

FINAL
YEAR 1 (2014) ANNUAL MONITORING REPORT
LITTLE LICK CREEK BUFFER RESTORATION

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

Data Collection - September 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



November 2014

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1.0 PROJECT 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 activities within an approximately 12.14-acre easement. The easement boundary currently has no signage or marking. Completed project activities, reporting history, completion dates, project contacts, and project attributes are summarized in Tables 1-4 (Appendix A). This report (compiled based on the NC Ecosystem Enhancement Program (NCEEP) *Procedural Guidance and Content Requirements for EEP Monitoring Reports* Version 1.5 dated 6/8/12) summarizes data for Year 1 (2014) monitoring.

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.

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.

Vegetation 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).

2.0 METHODOLOGY

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 to 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 B for approximate locations)	Annually in 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 B). 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. Vegetation plot information for MY1 (2014) was collected in September 2014 and can be found in Appendix C. Stem count measurements for MY1 (2014) indicate an average of 450 planted stems per acre across the Project. Six out of eight vegetation plots met success criteria for

MY1 (2014) monitoring. Plots 2 and 3 where 2 and 3 stems, respectively, shy of meeting success criteria based on planted stems alone; however, when including natural recruits of green ash (*Fraxinus pennsylvanica*) and willow oak (*Quercus phellos*) in Plot 2 and winged elm (*Ulmus alata*) in Plot 3, these plots were above success criteria.

Planted stem mortality can be attributed to competition from the dense herbaceous layer. A large patch of Japanese honeysuckle (*Lonicera japonica*) was observed in the center of the Site, in the vicinity of Plots 4, 5, and 6. The vines are affecting the vigor of planted woody stems; therefore, treatment is recommended. Additionally, a small patch of Chinese lespedeza (*Lespedeza cuneata*) was observed in the vicinity of Plot 3, which is attributing to the low planted stem counts in this plot. These areas are depicted on Figure 3 (Appendix B).

3.0 REFERENCES

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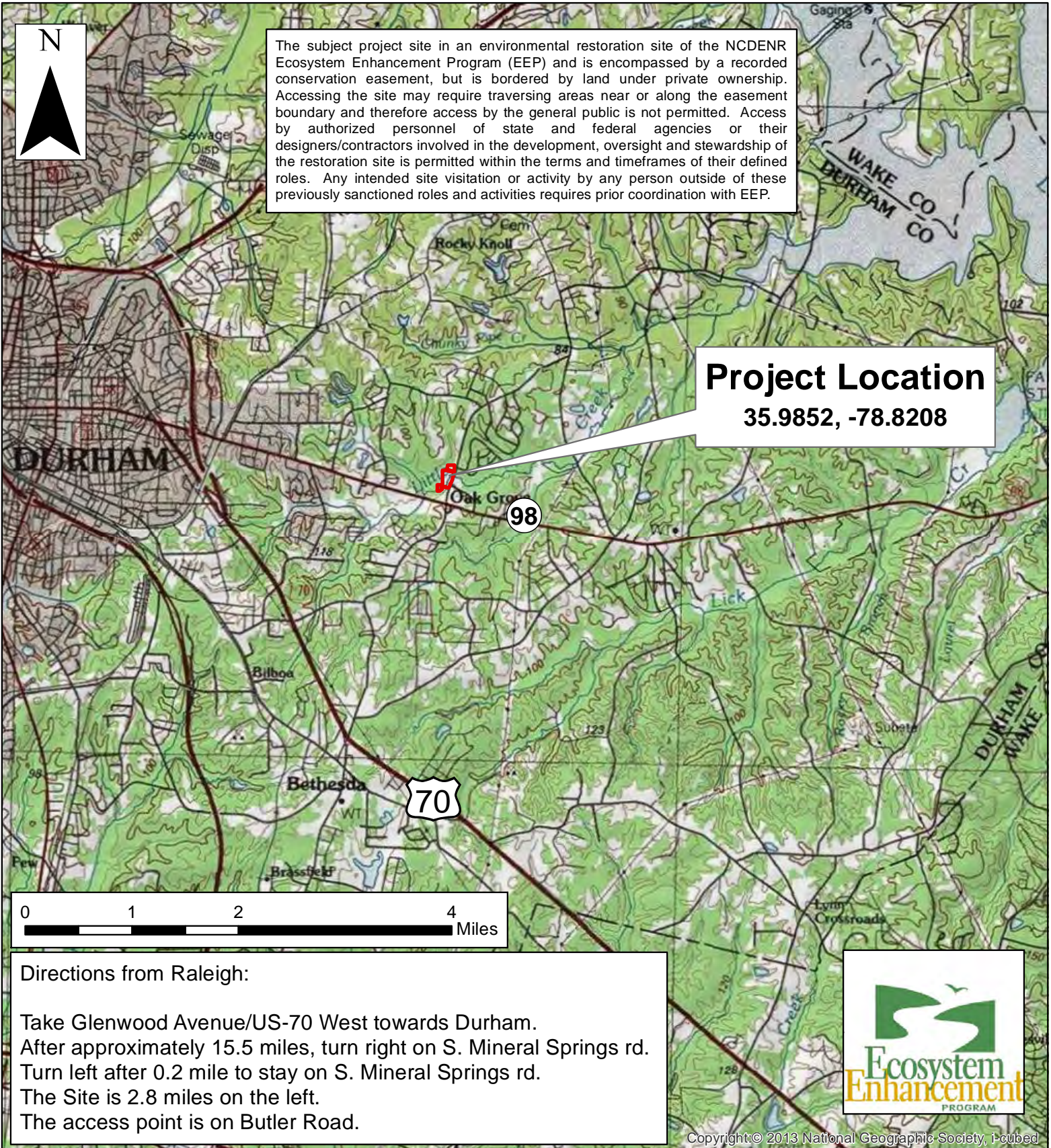
Appendix A.
Project Vicinity Map and Background Tables

