FINAL
BASELINE MONITORING DOCUMENT AND ASBUILT BASELINE REPORT
LITTLE LICK CREEK BUFFER RESTORATION

Durham County, North Carolina
EEP Project No. 92542, Contract No. D13010S

Data Collection - January 2014

NEUSE RIVER BASIN
Cataloging Unit **03020201**

SUBMITTED TO/PREPARED FOR:

North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, North Carolina 27699-1652

February 2014

TABLE OF CONTENTS

APPENDICES

EXECUTIVE SUMMARY

The North Carolina Ecosystem Enhancement Program (NCEEP) has established the **Little Lick Creek Buffer Project** (Project) located approximately five miles east of Durham in Durham County, North Carolina. The Project is located within the Upper Neuse River Basin Hydrologic Unit and Targeted Local Watershed 03020201050020. This document details riparian buffer and nutrient offset buffer mitigation activites within an approximately 12.14-acre easement.

The *Little Lick Creek Local Watershed Plan* (NCEEP 2006) project atlas includes this Project (called Butler Road) with identified stressors resulting from anthropogenic activities related to the conversion of 80 percent of the watershed to disturbed land use/land cover with impervious surfaces covering over 14 percent of the watershed. Water quality is influenced due to the watershed slope (6 percent), the presence of moderately erodible soils, and its location within the Triassic Basin ecoregion. This project was identified for riparian buffer and nutrient offset restoration opportunities to improve hydrology, water quality, and habitat. Little Lick Creek is on the NC Section 303(d) list of impaired water bodies, due to poor aquatic life ratings and low levels of dissolved oxygen.

The goals of the Little Lick Creek Project (Butler Road) address stressors identified in the Project watershed and include the following.

- Restore riparian buffers associated with Little Lick Creek, a UT to Little Lick Creek, and water conveyances flowing to jurisdictional waters on site.

The project goals will be addressed by the following objectives:

- Reestablish natural vegetation along stream banks and water by planting existing cleared/disturbed land and treating invasive species.

Project restoration activities were completed between November 2013 and December 2013 with invasive species controls ongoing. Activities included 1) removal and treatment of invasive species including rose (*Rosa* sp.), Japanese honeysuckle (*Lonicera japonica*), and Chinese privet (*Ligustrum sinense*), 2) mowing and/or clearing of dense areas of loblolly pine (*Pinus taeda*) seedlings and blackberry (*Rubus argutus*), 3) soil amendments based on recommendations from soil samples analyzed by the NCDA&CS Agronomy Division, and 4) plant community restoration. The implemented mitigation is as follows.

Project Components and Mitigation Units Table

Mitigation Credits^						
Type	**Riparian Buffer**		**Nutrient Offset**			
Totals	**106,331 ft^2 (2.44 acres)**		**221,429 ft^2 (5.08 acres)** [minimum, see ** below] **Nitrogen: 11,547 lbs Phosphorous: 742 lbs**			
Projects Components						
Project Component/ Reach ID	**Restoration/ Restoration Equivalent**	**Restoration Acreage**	**Mitigation Ratio**	**Pounds of Nitrogen Treated Over 30 Years**	**Pounds of Phosphorus Treated Over 30 Years**	**Comment**
*Riparian Buffer	Restoration	106,331 ft^2 (2.44 acres)	1:1	**5546 lbs	**356 lbs	Invasive/nuisance species removal and planting with native hardwood trees.
***Nutrient Offset	Restoration	221,429 ft^2 (5.08 acres)	1:1	11,547 lbs	742 lbs	

^Calculated in accordance with DWR Memorandum (Appendix D).
*These areas are between 0-100 feet from top of bank and will either be used for Riparian Buffer Mitigation OR Nutrient pound reduction, not both.
**Additional nutrient removal potential if used in lieu of Riparian Buffer square footage.
***This area is between 100-200 feet from top of bank and can ONLY be used for Nutrient Offset pound reduction.

1.0 PROJECT GOALS, BACKGROUND, AND ATTRIBUTES

1.1 Location and Setting

The Project is located five miles east of Durham in United States Geological Survey (USGS) Hydrologic Unit (HU) and Targeted Local Watershed 03020201050020 (North Carolina Division of Water Quality [NCDWQ] Subbasin 03-04-01) of the Upper Neuse River Basin and will service the USGS 8-digit Cataloging Unit (CU) 03020201 (Figure 1, Appendix A) (USGS 1974). The project HU encompasses approximately 21 square miles and is largely characterized by urban land use. The Project drainage area, nested in the 700 square mile Falls Lake watershed, encompasses approximately 6.0 square miles at the downstream Project outfall. The Project drainage area is located on the outer edge of Durham with identified stressors resulting from anthropogenic activities related to the conversion of 80 percent of the watershed to disturbed land use/land cover and impervious surfaces covering over 14 percent of the watershed (NCEEP 2006).

Directions to the Project from Raleigh, North Carolina:

- Take Glenwood Avenue/US-70 West towards Durham
- After approximately 15.5 miles, turn right on S. Mineral Springs Road
- Turn left after 0.2 mile to stay on S. Mineral Springs Road
- The Project is 2.8 miles on the left; the access point is on Butler Road
  Latitude 35.9852 ºN, Longitude 78.8208 ºW (NAD83/WGS84)

1.2 Project Goals and Objectives

The Little Lick Creek Buffer Restoration Project is located in the Little Lick Creek Local Watershed planning area, which is nested in the 700 square mile Falls Lake watershed. The Project watershed is located within 14-digit Hydrologic Unit Code (HUC) 03020201050020, which was identified as a Targeted Local Watershed (TLW) in the North Carolina Ecosystem Enhancement Program (NCEEP) 2010 *Neuse River Basin Restoration Priority* (RBRP) plan and is identified in the 2009 *Little Lick Creek Local Watershed Plan* (LWP) Upper Neuse Project Atlas (Butler Road).

NCEEP developed a LWP for the 21-square mile Little Lick Creek watershed area that included land use analysis, water quality monitoring, and stakeholder input to identify problems with water quality, habitat, and hydrology. The Little Lick Creek watershed is relatively undeveloped and in an active state of rural to suburban transition with agriculture, forestry, rural, and undeveloped land comprising over 50 percent of the land uses. Durham's laws zone this land for more intensive development; therefore, this land is rapidly being converted to residential and commercial properties. Little Lick Creek is on the NC Section 303(d) list of impaired water bodies, due to poor aquatic life ratings and low levels of dissolved oxygen as the result of trash dumping, poor maintenance of on-site wastewater treatment systems, small vehicle maintenance and repair operations, outdoor materials storage, grease storage, and wash water disposal.

The Little Lick Creek LWP project atlas includes this Project (Butler Road) with identified stressors resulting from anthropogenic activities related to the conversion of 80 percent of the watershed to disturbed land use/land cover with impervious surfaces covering over 14 percent of the watershed. Water quality is influenced due to the watershed slope (6 percent), the presence of moderately erodible soils, and its location with the Triassic Basin ecoregion. This project was identified for riparian buffer and nutrient offset restoration opportunities to improve hydrology, water quality, and habitat.

