FINAL
ANNUAL MONITORING REPORT
UT TO HAW (GWYNN) SITE
ALAMANCE COUNTY, NORTH CAROLINA
(EEP Project No. 92753, Contract No. 004543)

Monitoring Year 3 of 5 (2012)

Submitted to:
North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
Raleigh, North Carolina

August 2012

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Prepared by:
Axiom Environmental, Inc.
218 Snow Avenue
Raleigh, North Carolina 27603

Design Firm:
Axiom Environmental, Inc.
218 Snow Avenue
Raleigh, North Carolina 27603

Axiom Environmental, Inc.

Ecosystem Enhancement PROGRAM

August 2012

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1.0 EXECUTIVE SUMMARY

The North Carolina Ecosystem Enhancement Program (NCEEP) has completed enhancement and preservation of streams and wetlands at the UT to Haw (Gwynn) Site (hereafter referred to as the "Site") to assist in fulfilling stream and wetland mitigation goals in the area. The Site is located approximately 9 miles north of Burlington, in Alamance County within United States Geological Survey (USGS) Hydrologic Unit 03030002030010 (North Carolina Division of Water Quality Subbasin 03-06-02) of the Cape Fear River Basin and will service USGS 8-digit Cataloging Unit (CU) 03030002 (Figure 1, Appendix A). The Site is located within a NCEEP Targeted Local Watershed; in addition, this Site was identified for preservation and enhancement as Site 26 (Travis & Tickle 15.4) in the 2008 NCEEP *Little Alamance, Travis, and Tickle Creek Local Watershed Plan* (PTCG 2008).

The removal of invasive species and subsequent planting with native riparian vegetation at the Site resulted in 2428 linear feet of stream enhancement, 2.0 acres of riparian riverine wetland enhancement, and 0.3 acres of riparian riverine wetland preservation. Site activities provided 971 Stream Mitigation Units and 1.1 riparian riverine Wetland Mitigation Units. Tables summarizing project objectives and activities are included in Appendix A. This report (compiled based on EEP's *Procedural Guidance and Content Requirements for EEP Monitoring Reports* Version 1.3 dated 1/15/10) summarizes data for year 3 (2012) monitoring.

Prior to construction the Site was characterized by pasture land utilized for livestock grazing, a drained pond, and disturbed forest. Land use practices including the maintenance and removal of riparian vegetation and hoof shear from livestock had resulted in degraded water quality, unstable channel characteristics (stream entrenchment, erosion, and bank collapse), and reduced storage capacity and floodwater attenuation. In addition, hydric soils were disturbed due to regular plowing, vegetation maintenance, and hoof shear from livestock.

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. Reducing nonpoint sources of pollution by 1) fencing livestock from stream channels, buffers, and wetlands; 2) ceasing the application of agricultural herbicides, pesticides, and fertilizers; and 3) providing a vegetative buffer adjacent to streams and wetlands to treat surface runoff prior to entering Site streams and ultimately the Haw River.
2. Reducing sedimentation/siltation within on-Site and downstream receiving waters by a) eliminating bank erosion associated with livestock hoof shear on Site streams, b) filtering surface runoff and reducing particulate matter deposition into tributaries, and c) providing a forested vegetative buffer adjacent to Site streams and wetlands.
3. Promoting floodwater attenuation and improving stream stability by revegetating Site floodplains to reduce floodwater velocities through increased frictional resistance on floodwaters crossing Site floodplains.
4. Providing increased habitat for aquatic wildlife by 1) increasing organic matter, carbon export, and woody debris in the stream corridor and 2) restoring shade to Site open waters.
5. Providing wildlife habitat including a forested riparian corridor within a region of the state increasingly dissected by residential/agricultural land use.
6. Protecting a Site identified in the 2008 Piedmont Triad Council of Government's *Little Alamance, Travis, and Tickle Creek Watersheds Restoration Plan* (PTCG 2008) for preservation due to its location within a remote, rural area along the heavily used Boone Road (SR 1602) resulting in increasing development pressure and appeal to developers.

Success criteria for stream enhancement will include 1) success of riparian vegetation and 2) documentation of two bankfull channel events. One bankfull event was documented to date during year 3 monitoring (2012) for a total of six documented bankfull events with at least one event documented to occur in each monitoring year.