- Figure 1. Project Location Map
Table 1. Project Components and Mitigation Credits
Table 2. Project Activity and Reporting History
Table 3. Project Contacts Table
Table 4. Project Attributes Table



The subject project site in an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designers/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with EEP.

Project Location
35.9852, -78.8208



Directions from Raleigh:

Take Glenwood Avenue/US-70 West towards Durham.
 After approximately 15.5 miles, turn right on S. Mineral Springs rd.
 Turn left after 0.2 mile to stay on S. Mineral Springs rd.
 The Site is 2.8 miles on the left.
 The access point is on Butler Road.



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

Axiom Environmental, Inc.

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

Dwn. by:
 KRJ

Date:
 October 2014

EEP Project:
 92542

FIGURE
1

**Table 1. Project Components and Mitigation Credits
Little Lick Creek Buffer Restoration (EEP #92542)**

		Mitigation Credits [^]		Nutrient Offset		
Type	Riparian Buffer					
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.
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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 (EEP #92542)**

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
2014 Annual Monitoring Document (Year 1)	September 2014	October 2014

**Table 3. Project Contacts Table
Little Lick Creek Buffer Restoration (EEP #92542)**

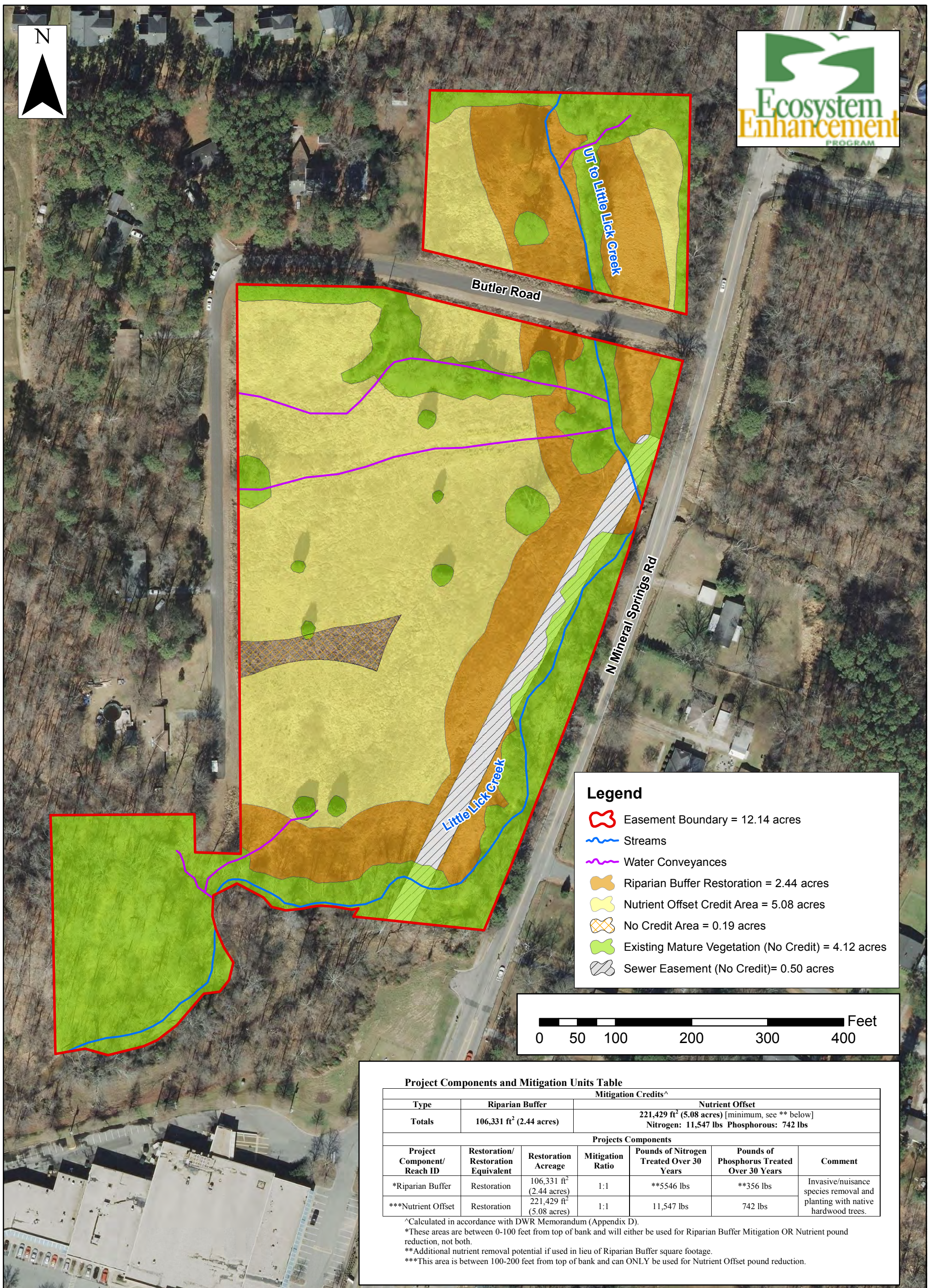
Designer	Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693
Planting/Vegetation Maintenance/Invasive Species Control Contractor	River Works, Inc. 6105 Chapel Hill Rd. Raleigh, NC 27607 George Morris 919-818-3984
Baseline Data Collection & Annual Monitoring	Axiom Environmental,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

**Table 4. Project Attribute Table
Little Lick Creek Buffer Restoration (EEP #92542)**

Project Information		
Project Name	Little Lick Creek	
Project County	Durham	
Project Area	12.1434 acres	
Project Coordinates	35.9852 °N, 78.8208 °W	
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	

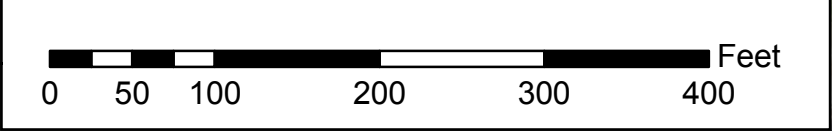
Appendix B.
Visual Assessment Data

Figure 2. Project Assets
Figure 3. Current Conditions Plan View
Table 5. Vegetation Condition Assessment
Vegetation Plot Photographs
Fixed-Station Photographs



