ANNUAL MONITORING REPORT
YEAR 5 (2014)
HEATH RIPARIAN BUFFER MITIGATION SITE
CRAVEN COUNTY, NORTH CAROLINA
(EEP Contract No. 002280, EEP ID No. 94014))

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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218 Snow Avenue
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December 2014

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 60.00 riparian buffer mitigation units for nutrient offset mitigation (NCEEP Contract #002280). 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 re-vegetating 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. Site restoration activities resulted in 59.95 units of riparian buffer restoration to be used for nutrient offset mitigation. 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 829 planted stems per acre counting towards riparian buffer success in the Fifth Monitoring Year (2014).

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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 60.00 riparian buffer mitigation units for nutrient offset mitigation (NCEEP Contract #002280). 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 59.95 units of riparian buffer restoration to be used for nutrient offset mitigation. (Table 1, Appendix B and Figure 2, Appendix A). Approximately 0.67 acres of the Site is surface water associated with Site ditches. 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 October 2014. Results are provided in Appendix C. Vegetation success criteria for year 5 (320 stems per acre) were exceeded for the 2014 annual monitoring year with an average density of 829 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 2-5. In addition, several stems that were thought to be dead during year 1 monitoring re-sprouted from the base and were counted during years 2-5 monitoring.

3.0 CONCLUSIONS

As a whole, the densities of vegetation plots across the Site were above the required 320 stems per acre in years 1-5 (2010-2014). In addition, each individual plot met success criteria based on planted stems per acre counting towards riparian buffer success alone.

Summary of Planted Stem Vegetation Plot Results

Plot	Planted Stems/Acre (Hardwood Trees Counting Toward Riparian Buffer Success Only)				
	Year 1 (2010)	Year 2 (2011)	Year 3 (2012)	Year 4 (2013)	Year 5 (2014)
1	890	1053	1053	1093	1053
2	971	972	972	891	931
3	850	1012	1012	1012	1012
4	1012	1053	1053	1053	1012
5	931	1012	1012	1134	1134
6	850	850	850	769	769
7	1012	972	972	972	972
8	688	769	810	769	729
9	850	850	891	891	891
10	1012	1053	1012	1012	1053
11	931	1093	1134	1134	1134
12	850	810	810	810	810
13	728	729	729	688	729
14	890	891	931	891	850
15	850	850	891	891	769
16	728	729	607	607	607
17	931	850	850	850	769
18	728	729	810	769	810
19	728	648	729	729	688
20	1052	1012	1053	1053	972
21	1052	1053	1053	1012	972
22	931	931	931	931	931
23	1012	972	972	972	972
24	971	972	972	972	972
25	486	445	445	445	445
26	486	486	486	486	486
27	486	486	486	486	445
28	445	445	445	445	445
29	607	567	567	567	567
Average Plots 1-29	**826**	**837**	**846**	**839**	**829**

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.