Success criteria dictate that an average density of 320 stems per acre of Characteristic Tree Species must be surviving in the first three monitoring years. Subsequently, 260 Characteristic Tree Species per acre must be surviving in year 5. Based on the number of stems counted, average densities were measured at 1149 planted stems per acre surviving in year 3 (2012). Stem counts went up slightly as the result of resprouts of planted stems that were thought to be missing in year 2 (2011). The dominant planted stems identified at the Site were swamp chestnut oak (*Quercus michauxii*), cherrybark oak (*Quercus pagoda*), persimmon (*Diospyros virginiana*), and green ash (*Fraxinus pennsylvanica*). All individual plots met success criteria when counting planted stems alone.

Survival of planted stems was slightly low within the wetland enhancement area during year 1 as the result of drought during the summer of 2010, overtopping of seedlings by grasses, or as the result of flooding from a beaver dam observed on June 29, 2010 and removed by APHIS in early August 2010. However, wetland enhancement area plant survival was good and remained constant through the 2011-2012 (years 2-3) monitoring years. In addition, all individual plots met success criteria and there is an abundant seed source adjacent to the Site. Plants within the wetland enhancement area will continue to be monitored closely throughout subsequent monitoring years. Beaver activity continues within the Site; and APHIS continues to manage and trap beaver. Areas of beaver activity are depicted on Figure 2 (Appendix A).

In summary, the Site achieved success criteria for vegetation and stream attributes in the Third Monitoring Year (2012). Summary information and data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in tables and figures within this report's appendices. Narrative background and supporting information formerly found in these reports can be found in the mitigation and restoration plan documents available on EEPs website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

2.0 METHODOLOGY

2.1 Stream Assessment

Annual stream monitoring will include vegetation survival (Section 2.2 Vegetation Assessment) and a photographic record of preconstruction and postconstruction conditions. Photographs of the enhancement (level II) reach will be taken for each year of the monitoring period (Appendix D). In addition, visual assessments of the stream will be conducted by walking the length of stream and bankfull flow events will be documented (Appendix E).

2.2 Vegetation Assessment

After planting was completed, an initial evaluation was performed to verify that planting methods were successful and to determine initial species composition and density. Five vegetation plots were established and marked after construction with four foot metal U-bar post demarking the corners with a ten foot, three-quarter inch PVC at the origin. The plots are 10 meters square and are located randomly within the Site. These plots were surveyed in June 2012 for the year 3 (2012) monitoring season using the *CVS-EEP Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008) (http://cvs.bio.unc.edu/methods.htm); results are included in Appendix C. The taxonomic standard for vegetation used for this document was *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas* (Weakley 2008).

3.0 REFERENCES

Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation. Version 4.2. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, North Carolina.

Piedmont Triad Council of Government (PTCG). 2008. Little Alamance, Travis, & Tickle Creek Watersheds Restoration Plan. Available: http://www.ptcog.org/eep/LATTPhaseIII.pdf [November 2008]. Piedmont Triad Council of Government, Greensboro, 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 Army Corps of Engineers, United States Environmental Protection Agency, North Carolina Wildlife Resources Commission, North Carolina Division of Water Quality (USACE et al.). 2003. Stream Mitigation Guidelines.

