation Site
Craven County, NC

1:28,151

N

0 550 1,100 2,200 3,300 4,400
Feet



Vegetation Plot Origin	Latitude	Longitude
1	35.194114	-77.381605
2	35.194226	-77.382686
3	35.193868	-77.383055
4	35.193610	-77.381874
5	35.193109	-77.382151
6	35.193327	-77.383165
7	35.192750	-77.383479
8	35.192128	-77.383342
9	35.192039	-77.382527
10	35.191877	-77.385477
11	35.191960	-77.384934
12	35.191755	-77.384082
13	35.191196	-77.384493
14	35.190875	-77.385155
15	35.189302	-77.386666
16	35.188837	-77.387174
17	35.189610	-77.385044
18	35.188995	-77.385595
19	35.188563	-77.386124
20	35.188814	-77.386423
21	35.189307	-77.386086

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MONITORING PLAN VIEW
VICKI'S THICKET
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 31.35-acre Site with native forest vegetation; credit was received for 28.38 acres of the Site.
Riparian Buffer Restoration	
28.38 Buffer Mitigation Units	

Table 2. Project Activity and Reporting History

Activity or Report	Data Collection Complete	Completion or Delivery
Final Restoration Plan	--	July 2010
Site Planting	--	Late winter/early spring 2010
Mitigation Plan	April 2010	August 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	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*)	4500
Black gum (*Nyssa sylvatica*)	1500
Elderberry (*Sambucus canadensis*)	1500
Loblolly pine (*Pinus taeda*)	4500
Northern red oak (*Quercus rubra*)	3000
River birch (*Betula nigra*)	1500
Sugarberry (*Celtis laevigata*)	1500
Swamp chestnut oak (*Quercus michauxii*)	4500
Sycamore (*Platanus occidentalis*)	3000
Willow oak (*Quercus phellos*)	4500
TOTAL	**30,000**

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)
VT	Vickies Thicket	Neuse	784.32

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

Project Code	Project Name	River Basin	Year 0 (baseline)
VT	Vickies Thicket	Neuse	784.3193176

Vigor

vigor	Count	Percent
0	1	0.2
1	29	7.1
2	116	28.4
3	254	62.3
4	8	2

Vigor by Species

Species	CommonName	4	3	2	1	0	Missing	Unknown
Betula nigra	river birch	1	25	5	7			
Celtis laevigata	sugarberry		5					
Nyssa sylvatica	blackgum	2	21	5				
Pinus taeda	loblolly pine		23	18		1		
Quercus michauxii	swamp chestnut oak		33	10				
Quercus phellos	willow oak	4	23	12	2			
Sambucus canadensis	Common Elderberry		25	8				
Quercus	oak		4	20	7			
Quercus rubra	northern red oak		15	18	1			
Magnolia virginiana	sweetbay		2					
Platanus occidentalis	American sycamore	1	37	7				
Ulmus americana	American elm		38	10	2			
Unknown			3	3	10			
13	**12**	**8**	**254**	**116**	**29**	**1**		

Damage

Damage	Count	Percent Of Stems
(no damage)	264	64.7
Unknown	143	35
Game	1	0.2

Damage by Species

Species	CommonName	Count of Damage Categories	(no damage)	Game	Unknown
Betula nigra	river birch	12	26		12
Celtis laevigata	sugarberry	0	5		
Magnolia virginiana	sweetbay	0	2		
Nyssa sylvatica	blackgum	5	23		5
Pinus taeda	loblolly pine	18	24		18
Platanus occidentalis	American sycamore	7	38		7
Quercus	oak	27	4		27
Quercus michauxii	swamp chestnut oak	10	33		10
Quercus phellos	willow oak	14	27		14
Quercus rubra	northern red oak	19	15		19
Sambucus canadensis	Common Elderberry	8	25	1	7
Ulmus americana	American elm	11	39		11
Unknown		13	3		13
13	**12**	**144**	**264**	**1**	**143**