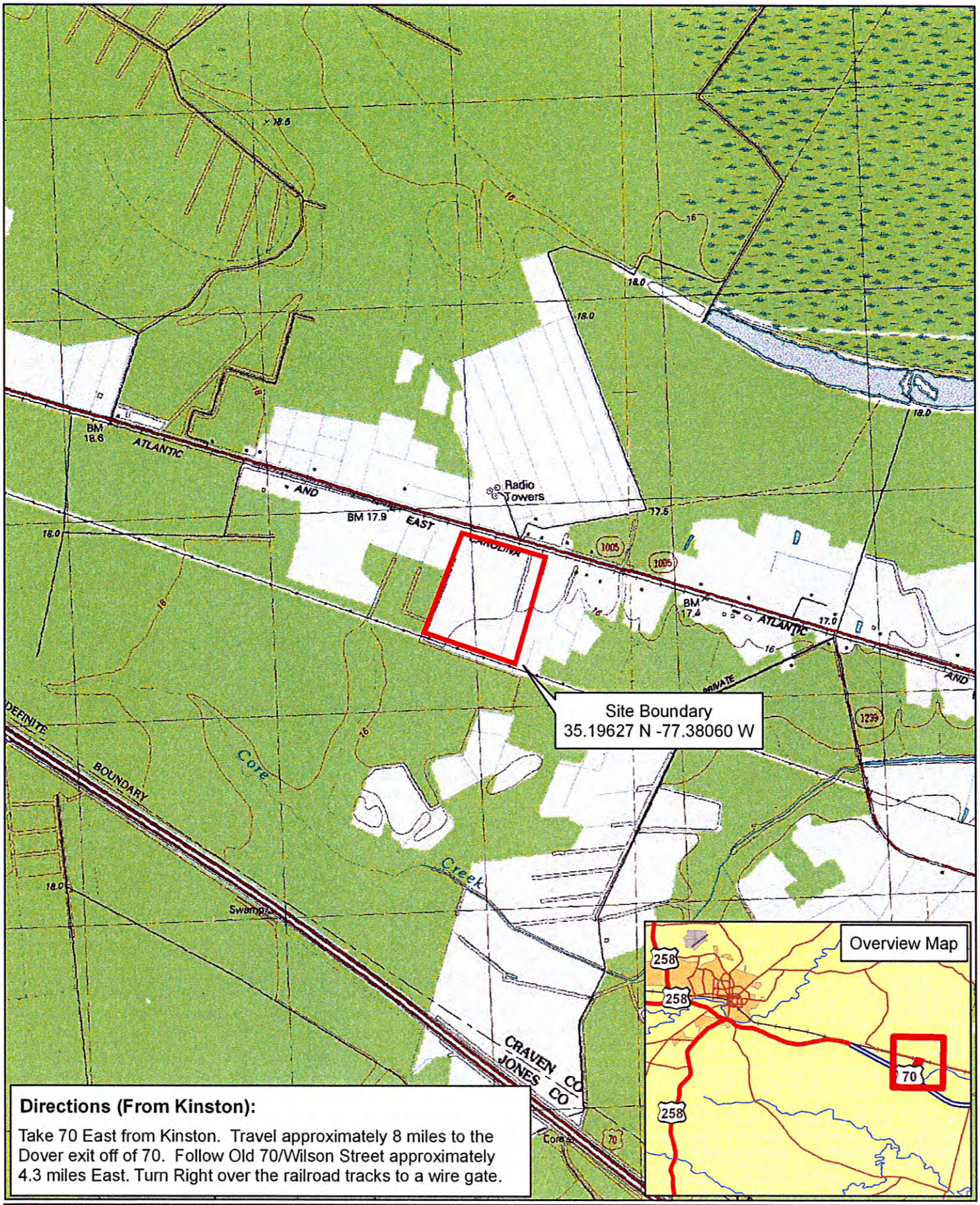
North Carolina Division of Water Quality (NCDWQ). 2008b. Draft Basinwide Planning Program: Neuse River Basinwide Water Quality Plan-June 2008. North Carolina Department of Environment and Natural Resources, Division of Water Quality. Raleigh, North Carolina.

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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tel: 919.755.9490

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

Heath
Nutrient Offset Restoration Credits = 59.95

Legend

- Easement = 60.62 acres
- Vegetation Plots
- Surface Water within Easement = 0.67 acre
- Nutrient Offset Restoration Area = 59.95 acres (2,611,560 sq. ft)
- Vegetation Plot Origins

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

Dwn. by: CLF
Date: Dec 2014
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 Site with native forest vegetation; credit was received for 59.95 acres of the Site.
Nutrient Offset Restoration	
59.95 Nutrient Offset Restoration Credits	

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
Invasive Species Treatment		Late summer 2012
Year 4 Monitoring	October 2013	November 2013
Year 5 Monitoring	October 2014	December 2014

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 Mary-Margaret 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	Year 4	Year 5
Heath	Heath	Neuse	826.12	838.68	847.05	838.68	823.33

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	Year 4	Year 5
Heath	Heath	Neuse	909.84	1024.27	1327.09	1500.13	1470.82