The goals of the Little Lick Creek Project (Butler Road) address stressors identified in the Project watershed and include the following.

- Restore riparian buffers associated with Little Lick Creek, a UT to Little Lick Creek, and water conveyances flowing to jurisdictional waters on site.

The project goals will be addressed by the following objectives:

- Reestablish natural vegetation along stream banks and water by planting existing cleared/disturbed land and treating invasive species.

1.3 Project Structure, Restoration Type, and Approach

1.3.1 Project Structure

A depiction of the project structure is provided in the Project Assets (Figure 2, Appendix A) and the Project Components and Mitigation Units Table (Table 1, Appendix A).

1.3.2 Restoration Type and Approach

Project restoration work resulted in 106,331 square feet (2.44 acres) between top of bank and 100 feet from the top of bank viable for either riparian buffer mitigation or nutrient offset mitigation (providing 5546 pounds of nitrogen and 356 pounds of phosphorus offsets over 30 years). Additionally, work between 100 feet and 200 feet from the top of bank will result in 221,429 square feet (5.08 acres) of nutrient offset mitigation (providing 11,547 pounds of nitrogen offsets and 742 pounds of phosphorus offsets over 30 years).

Completed project activities, reporting history, completion dates, project contacts, and project attributes are summarized in Tables 1-4 (Appendix A).

2.0 SUCCESS CRITERIA

An average density of 320 planted hardwood stems per acre must be surviving after five monitoring years in accordance with North Carolina Division of Water Quality Administrative Code 15A NCAC 02B.0242 (*Neuse River Basin, Mitigation Program for Protection and Maintenance of Existing Riparian Buffers*) (NCDWQ 2007).

3.0 MONITORING PLAN

Annual monitoring data will be reported using the EEP monitoring template. The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, population of EEP databases for analysis, research purposes, and assist in decision making regarding project close-out. The following table outlines monitoring requirements for this Project.

Monitoring Schedule/Requirements Table

Parameter	Quantity	Frequency	Notes
Vegetation	8 CVS plots (see Figure 3 in Appendix A for approximate locations)	Monitoring Years 1-5	Vegetation will be monitored using the Carolina Vegetation Survey (CVS) protocols
Exotic and nuisance vegetation		Semi-annual	Locations of exotic and nuisance vegetation will be mapped
Project boundary		Semi-annual	Locations of fence damage, vegetation damage, boundary encroachments, etc. will be mapped

Vegetation Monitoring

After planting was completed, an initial evaluation was performed to verify planting methods were successful and to determine initial species composition and density. Eight sample vegetation plots (10-meter by 10-meter) were installed and measured within the Site as per guidelines established in *CVS-EEP Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008) (Figure 3, Appendix A). Vegetation plots are permanently monumented with 6-foot metal T-posts at each corner, and a ten foot tall pvc at the origin.. 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 be documented by photograph. Baseline vegetation plot information was collected December 11, 2013 and can be found in Appendix B. Initial stem count measurements indicate an average of 496 planted stems per acre across the Project.

4.0 MAINTENANCE AND CONTINGENCY

NCEEP shall monitor the Project on a regular basis and shall conduct a physical inspection of the Project a minimum of once per year throughout the post-construction monitoring period until performance standards are met.

Vegetation

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 SITE PROTECTION INSTRUMENT

The land required for the construction, management, and stewardship of this mitigation project includes portions of the following parcels. The State of North Carolina holds a conservation easement in perpetuity on all 12.14 acres of the Project area. The underlying deed is held by the Triangle Greenways Council (Figure 4, Appendix A).

Project Land Information Table

Parcel	Landowner	PIN	County	Site Protection Instrument	Deed Book/Page Number	Acreage Protected
1	Triangle Greenways Council	0851-03-33-3914	Durham	Conservation Easement and Right of Access	007156 / 000758	1.19
2		0851-03-33-1937				0.79
3		0851-03-33-2686				0.74
4		0851-03-33-1700				0.86
5		0851-03-23-9712				0.91
6		0851-03-23-9513				0.92
7		0851-03-23-9313				0.92
8		0851-03-23-9112				1.00
9		0851-03-33-0098				0.79
10		0851-03-33-1440				2.50
11		0851-03-22-6975				1.22
29		0851-03-23-6160				0.22
					TOTAL	**12.14**

5.0 REFERENCES

Lee, Michael T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Version 4.2. (online). Available: http://cvs.bio.unc.edu/methods.htm.

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.

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North Carolina Ecosystem Enhancement Program (NCEEP). 2006. Little Lick Creek Local Watershed Plan (online). Available: http://www.nceep.net/services/lwps/little_lick/LittleLick_LWP.pdf [January 7, 2013]. North Carolina Department of Environment and Natural Resources, Raleigh, North Carolina.

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Natural Resources Conservation Service (NRCS). 2012. Web Soil Survey (online). Available: http://websoilsurvey.nrcs.usda.gov/ [January 18, 2013]. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture.

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 Department of Agriculture (USDA). 2012. National Hydric Soils List by State, North Carolina (online). Available: ftp://ftp-fc.sc.egov.usda.gov/NSSC/Hydric_Soils/Lists/hydric_soils.xlsx [January 18, 2013]. United State Department of Agriculture, Natural Resources Conservation Service.

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

Appendix A.
General Tables and Figures

Table 1. Project Components and Mitigation Credits
Little Lick Creek Buffer Restoration

Mitigation Credits^						
Type	**Riparian Buffer**		**Nutrient Offset**			
Totals	**106,331 ft^2 (2.44 acres)**		**221,429 ft^2 (5.08 acres)** [minimum, see ** below] **Nitrogen: 11,547 lbs Phosphorous: 742 lbs**			
Projects Components						
Project Component/ Reach ID	**Restoration/ Restoration Equivalent**	**Restoration Acreage**	**Mitigation Ratio**	**Pounds of Nitrogen Treated Over 30 Years**	**Pounds of Phosphorus Treated Over 30 Years**	**Comment**
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^Calculated in accordance with DWR Memorandum (Appendix D).
*These areas are between 0-100 feet from top of bank and will either be used for Riparian Buffer Mitigation OR Nutrient pound reduction, not both.
**Additional nutrient removal potential if used in lieu of Riparian Buffer square footage.
***This area is between 100-200 feet from top of bank and can ONLY be used for Nutrient Offset pound reduction.