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

APPENDIX A

PROJECT VICINITY MAP AND BACKGROUND TABLES

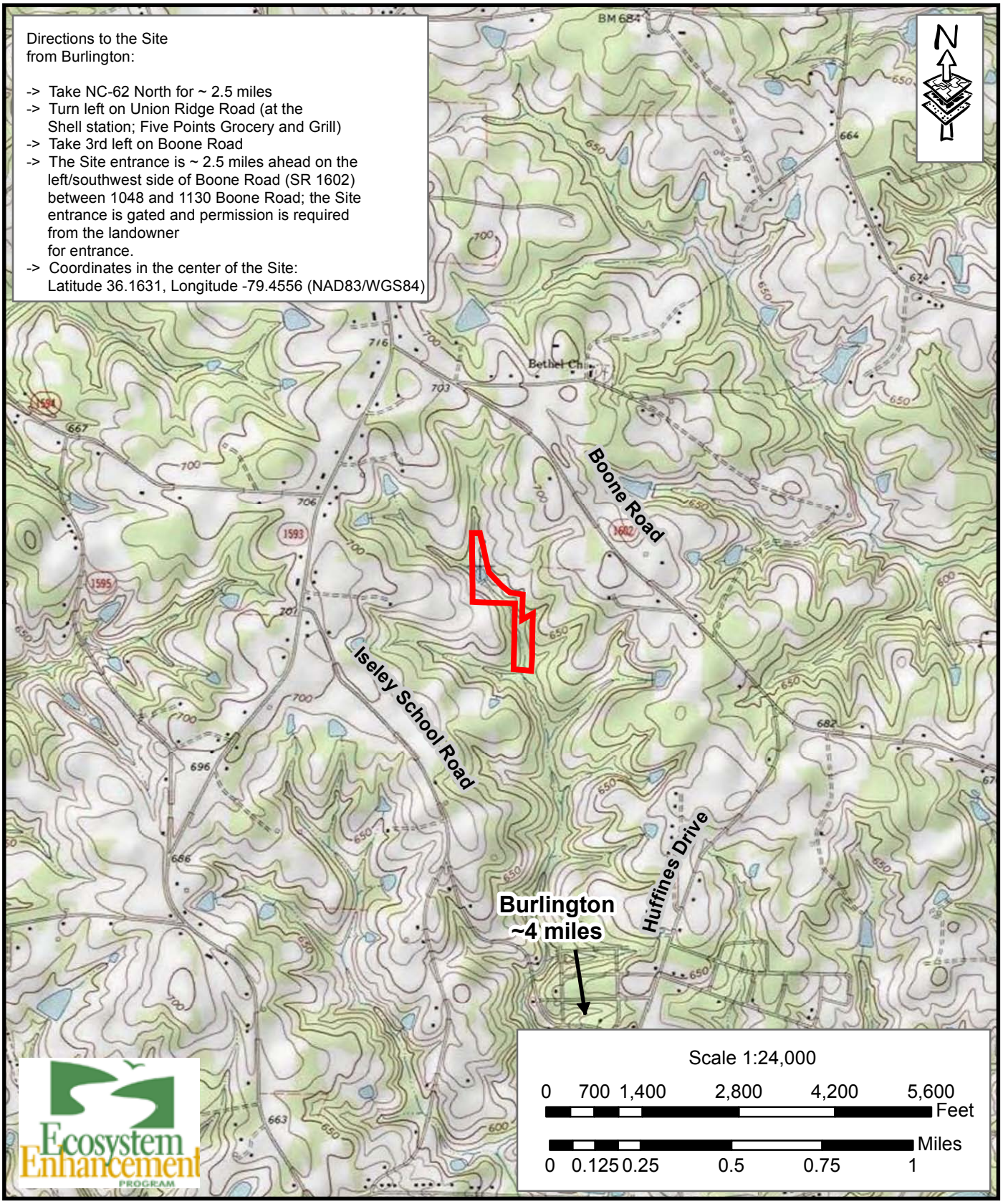
Figure 1. Vicinity Map

Table 1. Project Components and Mitigation Credits

Table 2. Project Activity and Reporting History

Table 3. Project Contacts Table

Table 4. Project Baseline Information and Attributes



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

SITE LOCATION
UT TO HAW (GWYNN) SITE
Alamance County, North Carolina

Dwn. by.	CLF
Date:	June 2011
Project:	10-009

FIGURE
1

Table 1. Project Components and Mitigation Credits

Mitigation Credits								
	Stream		Riparian Wetland		Non-Riparian Wetland	Buffer	Nitrogen Offset	Phosphorus Nutrient Offset
Type	R	RE	R	RE	--	--	--	--
Totals	--	971 SMUs	--	1.1 WMUs	--	--	--	--

Restoration Segment/ Reach ID	Station Range	Mitigation Type	Priority Approach	Linear Footage/ Acreage	Comment
Main Channel	--	Enhancement (Level II)	--	1987	Invasive species removal, planting with native forest vegetation, and exclusion of livestock.
UT1	--	Enhancement (Level II)	--	93	
UT2	--	Enhancement (Level II)	--	96	
UT3	--	Enhancement (Level II)	--	98	
UT4	--	Enhancement (Level II)	--	121	
UT5	--	Enhancement (Level II)	--	33	
Wetland 1	--	Enhancement	--	1.8	Invasive species removal, planting with native forest vegetation, and exclusion of livestock.
Wetland 2	--	Preservation	--	0.2	Exclusion of livestock.
Wetland 3	--	Preservation	--	0.1	
Wetland 4	--	Enhancement	--	0.2	Invasive species removal, planting with native forest vegetation, and exclusion of livestock.