Vigor

Vigor	Count	Percent
	1	0.2
0	1	0.2
2	70	11.5
3	99	16.2
4	421	69
Missing	19	3.1

Damage

Damage	Count	Percent Of Stems
(no damage)	496	81.2
Unknown	55	9
Other/Unknown Animal	37	6.1
Deer	22	3.6
Vine Strangulation	1	0.2

Vigor by Species

Species	CommonName	4	3	2	1	0	Missing	Unknown
Carya ovata	shagbark hickory			1				
Celtis laevigata	sugarberry	1	3	5			1	
Fraxinus pennsylvanica	green ash	52	34	15			2	
Nyssa sylvatica	blackgum	11	18	13			3	
Persea palustris	swamp bay			1				
Quercus michauxii	swamp chestnut oak	130	11	6			3	
Quercus nigra	water oak	68	1					
Quercus phellos	willow oak	94	10	1		1	1	
Carpinus caroliniana	American hornbeam	28	2	1				
Quercus	oak	8						
Quercus rubra	northern red oak	1						
Carya	hickory		5	1			1	
Magnolia virginiana	sweetbay	10						
Nyssa	tupelo	3		1			1	
Platanus occidentalis	American sycamore	1						
Ulmus	elm	1		4			1	
Ulmus americana	American elm	13	15	21			6	
17	**17**	**421**	**99**	**70**		**1**	**19**	

Damage by Species

Species	CommonName	Count of Damage Categories	(no damage)	Deer	Other/Unknown Animal	Unknown	Vine Strangulation
Carpinus caroliniana	American hornbeam	3	28	1	1	1	
Carya	hickory	2	5			2	
Carya ovata	shagbark hickory	1				1	
Celtis laevigata	sugarberry	5	5		3	2	
Fraxinus pennsylvanica	green ash	28	76	8	8	12	
Magnolia virginiana	sweetbay	0	10				
Nyssa	tupelo	1	4			1	
Nyssa sylvatica	blackgum	24	21	2	11	11	
Persea palustris	swamp bay	1		1			
Platanus occidentalis	American sycamore	0	1				
Quercus	oak	0	8				
Quercus michauxii	swamp chestnut oak	11	139	2	2	6	1
Quercus nigra	water oak	1	68		1		
Quercus phellos	willow oak	5	102	1		4	
Quercus rubra	northern red oak	0	1				
Ulmus	elm	4	2		2	2	
Ulmus americana	American elm	29	26	7	9	13	
17	**17**	**115**	**496**	**22**	**37**	**55**	**1**