Table 2. Project Activity and Reporting History
Little Lick Creek Buffer Restoration

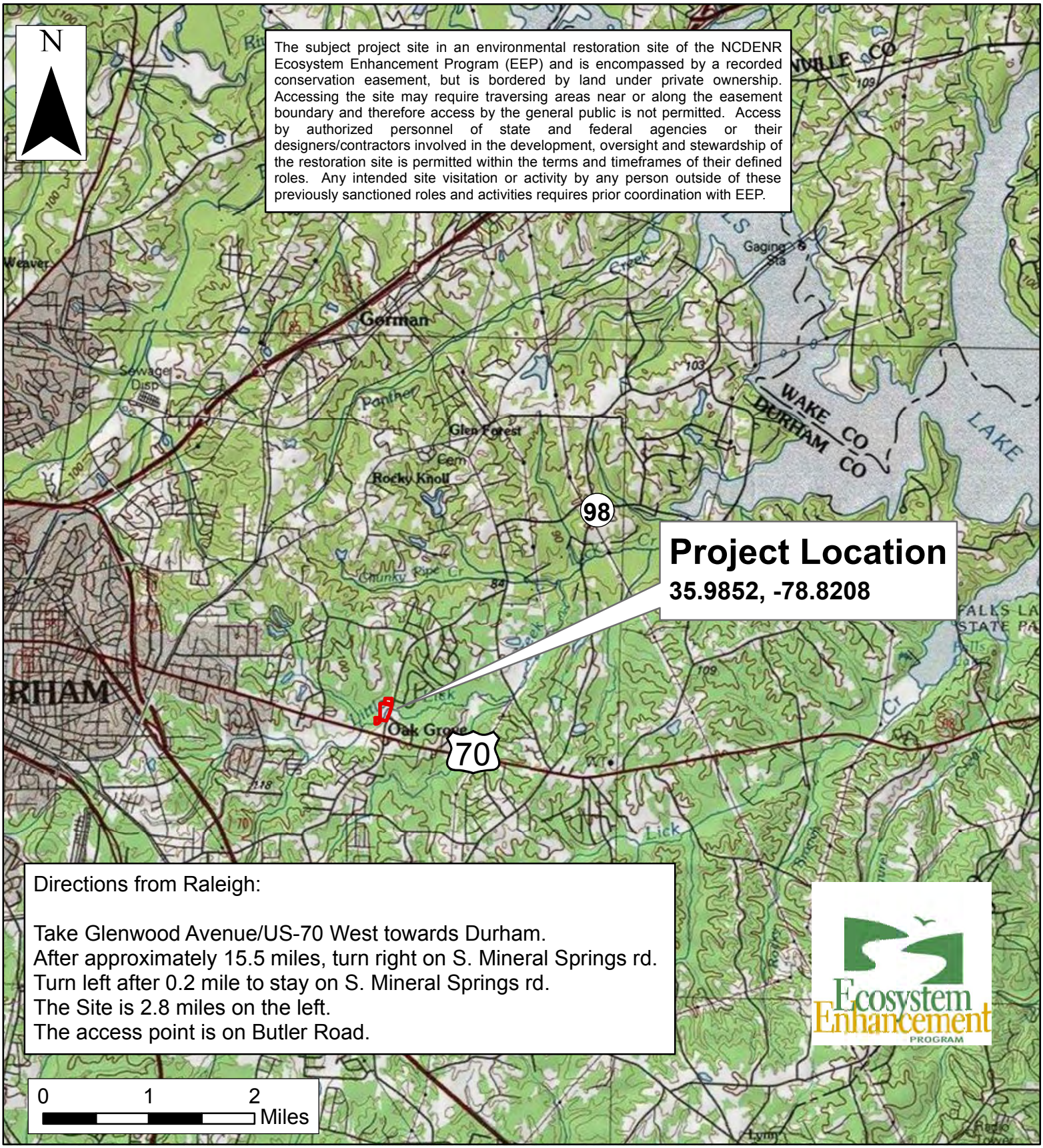
Activity or Deliverable	Data Collection Complete	Completion or Delivery
Mitigation Plan/Planting Plans	--	April 2013
Pine Removal & Invasive Species Control		August 2013
Bushhogging	--	November 2013
Invasive Species Controls	--	November 2013-present
Planting	--	December 2013
Baseline Monitoring Document (Year 0)	December 2013	February 2014

Table 3. Project Contacts Table
Little Lick Creek Buffer Restoration

Designer	Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693
Planting/Vegetation Maintenance/Invasive Species Control Contractor	River Works, Inc. 6105 Chapel Hill Rd. Raleigh, NC 27607 George Morris 919-818-3984
Baseline Data Collection	Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693

Table 4. Project Attribute Table
Little Lick Creek Buffer Restoration

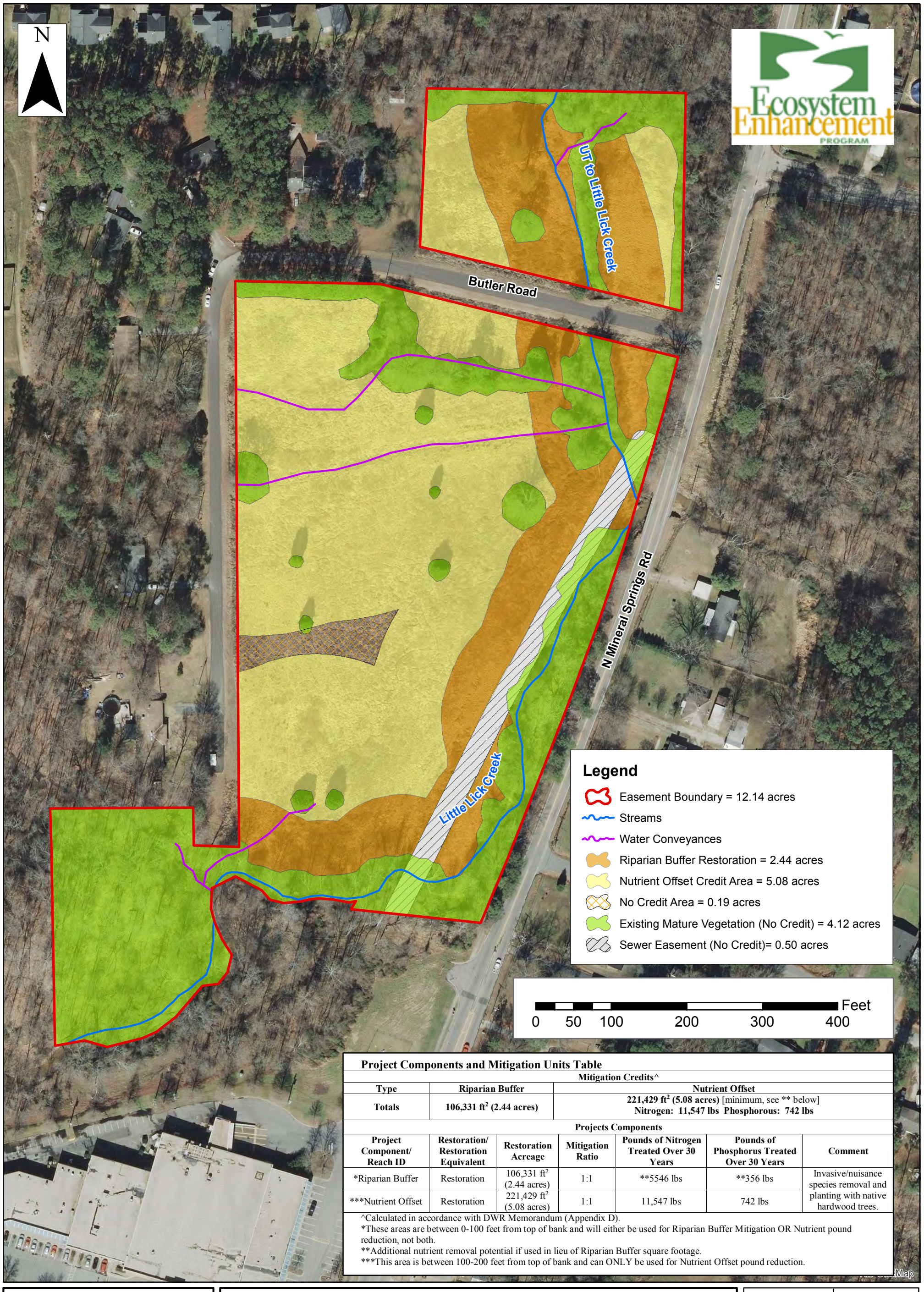
Project Information		
Project Name	Little Lick Creek	
Project County	Durham	
Project Area	12.1434 acres	
Project Coordinates	35.9852 ºN, 78.8208 ºW	
Project Watershed Summary Information		
Physiographic Region	Piedmont	
Project River Basin	Neuse	
USGS 8-digit HUC	03020201	
USGS 14-digit HUC	03020201050020	
NCDWQ Subbasin	03-04-01	
Project Drainage Area	6.0 square miles	
Project Drainage Area Impervious Surface	>14%	
Reach Summary Information		
Parameters	**Little Lick Creek**	**UT to Little Lick Creek**
Length of Reach (linear feet)	1254	510
Drainage Area (square miles)	6.04	0.27
NCDWQ Index Number	27-9-(0.5)	27-9-(0.5)
NCDWQ Classification	WS-IV, NSW	WS-IV, NSW
Dominant Soil Series	Chewacla and Wehadkee	
Drainage Class	Somewhat Poorly to Poorly Drained	
Soil Hydric Status	Hydric	
Slope	0-2 percent	
FEMA Classification	100-Year Floodplain	
Native Vegetation Community	Piedmont/Low Mountain Alluvial Forest	
Percent Composition of Exotic Invasives	5.6	
Regulatory Considerations		
Regulation	**Applicable**	
Waters of the U.S. –Sections 404 and 401	No	
Endangered Species Act	No	
Historic Preservation Act	No	
CZMA/CAMA	No	
FEMA Floodplain Compliance	No	
Essential Fisheries Habitat	No	