Component Summation

Restoration Level	Stream (linear footage)	Riverine Riparian Wetland (acreage)	Planted Riparian Area (acreage)
Enhancement (Level II)	2428	--	--
Enhancement	--	2.0	--
Preservation	--	0.3	--
Totals	**2428**	**2.3**	**8.3**
Mitigation Units	**971 SMUs**	**1.1 WMUs**	**--**

Table 2. Project Activity and Reporting History

Activity or Report	Data Collection Complete	Completion or Delivery
Restoration Plan	--	June 2009
Invasive Species Control	--	February 2010
Soil Amendments	--	February 2010
Site Planting	--	January 2010
Mitigation Plan	February 2010	February 2010
Monitoring Year 1 (2010)	October 2010	November 2010
Monitoring Year 2 (2011)	June 2011	June 2011
Monitoring Year 3 (2012)	June 2012	August 2012

Table 3. Project Contacts Table

Designer and Monitoring Performer	Axiom Environmental, Inc. 218 Snow Avenue Raleigh, North Carolina 27603 Grant Lewis (919) 215-1693
Planting, Soil Amendment, and Invasive Species Removal Contractor	Carolina Silvics 908 Indian Trail Road Edenton, North Carolina 27932 Dwight McKinney (252) 482-8491

Table 4. Project Baseline Information and Attributes Table

Project Information						
Project name			UT to Haw Gwynn			
County			Alamance			
Project Area			12.5 acres			
Project Coordinates			36.1631°N, -79.4556°W			
Project Watershed Summary Information						
Physiographic Province			Southern Outer Piedmont			
River Basin			Cape Fear			
USGS Hydrologic Unit 8-digit	03030002		USGS Hydrologic Unit 14-digit	03030002030010		
DWQ Sub-Basin			03-06-02			
Project Drainage Area			250 acres			
Project Drainage Area Percentage Impervious Surface			<5			
CGIA Land Use Classification			Managed Herbaceous Cover, Hardwood Swamps			
Reach Summary Information						
Parameters	**Main Channel**	**UT 1**	**UT 2**	**UT 3**	**UT 4**	**UT 5**
Length of reach (linear feet)	2299	93	95	197	234	84
Valley classification	VIII	VIII	VIII	VIII	VIII	VIII
Drainage area (acres)	250	80	<5	20	20	20
NCDWQ stream identification score	28.5	20.75	19	32.5	30.5	36.5
NCDWQ Water Quality Classification	C-NSW					
Morphological Description (stream type)	-		-		-	-
Evolutionary trend	-		-		-	-
Underlying mapped soils	Appling, Enon, Cecil, Local Alluvial Land					
Drainage class	Well-drained, Somewhat poorly drained, Poorly drained					
Soil Hydric status	Nonhydric and Hydric					
FEMA classification	--					
Percent composition of exotic invasive vegetation	<1					

Wetland Summary Information				
Parameters	**Wetland 1**	**Wetland 2**	**Wetland 3**	**Wetland 4**
Size of Wetland (acres)	1.8 acres	0.2 acres	0.1 acres	0.2 acres
Wetland Type	Riparian			
Drainage class	Poorly Drained			
Soil Hydric Status	Hydric			
Source of Hydrology	Overbank and over-land flow			
Native Vegetation Community	Piedmont/Mountain Swamp Forest	Bottomland Hardwood Forest	Bottomland Hardwood Forest	Bottomland Hardwood Forest
Percent composition of exotic invasive vegetation	<1			

Table 4. Project Baseline Information and Attributes Table (continued)

Regulatory Considerations			
Regulation	**Applicable**	**Resolved?**	**Supporting Document**
Waters of the United States – Section 404	No		
Waters of the United States – Section 401	No		
Endangered Species Act	No		
Historic Preservation Act	No		
Coastal Management Zone Act (CZMA)/ Coastal Area Management Act (CAMA)	No		
FEMA Floodplain Compliance	No		
Essential Fisheries Habitat	No		