Damage by Plot

plot	Count of Damage Categories	(no damage)	Deer	Diseased	Human Trampled	Insects
Heath-AXE-0001-year:5	1	26	1			
Heath-AXE-0002-year:5	0	24				
Heath-AXE-0003-year:5	10	15		3	7	
Heath-AXE-0004-year:5	7	19			7	
Heath-AXE-0005-year:5	0	30				
Heath-AXE-0006-year:5	8	12		2	6	
Heath-AXE-0007-year:5	5	19			5	
Heath-AXE-0008-year:5	8	12		5	3	
Heath-AXE-0009-year:5	7	15		5	2	
Heath-AXE-0010-year:5	9	17	1	3	5	
Heath-AXE-0011-year:5	4	24	1	1	2	
Heath-AXE-0012-year:5	1	19			1	
Heath-AXE-0013-year:5	10	8		6	4	
Heath-AXE-0014-year:5	1	21		1		
Heath-AXE-0015-year:5	5	17		3	1	1
Heath-AXE-0016-year:5	1	14		1		
Heath-AXE-0017-year:5	3	18	3			
Heath-AXE-0018-year:5	0	20				
Heath-AXE-0019-year:5	1	17		1		
Heath-AXE-0020-year:5	10	16	1	1	8	
Heath-AXE-0021-year:5	6	20		2	4	
Heath-AXE-0022-year:5	3	20		3		
Heath-AXE-0023-year:5	3	21	3			
Heath-AXE-0024-year:5	0	24				
Heath-AXE-0025-year:5	5	6	5			
Heath-AXE-0026-year:5	3	9	3			
Heath-AXE-0027-year:5	0	12				
Heath-AXE-0028-year:5	2	9	2			
Heath-AXE-0029-year:5	2	12	2			
29	**115**	**496**	**22**	**37**	**55**	**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	5	26	26	1	16	42	42	1052	1052	647	1700	1700	6
0002	2	5	23	23	1	14	37	37	931	931	567	1497	1497	7
0003	2	5	25	25	0	16	41	41	1012	1012	647	1659	1659	6
0004	2	5	25	25	1	9	34	34	1012	1012	364	1376	1376	7
0005	2	5	28	28	2	4	32	32	1133	1133	162	1295	1295	5
0006	2	5	19	19	1	12	31	31	769	769	486	1255	1255	6
0007	2	5	24	24	0	13	37	37	971	971	526	1497	1497	10
0008	2	5	18	18	2	13	31	31	728	728	526	1255	1255	6
0009	2	5	22	22	0	20	42	42	890	890	809	1700	1700	7
0010	2	5	26	26	0	13	39	39	1052	1052	526	1578	1578	4
0011	2	5	28	28	0	2	30	30	1133	1133	81	1214	1214	4
0012	2	5	20	20	0	17	37	37	809	809	688	1497	1497	7
0013	2	5	18	18	0	18	36	36	728	728	728	1457	1457	6
0014	2	5	21	21	1	17	38	38	850	850	688	1538	1538	6
0015	2	5	19	19	3	18	37	37	769	769	728	1497	1497	7
0016	2	5	15	15	0	7	22	22	607	607	283	890	890	5
0017	2	5	19	19	2	2	21	21	769	769	81	850	850	6
0018	2	5	20	20	0	8	28	28	809	809	324	1133	1133	6
0019	2	5	17	17	1	35	52	52	688	688	1416	2104	2104	5
0020	2	5	24	24	2	20	44	44	971	971	809	1781	1781	7
0021	2	5	24	24	1	10	34	34	971	971	405	1376	1376	5
0023	2	5	23	23	0	1	24	24	931	931	40	971	971	6
0023	2	5	23	23	1	2	25	25	931	931	81	1012	1012	5

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	5	24	24	0	39	63	63	971	971	1578	2550	2550	5
0025	2	5	11	11	0	76	87	87	445	445	3076	3521	3521	5
0026	2	5	12	12	0	33	45	45	486	486	1335	1821	1821	4
0027	2	5	11	11	1	12	23	23	445	445	486	931	931	5
0028	2	5	11	11	0	17	28	28	445	445	688	1133	1133	3
0029	2	5	14	14	0	0	14	14	567	567	0	567	567	6