Axiom Environmental, Inc.
Axiom Environmental
218 Snow Avenue
Raleigh, NC 27603
(919) 215-1693

PROJECT LOCATION MAP
LITTLE LICK CREEK PROJECT
Durham County, North Carolina

Dwn. by. KRJ	FIGURE
Date: January 2013	1
EEP Project: 92542	



Project Components and Mitigation Units Table

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Axiom Environmental, Inc.
Axiom Environmental
218 Snow Avenue
Raleigh, NC 27603
(919) 215-1693

PROJECT ASSETS
LITTLE LICK CREEK PROJECT
Durham County, North Carolina

Dwn. by. KRJ/CLF/PHP
Date: January 2014
EEP Project: 92542

FIGURE
2

N

Butler Road

Mineral Springs Road

Little Lick Creek

1
2
3
4
5
6
7
8

1
2
3
4
5

Ecosystem Enhancement PROGRAM

Legend

- Easement Boundary = 12.14 acres
- Streams
- Water Conveyances
- CVS Vegetation Plots
- Photo Point
- Sewer Easement
- Excluded Area (No Credit) = 0.19 acres
- Existing Mature Vegetation (No Planting) = 4.12 acres

0 100 200 Feet

Axiom Environmental, Inc.
Axiom Environmental
218 Snow Avenue
Raleigh, NC 27603
(919) 215-1693

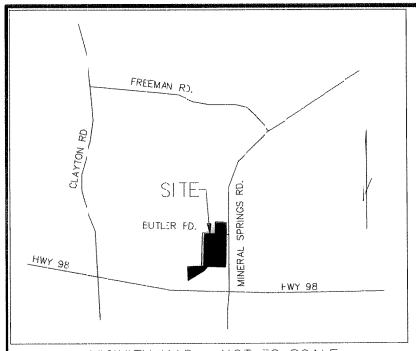
CURRENT CONDITION PLAN VIEW
LITTLE LICK CREEK SITE
Durham County, North Carolina

Dwn. by.
KRJ

Date:
January 2014

Project:
12-025

FIGURE
3



VICINITY MAP - NOT TO SCALE

STATE OF NORTH CAROLINA WAKE COUNTY

I, G. SCOTT WILSON, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION DEED DESCRIPTION RECORDED IN BOOK 1412, PAGE 109, THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN BOOK _____, PAGE _____; THAT THE RATIO OF PRECISION AS CALCULATED IS 1:10,000+; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED.

WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER, AND SEAL THIS 21st DAY OF June, A.D., 2011

PROFESSIONAL LAND SURVEYOR - LICENSE # 2601

POINT TABLE		
REBAR & CAP #	NORTHING	EASTING
1	814078.38	2053405.53
2	813789.31	2053461.32
3	813874.74	2053054.54
4	814084.69	2053063.91
5	813728.62	2053396.87
6	812978.33	2053131.04
7	812996.50	2052963.33
8	812833.30	2052571.14
9	813130.46	2052563.77
10	813131.63	2052755.02
11	813081.47	2052751.32
12	813079.48	2052815.34
13	813829.73	2052810.70
14	813825.80	2053002.34

I, G. SCOTT WILSON, PROFESSIONAL LAND SURVEYOR NO. L-2601 CERTIFY TO ONE OR MORE OF THE FOLLOWING AS INDICATED:
A. THAT THIS PLAT IS OF A SURVEY THAT CREATES A SUBDIVISION OF LAND WITHIN THE AREA OF A COUNTY OR MUNICIPALITY THAT HAS AN ORDINANCE THAT REGULATES PARCELS OF LAND;
B. THAT THIS PLAT IS OF A SURVEY THAT IS LOCATED IN SUCH PORTION OF A COUNTY OR MUNICIPALITY THAT IS UNREGULATED AS TO AN ORDINANCE THAT REGULATES PARCELS OF LAND;
C. THAT THIS IS OF A SURVEY OF AN EXISTING PARCEL OR PARCELS OF LAND AND DOES NOT CREATE A NEW STREET OR CHANGE AN EXISTING STREET;
D. THAT THIS PLAT IS OF A SURVEY OF ANOTHER CATEGORY, SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT-ORDERED SURVEY OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION;
E. THAT THE INFORMATION AVAILABLE TO THIS SURVEYOR IS SUCH THAT I AM UNABLE TO MAKE A DETERMINATION TO THE BEST OF MY PROFESSIONAL ABILITY AS TO PROVISIONS CONTAINED IN (A) THROUGH (D) ABOVE.