Legend

- Easement Boundary = 12.14 acres
- Streams
- Water Conveyances
- Riparian Buffer Restoration = 2.44 acres
- Nutrient Offset Credit Area = 5.08 acres
- No Credit Area = 0.19 acres
- Existing Mature Vegetation (No Credit) = 4.12 acres
- Sewer Easement (No Credit) = 0.50 acres



Project Components and Mitigation Units Table

Type	Mitigation Credits [^]	
	Riparian Buffer	Nutrient Offset
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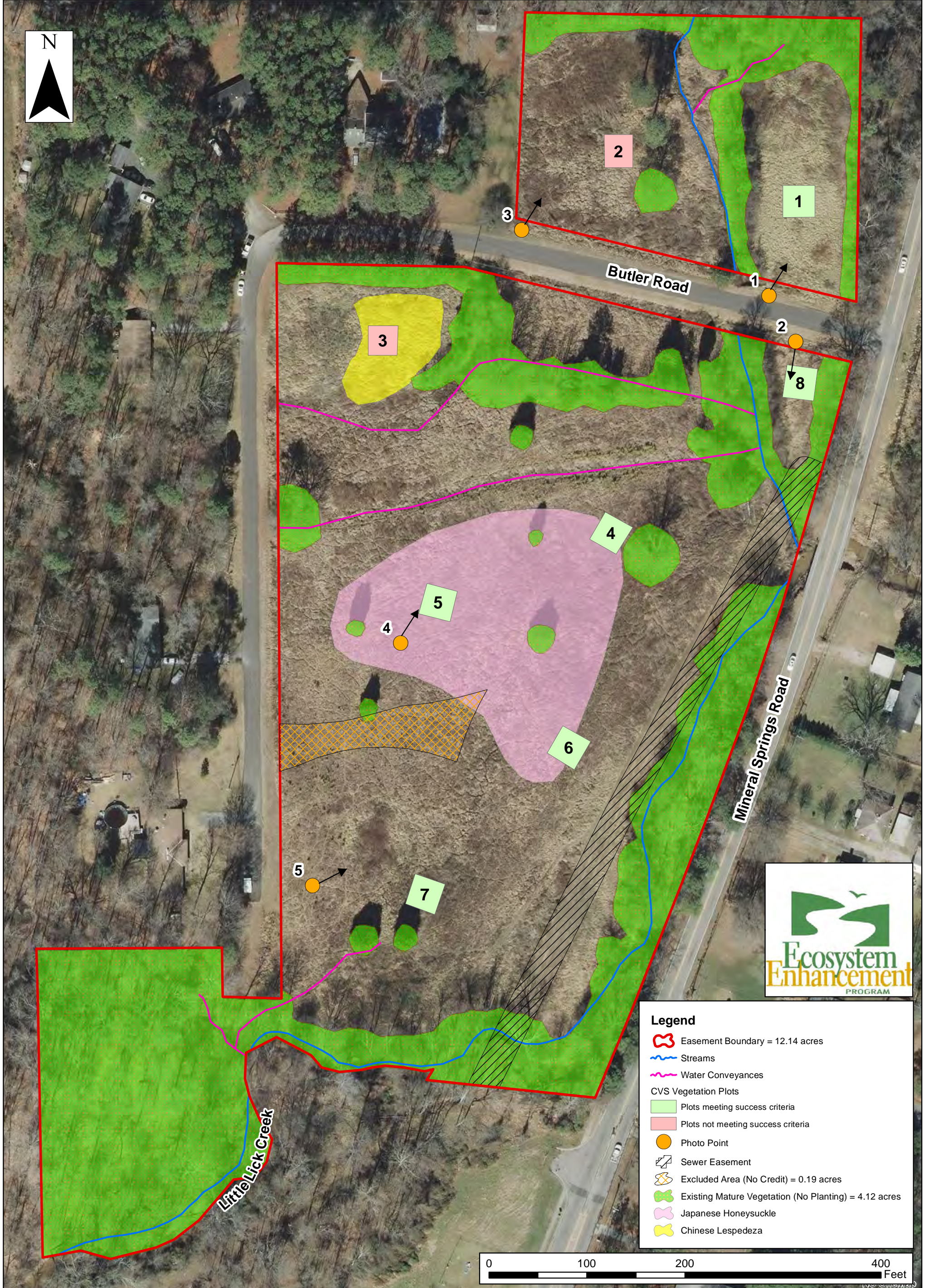
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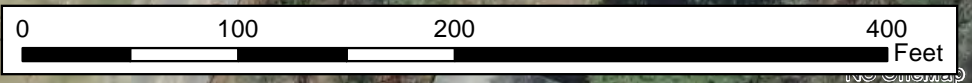
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**PROJECT ASSETS
 LITTLE LICK CREEK PROJECT
 Durham County, North Carolina**