Heath 2014 (Year 5) 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**	4	8		1	6	3	2		1		2	2																	2
tree	***Carya***	**hickory**							1		2						2					1									
tree	***Carya ovata***	**shagbark hickory**							1																						
tree	***Celtis laevigata***	**sugarberry**					1			4				1	1		2														
tree	***Fraxinus pennsylvanica***	**green ash**		2	3	5	1	2	4	2	7	5		2	3	1		1	3	4	4	3	10	8	10	2	4	2	5	5	3
tree	***Magnolia virginiana***	**sweetbay**	1	2		2	1											1						1			1				1
tree	***Nyssa***	**tupelo**							1										3												
tree	***Nyssa sylvatica***	**blackgum**			2			2	1	5	5	9	6	3			2		3	4											
tree	***Persea palustris***	**swamp bay**																				1									
tree	***Platanus occidentalis***	**American sycamore**						1																							
tree	***Quercus***	**oak**				1			1							2		1	1	1											1
tree	***Quercus michauxii***	**swamp chestnut oak**	13	6	8	8	19	4	1	2	2	2	3	3	2	4	8	10	3	6	9	3	3	4	9	13	1		1		
tree	***Quercus nigra***	**water oak**	4	3					10	3	1			2			1		6	1	1	6	5	6	2	6	2	3	2	4	1
tree	***Quercus phellos***	**willow oak**	2	1	7	2		7	2	2	4	10	17	7	4	11	3	2		4	1	1	3	2	1	2		3	1		6
tree	***Quercus rubra***	**northern red oak**															1														
tree	***Ulmus***	**elm**			2										1	2															
tree	***Ulmus americana***	**American elm**	2	1	3	6									7	1					2	9	3	2	2	1	3	4	2	2	
Totals		**Stem count**	26	23	25	25	28	19	24	18	22	26	28	20	18	21	19	15	19	20	17	24	24	23	24	24	11	12	11	11	14
		Species count	6	7	6	7	5	6	10	6	7	4	4	7	6	6	7	5	6	6	5	7	5	6	5	5	5	4	5	3	6
		Stems per ACRE	1053	931	1012	1012	1134	769	972	729	891	1053	1134	810	729	850	769	607	769	810	688	972	972	931	972	972	445	486	445	445	567
Riparian Buffer Success Criteria		**Stem count**	26	23	25	25	28	19	24	18	22	26	28	20	18	21	19	15	19	20	17	24	24	23	24	24	11	12	11	11	14
		Species count	6	7	6	7	5	6	10	6	7	4	4	7	6	6	7	5	6	6	5	7	5	6	5	5	5	4	5	3	6
		Stems per ACRE	1053	931	1012	1012	1134	769	972	729	891	1053	1134	810	729	850	769	607	769	810	688	972	972	931	972	972	445	486	445	445	567

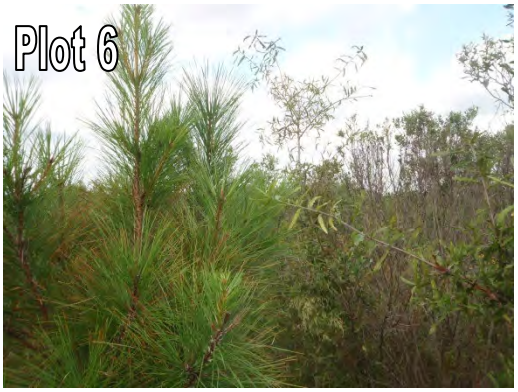
***Bolded** hardwood tree species are counted toward riparian buffer success criteria.

Heath 2014 (Year 5) 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**																									8				
shrub	Baccharis halimifolia	eastern baccharis	7	3	5	7	4	10	10	12	18	12	2	10	8	7	16	5	1	8	3	12	7			22	2	3	1	7	
shrub	Callicarpa americana	American beautyberry																										1			