G. SCOTT WILSON P.L.S. NO. 2601

OWNERS CERTIFICATE:

THE UNDERSIGNED OWNER OF THIS PROPERTY LYING WITHIN THE ATTACHED PLAT AND SUBDIVISION HEREBY CERTIFIES THAT RICHARD D. LARRABEE & THELMA A. LARRABEE ORDERED THE WORK OF SURVEYING AND PLATTING TO BE DONE, AND THAT ALL PUBLIC STREETS, ALLEYS, EASEMENTS, AND OTHER OPEN SPACES SO DESIGNATED UPON SAID PLAT ARE HEREBY DEDICATED FOR SUCH USE AND THAT ALL PUBLIC AND PRIVATE EASEMENTS SHOWN UPON SAID PLAT ARE HEREBY GRANTED FOR THE USE STIPULATED.

Richard D. Larrabee OWNER;
Thelma A. Larrabee OWNER

WITNESS TO SIGNATURE
G. SCOTT WILSON, PLS

STATE OF NORTH CAROLINA
COUNTY OF WAKE

I RAYE W. TAYLOR A NOTARY PUBLIC, CERTIFY THAT G. SCOTT WILSON PERSONALLY APPEARED BEFORE ME THIS DAY AND CERTIFIED TO ME BY AFFIRMATION THAT HE IS NOT A GRANTEE OR BENEFICIARY OF THE TRANSACTION, SIGNED THE FOREGOING DOCUMENT AS A SUBSCRIBING WITNESS, AND WITNESSED RICHARD D. LARRABEE & THELMA A. LARRABEE SIGN THE FOREGOING DOCUMENT.

DATE 6-23-11
Raye W. Taylor
NOTARY PUBLIC
MY COMMISSION EXPIRES March 27, 2015

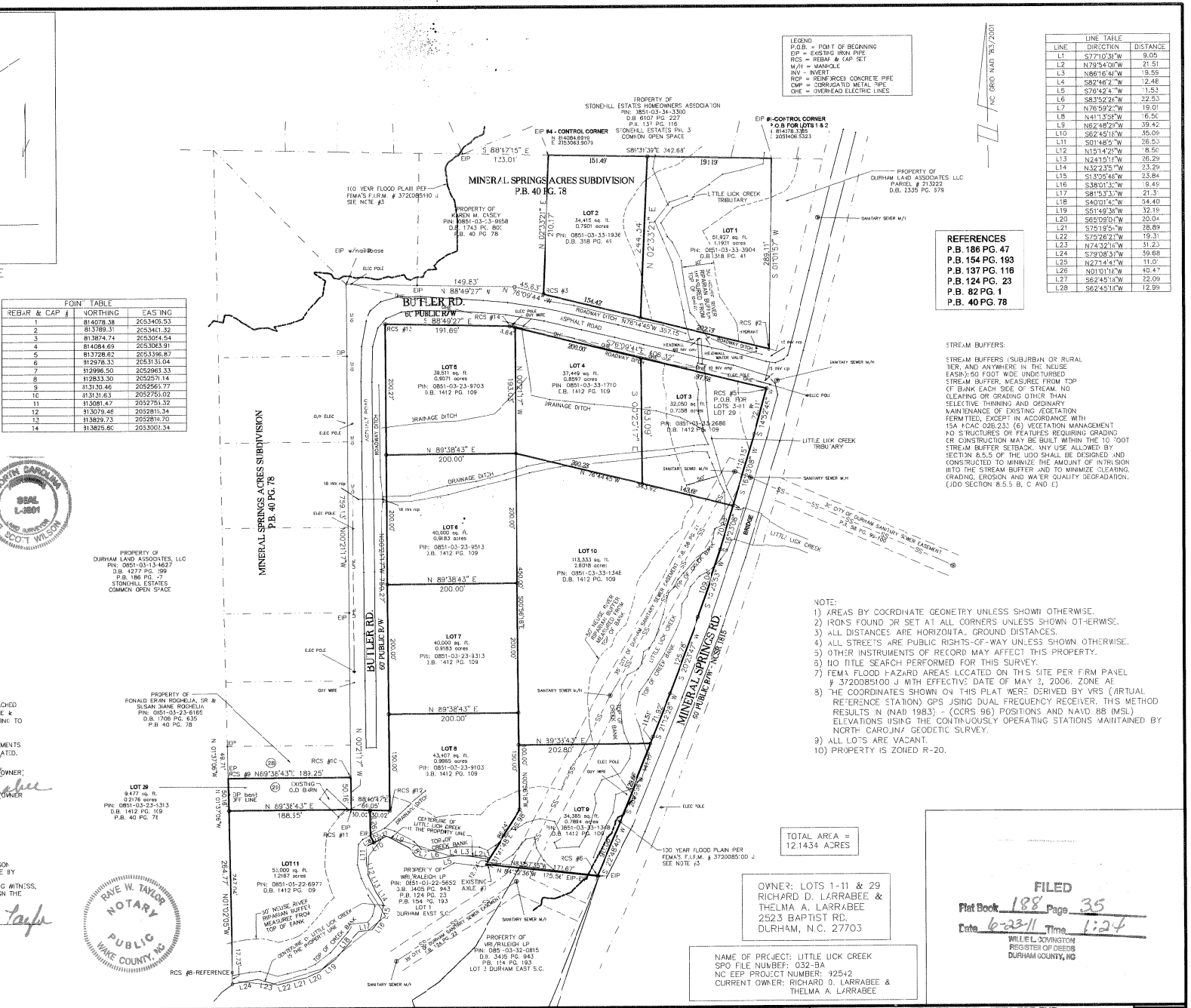
RAYE W. TAYLOR NOTARY PUBLIC WAKE COUNTY, NC

STATE OF NORTH CAROLINA
COUNTY OF DURHAM

I, _____, REVIEW OFFICER FOR DURHAM COUNTY, N.C., DO HEREBY CERTIFY THE PLAT OR MAP TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