Damage by Plot

plot	Count of Damage Categories	(no damage)	Game	Unknown
1	7	12		7
2	10	13	1	9
3	4	15		4
4	4	17		4
5	6	19		6
6	10	13		10
7	7	15		7
8	9	5		9
9	9	10		9
10	8	14		8
11	10	10		10
12	10	19		10
13	9	11		9
14	4	20		4
15	8	13		8
16	3	11		3
17	4	10		4
18	8	6		8
19	5	11		5
20	7	7		7
21	2	13		2
21	**144**	**264**	**1**	**143**

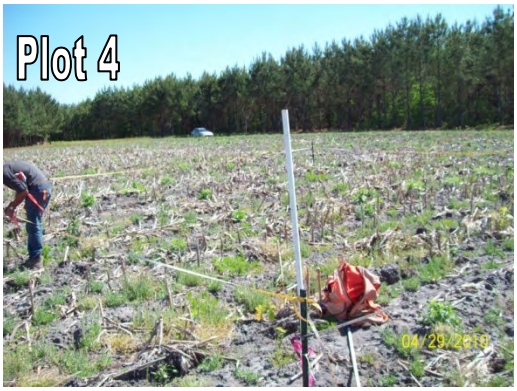
Plot Information

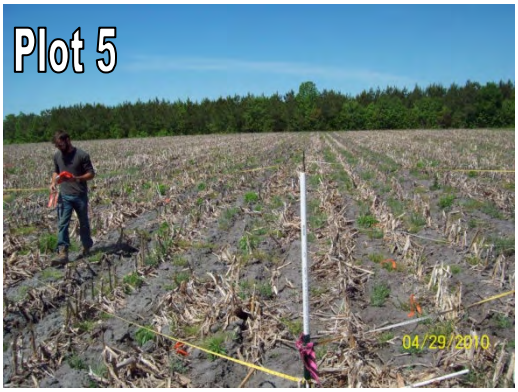
Plot	Plot Level	Year	Planted Living Stems	Planted Living Stems EXCLUDING Live Stakes	Dead/Missing Stems	Natural (Volunteer) Stems	Total Living Stems	Total Living Stems EXCLUDING Live Stakes	Planted Living Stems per ACRE	Planted Living Stems EXCLUDING Live Stakes PER ACRE	Natural (Volunteer) Stems PER ACRE	Total Living Stems PER ACRE	Total Living Stems EXCLUDING Live Stakes PER ACRE	# species
1	2	0	19	19	0	0	19	19	769	769	0	769	769	8
2	2	0	23	23	0	0	23	23	931	931	0	931	931	8
3	2	0	19	19	0	0	19	19	769	769	0	769	769	6
4	2	0	21	21	0	0	21	21	850	850	0	850	850	7
5	2	0	25	25	0	0	25	25	1012	1012	0	1012	1012	9
6	2	0	23	23	0	0	23	23	931	931	0	931	931	8
7	2	0	22	22	0	0	22	22	890	890	0	890	890	8
8	2	0	14	14	0	0	14	14	567	567	0	567	567	9
9	2	0	18	18	1	0	18	18	728	728	0	728	728	9
10	2	0	22	22	0	0	22	22	890	890	0	890	890	9
11	2	0	20	20	0	0	20	20	809	809	0	809	809	6
12	2	0	29	29	0	0	29	29	1174	1174	0	1174	1174	10
13	2	0	20	20	0	0	20	20	809	809	0	809	809	8
14	2	0	24	24	0	0	24	24	971	971	0	971	971	9
15	2	0	21	21	0	0	21	21	850	850	0	850	850	7
16	2	0	14	14	0	0	14	14	567	567	0	567	567	6
17	2	0	14	14	0	0	14	14	567	567	0	567	567	6
18	2	0	14	14	0	0	14	14	567	567	0	567	567	9
19	2	0	16	16	0	0	16	16	647	647	0	647	647	4
20	2	0	14	14	0	0	14	14	567	567	0	567	567	6
21	2	0	15	15	0	0	15	15	607	607	0	607	607	7