tree	**Carpinus caroliniana**	**American hornbeam**	4	8		1	6	3	2		1		2	2																	2
tree	**Carya**	**hickory**							1		2						2					1									
tree	**Carya ovata**	**shagbark hickory**							1																						
tree	**Celtis laevigata**	**sugarberry**					1			4				1	1		2														
tree	**Fraxinus pennsylvanica**	**green ash**		2	3	5	1	2	4	2	7	5		2	3	1		1	3	4	4	3	10	8	10	2	4	2	5	5	3
shrub	Ilex opaca	American holly	1	1																	2							1			
tree	**Liquidambar styraciflua**	**sweetgum**														1					10						17				
tree	**Magnolia virginiana**	**sweetbay**	1	2		2	1											1						1			1				1
tree	**Nyssa**	**tupelo**							1										3												
tree	**Nyssa sylvatica**	**blackgum**			2			2	1	5	5	9	6	3			2		3	4											
tree	**Persea palustris**	**swamp bay**																				1									
tree	Pinus taeda	loblolly pine	8	1	2			2	3	1	2	1		7	10	9	2	2	1		20	8	3	1	2	4	27	13	5	4	
tree	**Platanus occidentalis**	**American sycamore**						1																							
tree	**Prunus serotina**	**black cherry**			1																					12					
tree	**Quercus**	**oak**				1			1						2	2		1	1	1											1
tree	**Quercus michauxii**	**swamp chestnut oak**	13	6	8	8	19	4	1	2	2	2	3	3	4	4	8	10	3	6	9	3	3	4	9	13	1		1		
tree	**Quercus nigra**	**water oak**	4	3					10	3	1			2			1		6	1	1	6	5	6	2	6	2	3	2	4	1
tree	**Quercus phellos**	**willow oak**	2	1	7	3		7	2	2	4	10	17	7		11	3	2		4	1	1	3	2	1	2		3	1		6
tree	**Quercus rubra**	**northern red oak**															1														
shrub	Rhus copallinum	flameleaf sumac		9	8	2																					22	15	6	6	
tree	**Ulmus**	**elm**			2										1	2															
tree	**Ulmus americana**	**American elm**	2	1	3	6									7	1					2	9	3	2	1	2	3	4	2	2	
Totals		**Stem count**	42	37	41	35	32	31	37	31	42	39	30	37	36	38	37	22	21	28	52	44	34	24	25	63	87	45	23	28	14
		Species count	9	11	10	9	6	8	12	8	9	6	5	9	8	9	9	7	8	7	9	9	7	7	6	8	10	9	8	6	6
		Stems per ACRE	1700	1498	1660	1417	1296	1255	1498	1255	1700	1579	1215	1498	1457	1538	1498	891	850	1134	2105	1781	1377	972	1012	2551	3522	1822	931	1134	567
Riparian Buffer Success Criteria		**Stem count**	26	23	26	26	28	19	24	18	22	26	28	20	18	22	19	15	19	20	27	24	24	23	23	37	36	12	11	11	14
		Species count	6	7	7	7	5	6	10	6	7	4	4	7	6	7	7	5	6	6	6	7	5	6	5	6	7	4	5	3	6
		Stems per ACRE	1053	931	1053	1053	1134	769	972	729	891	1053	1134	810	729	891	769	607	769	810	1093	972	972	931	931	1498	1457	486	445	445	567