_____ DATE _____
REVIEW OFFICER

SCALE: 1" = 100'
0 50 100 200 300 400


PROPERTY OF STONEHILL ESTATES HOMEOWNERS ASSOCIATION PIN: 1851-03-34-3300 D.B. 6107 PG. 227 P.B. 137 PG. 116
EIP #4 - CONTROL CORNER N 814084.6916 E 2153063.9073
EIP #1-CONTROL CORNER ? O.B FOR LOTS 1 & 2 814078.1385 2051406.5323
MINERAL SPRINGS ACRES SUBDIVISION P.B. 40 PG. 78
STONEHILL ESTATES PH. 3 COMMON OPEN SPACE
PROPERTY OF DURHAM LAND ASSOCIATES LLC PARCEL # 213222 D.B. 2335 PG. 379
100 YEAR FLOOD PLAIN PER FEMA'S F.I.R.M. # 3720085100 J SEE NOTE #3
PROPERTY OF KAREN M. CASEY PIN: 0851-03-13-9658 D.B. 1743 PG. 860 P.B. 40 PG. 78
LOT 1 51,922 sq. ft. 1.1921 acres PIN: 0851-03-33-3904 D.B. 1318 PG. 41
LOT 2 34,415 sq. ft. 0.7901 acres PIN: 0851-03-33-1936 D.B. 318 PG. 41
LOT 3 32,050 sq. ft. 0.7358 acres PIN: 0851-03-33-2686 D.B. 1412 PG. 109
LOT 4 37,449 sq. ft. 0.8597 acres PIN 0851-03-33-1710 D.B. 1412 PG. 109
LOT 5 39,541 sq. ft. 0.9078 acres PIN: 0851-03-23-9703 D.B. 1412 PG. 109
LOT 6 40,000 sq. ft. 0.9183 acres PIN: 0851-03-23-9513 D.B. 1412 PG. 109
LOT 7 40,000 sq. ft. 0.9183 acres PIN: 0851-03-23-9313 D.B. 1412 PG. 109
LOT 8 43,407 sq. ft. 0.9965 acres PIN: 0851-03-23-9103 D.B. 1412 PG. 109
LOT 9 34,385 sq. ft. 0.7894 acres PIN: 0851-03-33-1348 D.B. 1412 PG. 109
LOT 10 113,333 sq. ft. 2.6018 acres PIN: 0851-03-33-1348 D.B. 1412 PG. 109
LOT 11 51,000 sq. ft. 1.2187 acres PIN: 0851-01-22-6977 D.B. 1412 PG. 099
LOT 39 9,477 sq. ft. 0.2176 acres PIN: 0851-03-23-5313 D.B. 1412 PG. 109 P.B. 40 PG. 78
PROPERTY OF RONALD ERWIN ROCHELLE, SR & SUSAN DIANE ROCHELLE PIN: 0851-03-23-6165 D.B. 1706 PG. 635 P.B 40 PG. 78
PROPERTY OF DURHAM LAND ASSOCIATES, LLC PIN: 0851-03-13-4627 D.B. 9277 PG. 199 P.B. 186 PG. 47 STONEHILL ESTATES COMMON OPEN SPACE
PROPERTY OF WR/RALEIGH LP PIN: 0851-01-22-5652 D.B. 3405 PG. 943 P.B. 124 PG. 23 P.B. 154 PG. 193 LOT 1 DURHAM EAST S.C.
PROPERTY OF WR/RALEIGH LP PIN: 085 -03-32-0815 D.B. 3415 PG. 943 P.B. 174 PG. 193 LOT 2 DURHAM EAST S.C.
BUTLER RD. 60' PUBLIC R/W
MINERAL SPRINGS RD. 60' PUBLIC R/W - NCSR 1815
LITTLE LICK CREEK TRIBUTARY
LITTLE LICK CREEK
RCS #1 RCS #2 RCS #3 RCS #4 RCS #5 RCS #6 RCS #7 RCS #8 RCS #9 RCS #10 RCS #11 RCS #12
EIP EIP w/nail&base
S 88°17'15" E 133.01'
S 88°31'39"E 342.68'
N 88°49'27" W 149.83'
S 88°49'27" E 191.66'
N 76°09'44" W 154.42'
N 76°09'44" W 357.15'
S 76°09'44" E 406.32'
N 02°23'32" E 210.17'
N 02°23'32" E 244.54'
S 01°01'57" W 289.11'
N 89°38'43" E 200.00'
N 39°33'43" E 202.80'
N 69°36'43" E 188.55'
S 88°49'27" E 189.25'
S 27°12'32" E 175.46'
N 84°22'36" W 175.54'
N 89°36'43" E 189.25'
N 00°27'17" W 1,007.13'
S 00°27'17" E 1,007.13'
S 00°27'17" E 1,007.13'
N 00°27'17" W 1,007.13'
S 16°44'45" W 383.92'
S 16°44'45" W 383.92'
S 16°44'45" W 383.92

Appendix B.
Vegetation Data

Table 7. Planted Woody Vegetation
Table 8. Total Planted and All Stems by Plot and Species
Vegetation Plot Photographs

Table 7. Planted Bare Root Woody Vegetation

Species	Quantity
American sycamore *(Platanus occidentalis)*	504
Green ash (*Fraxinus pennsylvanica*)	466
Hackberry (*Celtis laevigata*)	56
Red maple *(Acer rubrum)*	277
River birch (*Betula nigra*)	458
Swamp chestnut oak (*Quercus michauxii*)	310
Tulip Poplar *(Liriodendron tulipifera)*	429
Water oak (*Quercus nigra*)	300
Willow oak (*Quercus phellos*)	254
TOTAL	3054

Table 8. Total and Planted Stems by Plot and Species
EEP Project Code 92542. Project Name: Little Lick Creek

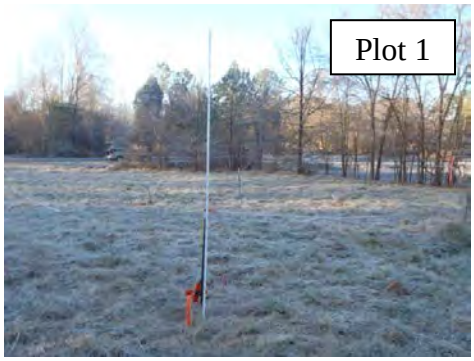
			Current Plot Data (MY0 2013)																							Annual Means		
			92542-01-0001			92542-01-0002			92542-01-0003			92542-01-0004			92542-01-0005			92542-01-0006			92542-01-0007			92542-01-0008			MY0 (2013)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree							1	1	1	2	2	2	3	3	3				1	1	1				7	7	7
Betula nigra	river birch	Tree				1	1	1	4	4	4				1	1	1				2	2	2	4	4	4	12	12	12
Fraxinus pennsylvanica	green ash	Tree	9	9	9	2	2	2	1	1	1				1	1	1	4	4	4				6	6	6	23	23	23
Liriodendron tulipifera	tuliptree	Tree				1	1	1										3	3	3	2	2	2	2	2	2	8	8	8
Platanus occidentalis	American sycamore	Tree	1	1	1				2	2	2				2	2	2	1	1	1	4	4	4	1	1	1	11	11	11
Quercus michauxii	swamp chestnut oak	Tree	7	7	7	2	2	2				2	2	2	3	3	3	1	1	1	1	1	1	4	4	4	20	20	20
Quercus nigra	water oak	Tree	3	3	3	1	1	1	2	2	2	4	4	4				1	1	1							11	11	11
Quercus phellos	willow oak	Tree				1	1	2				2	2	2	1	1	1	1	1	1	1	1	1				6	6	7
Ulmus alata	winged elm	Tree									1																		1
		Stem count	20	20	20	8	8	9	10	10	11	10	10	10	11	11	11	11	11	11	11	11	11	17	17	17	98	98	100
		size (ares)	1			1			1			1			1			1			1			1			8		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.20		
		Species count	4	4	4	6	6	6	5	5	6	4	4	4	6	6	6	6	6	6	6	6	6	5	5	5	8	8	9
		Stems per ACRE	809.4	809.4	809.4	323.7	323.7	364.2	404.7	404.7	445.2	404.7	404.7	404.7	445.2	445.2	445.2	445.2	445.2	445.2	445.2	445.2	445.2	688	688	688	495.7	495.7	505.9