Dwn. by: KRJ/CLF/PHP	FIGURE 2
Date: October 2014	
EEP Project: 92542	



- Legend**
- Easement Boundary = 12.14 acres
 - Streams
 - Water Conveyances
 - CVS Vegetation Plots
 - Plots meeting success criteria
 - Plots not meeting success criteria
 - Photo Point
 - Sewer Easement
 - Excluded Area (No Credit) = 0.19 acres
 - Existing Mature Vegetation (No Planting) = 4.12 acres
 - Japanese Honeysuckle
 - Chinese Lespedeza



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Axiom Environmental, Inc.

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

Dwn. by:
 KRJ

Date:
 October 2014

Project:
 12-004.19

FIGURE
3

Table 5

Vegetation Condition Assessment

Little Lick Creek Buffer Restoration

Planted Acreage¹

8.02

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage	
1. Bare Areas	None	0.1 acres	none	0	0.00	0.0%	
2. Low Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%	
				Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	None	0.25 acres	N/A	0	0.00	0.0%	
				Cumulative Total	0	0.00	0.0%

Easement Acreage²

12.14

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern ⁴	Dense Japanese honeysuckle and Chinese lespedeza competing with planted woody vegetation.	1000 SF	none	0	1.35	11.1%
5. Easement Encroachment Areas ³	None	none	none	0	0.00	0.0%

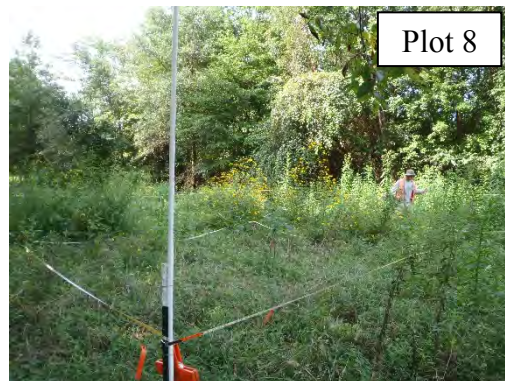
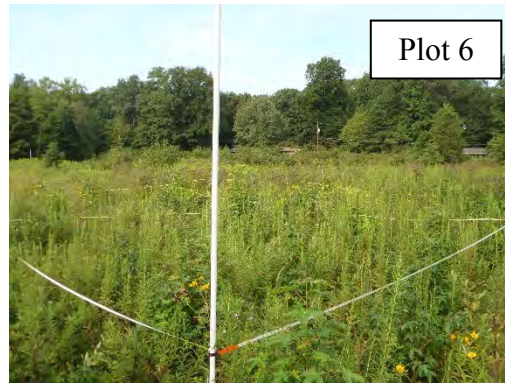
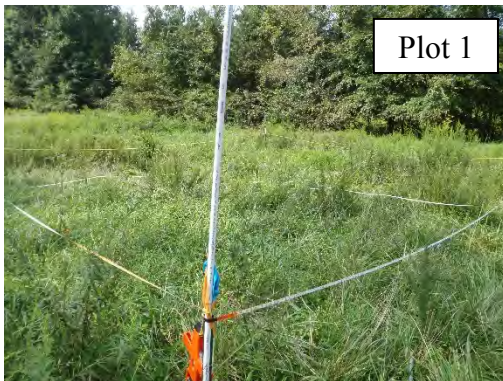
¹ = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project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

² = The acreage within the easement boundaries.