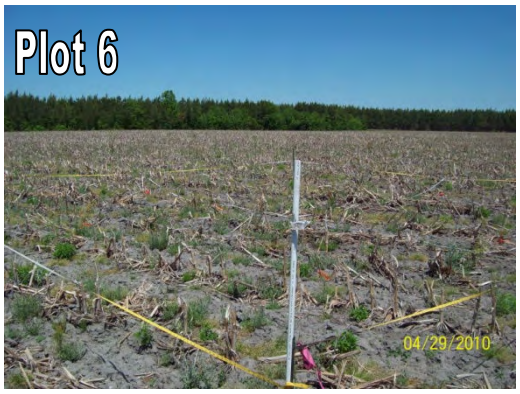
Planted Stems by Plot (Note: no natural recruits were present during baseline measurements)

Species	Common Name	Total Planted Stems	# plots	avg# stems	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Betula nigra	river birch	38	13	2.92			3		1		3		2	2		1		3	7	3	1		7	2	3
Celtis laevigata	sugarberry	5	4	1.25												1					1	1			2
Magnolia virginiana	sweetbay	2	1	2										2											
Nyssa sylvatica	blackgum	28	14	2	2	3		2	2			1	1	3	3	2	1	3			3	1	1		
Pinus taeda	loblolly pine	41	16	2.56		1	3		4	3	3	3	3	3	3	5	1	5				1	1	1	1
Platanus occidentalis	American sycamore	45	15	3		1				5	2			2	1	4	2	2	3	5	2	2	7	1	6
Quercus	oak	31	15	2.07	1	1		2		1		3	1	2	2	2	4	3	3	1		3		2	
Quercus michauxii	swamp chestnut oak	43	14	3.07	1	4	3	3	6		5	1	1		7	4	4	2	1			1			
Quercus phellos	willow oak	41	13	3.15	2				3	3		2	1	6			3	3	3	3	5	2		5	
Quercus rubra	northern red oak	34	16	2.12	1		2	4	1	1	2	1		1	4	7	4	2	1	1		1			1
Sambucus canadensis	Common Elderberry	33	15	2.2	6	5	1	3	1	1	2	1	1						3	1	2	2		3	1
Ulmus americana	American elm	50	13	3.85	5	7	7	6	5	6	3	1	5	1		2	1	1							
Unknown		16	10	1.6	1	1		1	2	3	2	1	3			1									1
13	**12**	**407**	**13**		**19**	**23**	**19**	**21**	**25**	**23**	**22**	**14**	**18**	**22**	**20**	**29**	**20**	**24**	**21**	**14**	**14**	**14**	**16**	**14**	**15**

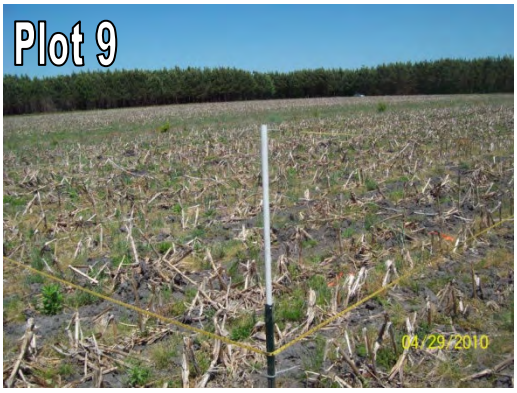
Vickies Thicket
Baseline
Vegetation Monitoring Plot Photos
Taken April 2010







Vickies Thicket
Baseline
Vegetation Monitoring Plot Photos
Taken April 2010
(continued)



Vickies Thicket
Baseline
Vegetation Monitoring Plot Photos
Taken April 2010
(continued)

Plot 20

No Photo Available

Appendix D.
NCDWQ Verification 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

August 13, 2010

Craven County
DWQ #: 10-0652

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

Re: Vicki's Thicket Preliminary Restoration Approval

Dear Mr. Baumgartner:

The Division of Water Quality received a final restoration plan for the Vicki's Thicket Riparian Buffer Mitigation Site on August 10, 2010. On June 17, 2010, Lia Myott Gilleski 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 28.38 acres of nutrient offset credit for Neuse 03020202. 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 EEP Contract number (and DWQ number if applicable).

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

Sincerely,

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/