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

Heath
Year 5 (2014)
Vegetation Monitoring Plot Photos
Taken October 2014



Heath
Year 5 (2014)
Vegetation Monitoring Plot Photos
Taken October 2014
(continued)

Heath
Year 5 (2014)
Vegetation Monitoring Plot Photos
Taken October 2014
(continued)

Heath
Year 5 (2014)
Vegetation Monitoring Plot Photos
Taken October 2014
(continued)

Appendix E.
Additional Site Data

Restoration Plan Figure 3. Soils
Preconstruction Aerial
Agency Coorespondence

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

Figure 3:
Soils

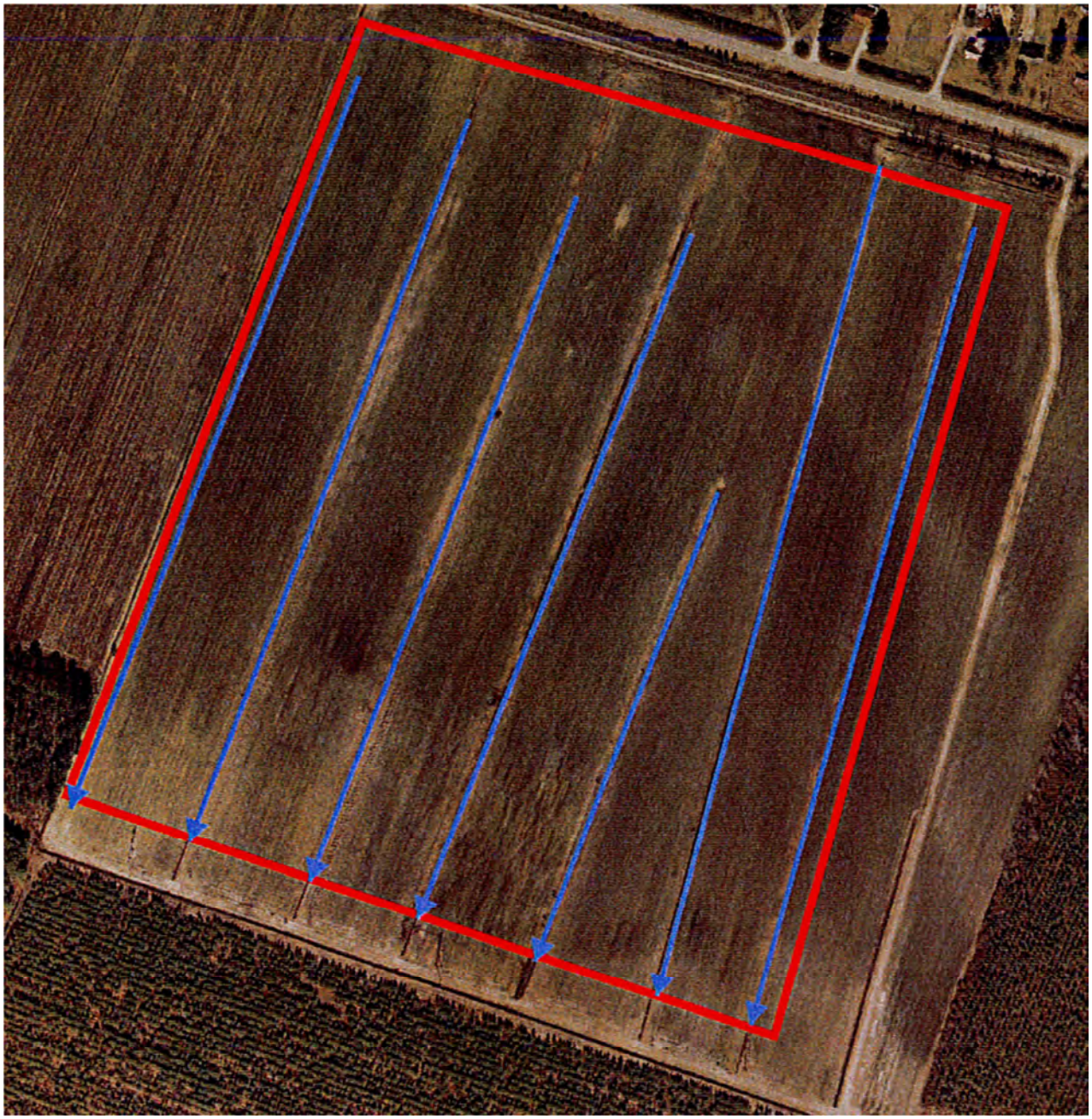
Heath Riparian Buffer
Mitigation Site
Craven County, NC

1:5,000

N

0 95 190 380 570 760
Feet

Preconstruction Aerial
Heath



North Carolina Department of Environment and Natural Resources
Division of Water Resources

Pat McCrory
Governor

Thomas A. Reeder
Director

John E. Skvarla, III
Secretary

February 20, 2014

To: Jeff Schaffer
NCEEP

From: Katie Merritt
NCDWR

Re: Year 4 Monitoring Report Review Comments
Heath Riparian Buffer Mitigation Site
Craven County
EEP # 002280
DWR #10-0691

On January 21, 2014, the Division of Water Resources (DWR) received the Year 4 Monitoring Report for the above-referenced site, dated November 2013.

A review of the report showed that the entire site was meeting success criteria for planted stems.

According to the report, this site will generate 59.45 acres of Riparian Buffer Mitigation Units. However, according to previous correspondence from DWR, only nutrient offset credits are approved to be generated since there are no buffered streams onsite. On February 20, 2014, a request for the subject site's ledger information was submitted to Kelly Williams with EEP. On February 20, 2014, Jeff Schaffer confirmed that EEP's IMS project database shows that this project will provide 59.45 acres (2,589,642 sq. ft.) of Nutrient Offset only.

Please feel free to contact me at (919) 807-6371 if you have any questions regarding this correspondence.

Cc: File Copy (Katie Merritt)
Tim Baumgartner (EEP)

401 and Buffer Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
Location: 512 N. Salisbury St. Raleigh, North Carolina 27604
Phone: 919-807-6300 \ FAX: 919-807-6494 \ Customer Service: 1-877-623-6748
Internet: www.ncwaterquality.org