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

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

**Little Lick Creek (Butler Road)
Vegetation Monitoring Photographs
Taken September 2014**



**Little Lick Creek (Butler Road)
Fixed-Station Photographs
Taken September 2014**

Photo Point 1



Photo Point 2



Photo Point 3



Photo Point 4



Photo Point 5



Appendix C.
Vegetation Plot Data

- Table 6. Planted Woody Vegetation
Table 7. Vegetation Plot Success by Project Access Type
Table 8. Total Planted and All Stems by Plot and Species

Table 6. Planted Bare Root Woody Vegetation

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

**Table 7. Vegetation Plot Success by Plot Type
Little Lick Creek (#92542)**

Plot #	Riparian Buffer Stems ¹	Stream/Wetland Stems ²	Live Stakes	Invasives	Volunteers ³	Total ⁴	Unknown Growth Form
1	18	n/a	0	0	11	29	0
2	6	n/a	0	0	4	10	0
3	5	n/a	0	0	4	9	0
4	10	n/a	0	0	94	104	0
5	11	n/a	0	0	70	81	0
6	n/a	11	0	0	98	109	0
7	11	n/a	0	0	45	56	0
8	17	n/a	0	0	0	17	0

Stem Class¹Buffer Stems²Stream/ Wetland Stems³Volunteers⁴Total**characteristics**

Native planted hardwood trees. Does NOT include shrubs. No pines. No vines.

Native planted woody stems. Includes shrubs, does NOT include live stakes. No vines

Native woody stems. Not planted. No vines.

Planted + volunteer native woody stems. Includes live stakes. Excl. exotics. Excl. vines.

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

Scientific Name	Common Name	Species Type	Current Plot Data (MY1 2014)																								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			MY1 (2014)			MY0 (2013)		
			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	PnoLS	P-all	T
Acer rubrum	red maple	Tree							1	1	1	2	2	5	3	3	10			1	1	1	2				7	7	19	7	7	7
Betula nigra	river birch	Tree							1	1	1				1	1	1				2	2	2	4	4	4	8	8	8	12	12	12
Carya	hickory	Tree												2															2			
Cornus amomum	silky dogwood	Shrub															7			7									14			
Diospyros virginiana	common persimmon	Tree			10									35						10									55			
Fraxinus pennsylvanica	green ash	Tree	8	8	9	2	2	5	1	1	1			20	1	1	15	4	4	37			18	6	6	6	22	22	111	23	23	23
Liquidambar styraciflua	sweetgum	Tree												30			40			43			26						139			
Liriodendron tulipifera	tuliptree	Tree																3	3	3	2	2	2	2	2	2	7	7	7	8	8	8
Platanus occidentalis	American sycamore	Tree	1	1	1				1	1	1				2	2	2	1	1	1	4	4	4	1	1	1	10	10	10	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	20	20	20
Quercus nigra	water oak	Tree	2	2	2	1	1	1	1	1	1	4	4	4				1	1	1							9	9	9	11	11	11
Quercus pagoda	cherrybark oak	Tree												1															1			
Quercus phellos	willow oak	Tree				1	1	2				2	2	3	1	1	1	1	1	1	1	1	1				6	6	8	6	6	7
Rhus copallinum	flameleaf sumac	shrub									1																		1			
Ulmus alata	winged elm	Tree									3			2			2			4									11			1
Stem count			18	18	29	6	6	10	5	5	9	10	10	104	11	11	81	11	11	109	11	11	56	17	17	17	89	89	415	98	98	100
size (ares)			1			1			1			1			1			1			1			8			8					
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.20			0.20					
Species count			4	4	5	4	4	4	5	5	7	4	4	10	6	6	9	6	6	11	6	6	8	5	5	5	8	8	15	8	8	9
Stems per ACRE			728.4	728.4	1174	242.8	242.8	404.7	202.3	202.3	364.2	404.7	404.7	4209	445.2	445.2	3278	445.2	445.2	4411	445.2	445.2	2266	688	688	688	450.2	450.2	2099	495.7	495.7	505.9

Exceeds requirements, but by less than 10% P-all = Planting including livestakes
 Fails to meet requirements, by less than 10% T = All planted and natural recruits including livestakes
 Fails to meet requirements by more than 10% T includes natural recruits