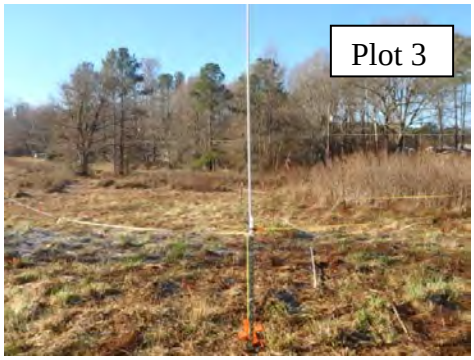
Color for Density

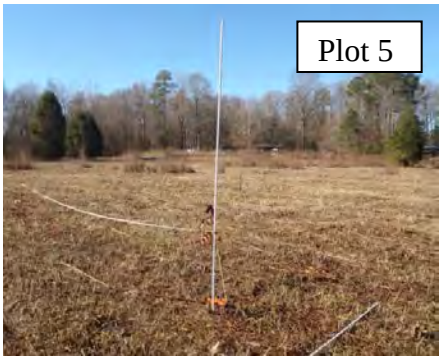
Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

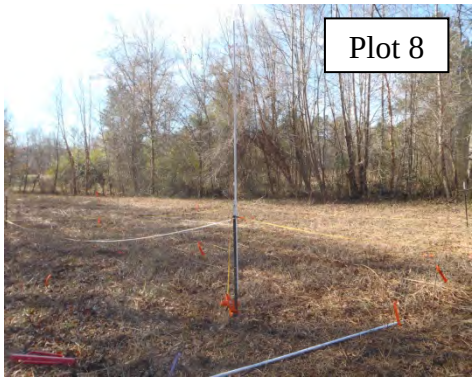
PnoLS = Planted excluding livestakes
P-all = Planting including livestakes
T = All planted and natural recruits including livestakes
T includes natural recruits

Little Lick Creek (Butler Road)
Baseline Vegetation Monitoring Photographs
Taken December 2013





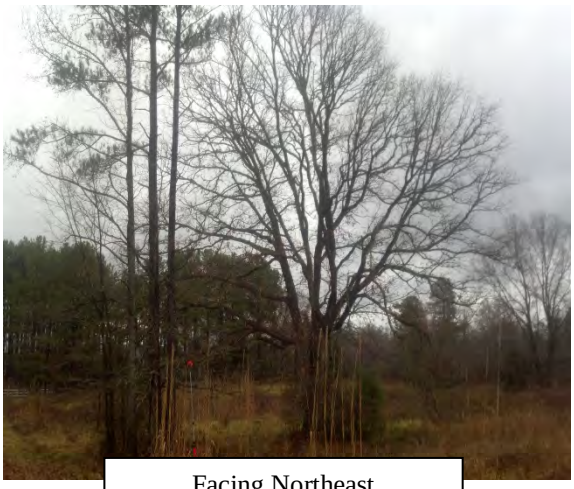




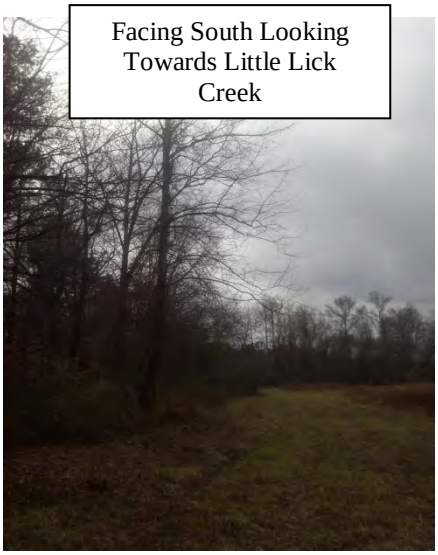
Appendix C.
Preconstruction and
Asbuilt Photographs

Preconstruction Photographs
Taken January 2013

Facing East



Facing Northeast



Facing South Looking Towards Little Lick Creek

Facing West Looking at a Water Conveyance Draining Project Fields

Facing North Looking at the UT to Little Lick Creek

Asbuilt Photo Point Photographs
Taken December 2013

Appendix D.
DWR Memorandum

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

Pat McCrory
Governor

Thomas A. Reeder
Director

John E. Skvarla, III
Secretary

August 9, 2013

MEMORANDUM

To: N.C. Ecosystem Enhancement Program

From: Tom Reeder

Subject: DWR responses to the EEP document "*Reforms needed immediately in the regulation of riparian buffer mitigation*"

On August 2, 2013, the Division of Water Resources (DWR) received a document from the N.C. Ecosystem Enhancement Program (EEP) titled "*Reforms needed immediately in the regulation of riparian buffer mitigation*". Below is a short summary of each point raised in the document and DWR's response to those points.

I. Riparian Buffer Mitigation Widths – the Ironclad 50' Standard

There are two issues raised under this section: (a) provide mitigation credit for buffers wider than 50 feet and (b) provide mitigation credit for buffers narrower than 50 feet.

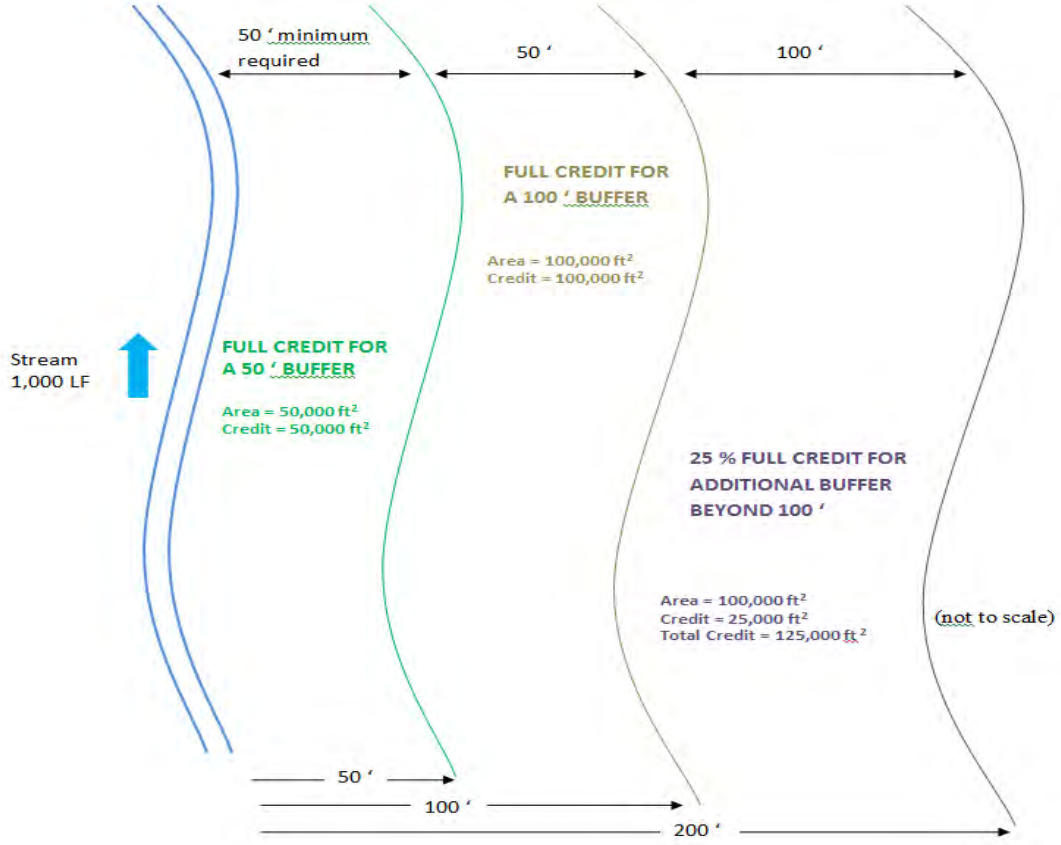
Response:

(a) DWR will approve mitigation credit for buffer widths in excess of 50 feet on a prorated basis, up to a maximum of 200 feet, including on pre-existing mitigation sites:

Buffer width (ft)	Percentage of Full Credit
50-100	100%
101-200	25% for area > 100 feet

1617 Mail Service Center, Raleigh, North Carolina 27699-1617
Location: 512 N. Salisbury St. Raleigh, North Carolina 27604
Phone: 919-807-6300 \ FAX: 919-807-6492
Internet: www.ncwaterquality.org

Example for restoration of a 1,000 linear foot stream segment:



(b) DWR agrees that mitigation credit should be granted for restored buffer widths less than 50 feet, however this would require a rule change. The draft consolidated buffer mitigation rule (15A NCAC 02B .0295) already has provisions for narrower buffers in urban areas and DWR supports expanding this to non-urban areas.

II. Riparian Buffer Jurisdiction – Map Jurisdiction.

There are two issues raised under this section: (a) the ability to conduct restoration or enhancement on unmapped streams and (b) the ability to conduct restoration or enhancement on all watercourses, including ditches.

Response for the Neuse, Tar-Pamlico, Catawba and Jordan:

Under the current buffer mitigation rules, applicants may "restore or enhance a non-forested riparian buffer…" A riparian buffer is defined within each of the buffer rules. Each rule has an applicability paragraph that defines where the rule shall apply (*e.g.* in the Neuse "*This Rule shall apply to 50-foot wide riparian buffers directly adjacent to surface waters in the Neuse River Basin (intermittent streams, perennial streams, lakes, ponds, and estuaries), excluding wetlands*.") The rule goes on further to clarify that a subject feature must be depicted on either the USGS topo map or the NRCS soil survey and defines the Zones of the riparian buffer.

To allow buffer mitigation to occur on non-subject features requires a rule change. DWR does support buffer mitigation on unmapped streams, and the draft consolidated buffer mitigation rule (15A NCAC 02B .0295) already has language to allow for this.

Response for Randleman:

Under the current Randleman buffer mitigation rules, applicants may "restore or enhance a non-forested riparian buffer…" A riparian buffer is defined within the Randleman rules to include unmapped features, as well as ditches or manmade conveyances that "deliver untreated stormwater runoff from an adjacent source directly to an intermittent or perennial stream are subject to the Rule."

DWR will continue to allow buffer mitigation to occur in the Randleman watershed on unmapped features as well as ditches or manmade conveyances that meet the rule.

Response for Goose Creek:

Under the current Goose Creek buffer mitigation rules, unmapped streams may be used to provide buffer mitigation, as well as first order ephemeral streams that discharge/outlet into intermittent or perennial streams.

III. Riparian Buffer Jurisdiction – Stream Calls on Mapped Streams

The issues raised under this section focus on the requirement to have a stream determination made by DWR staff. More specifically, there is a concern that the stream method is not appropriate for modified natural streams that may be severely degraded and that these streams are not eligible for mitigation.

Response:

- DWR will allow all subject streams to be eligible for riparian buffer mitigation.

IV. Restoration Success Criteria – Native Hardwood Trees

The issues raised under this section focus on the requirement to plant a minimum of at least two native hardwood tree species and the current DWR practice of not allowing Sweet Gum or Red Maple to be counted towards meeting this requirement.

Response:

- DWR agrees that as written, the use of Sweet Gum and Red Maple counts towards meeting the minimum requirement of the rule. Mitigation providers will be expected to meet planting criteria established by the IRT in buffer areas that are part of a stream mitigation site.

V. Restoration Success Criteria – Planted Stems

The issues raised under this section focus on the requirement to plant 320 trees per acre and the statement that DWR does not count trees derived from existing seed sources, planted seeds, stump sprouts or other volunteer species towards meeting that 320 requirement.

Response:

- DWR agrees that using 260 stems per acre at the end of the monitoring period would provide more consistency with the federal performance standards for stream and wetland projects; however this would require a rule change. The draft consolidated buffer mitigation rule (15A NCAC 02B .0295) has already incorporated this change.

  DWR staff will continue to consider the presence of woody volunteers during closeout of buffer sites.

VI. Restoration and Enhancement Criteria – Measuring Density

The issues raised under this section focus on tree density for determining restoration or enhancement. More specifically, the issues include the inconsistency among rules, the lack of clarity on how to measure density which has resulted in inconsistent calls among DWR staff, and the use of a tree's dripline.

Response:

- DWR agrees that the inconsistency among rules has created confusion and inconsistency in implementation; however this would require a rule change to be consistent among all six rules. The draft consolidated buffer mitigation rule (15A NCAC 02B .0295) has definitions for restoration, enhancement and preservation, which were written to provide clarity and predictability while still allowing DWR staff to use best professional judgment in evaluating potential mitigation sites based on their many years of experience.

  In the Jordan and Randleman watersheds, the rules allow for restoration on sites with fewer than 100 trees/acre and enhancement on sites with between 100 and 200 trees. In these two watersheds, DWR will accept established forestry protocols (e.g. fixed radius plot sampling) to be used to determine existing tree densities in any non-forested buffer area. Sufficient numbers of plots should be used to accurately assess stem densities and delineate areas of the site with varying densities. Plot data should not be averaged to determine an overall stem density unless the site is fairly homogeneous in terms of vegetative coverage. Existing forested areas should be delineated out and not included in stem density calculations. DWR has not considered the drip line to represent the outer edge of a wooded area for several years and will not consider it in the future. Existing wooded areas should be delineated at the trunks of the outer edge of the areas.