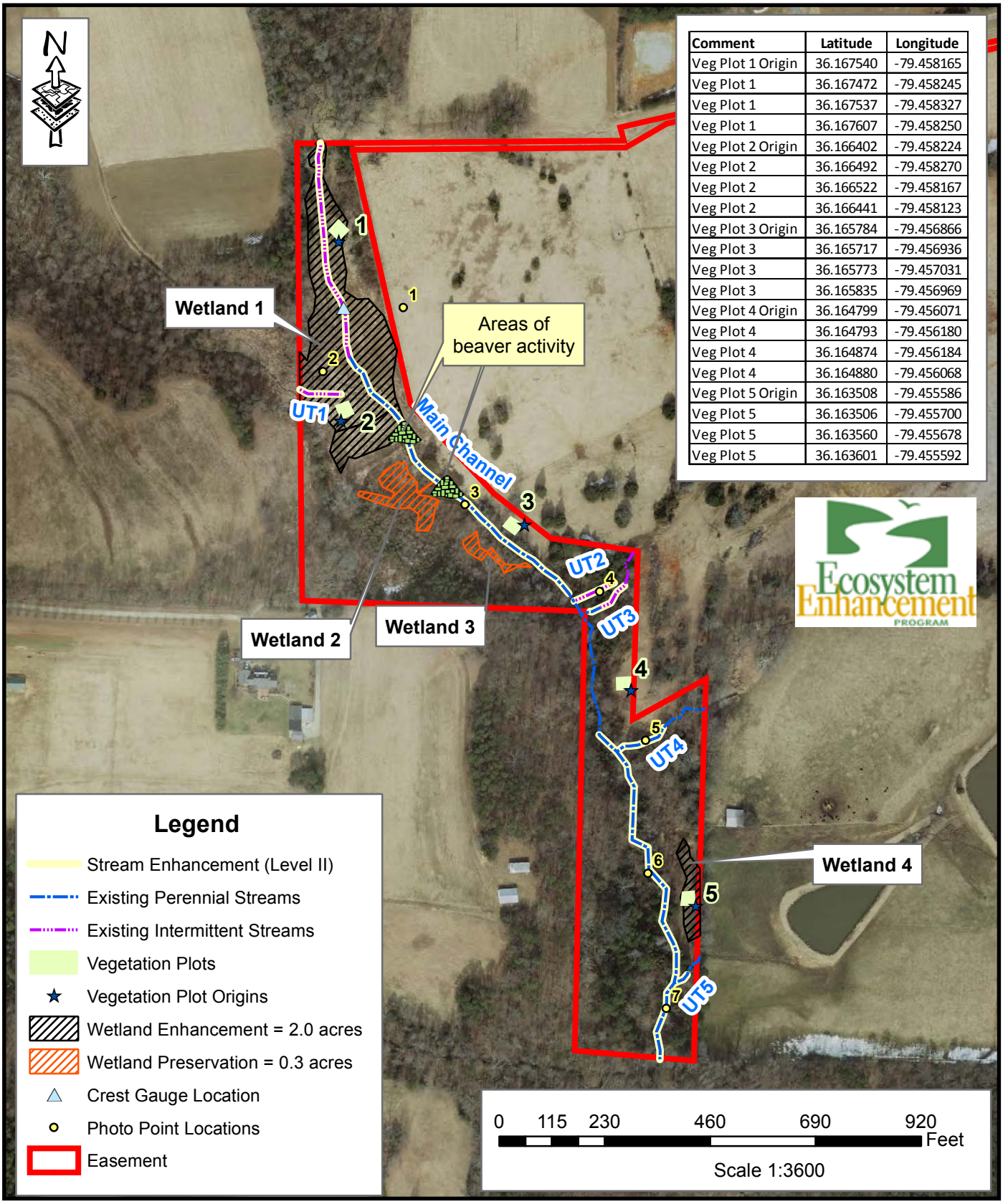
APPENDIX B

VISUAL ASSESSMENT DATA

Figure 2. Current Conditions Plan View

Table 5. Vegetation Condition Assessment Table

Vegetation Monitoring Plot Photos



Comment	Latitude	Longitude
Veg Plot 1 Origin	36.167540	-79.458165
Veg Plot 1	36.167472	-79.458245
Veg Plot 1	36.167537	-79.458327
Veg Plot 1	36.167607	-79.458250
Veg Plot 2 Origin	36.166402	-79.458224
Veg Plot 2	36.166492	-79.458270
Veg Plot 2	36.166522	-79.458167
Veg Plot 2	36.166441	-79.458123
Veg Plot 3 Origin	36.165784	-79.456866
Veg Plot 3	36.165717	-79.456936
Veg Plot 3	36.165773	-79.457031
Veg Plot 3	36.165835	-79.456969
Veg Plot 4 Origin	36.164799	-79.456071
Veg Plot 4	36.164793	-79.456180
Veg Plot 4	36.164874	-79.456184
Veg Plot 4	36.164880	-79.456068
Veg Plot 5 Origin	36.163508	-79.455586
Veg Plot 5	36.163506	-79.455700
Veg Plot 5	36.163560	-79.455678
Veg Plot 5	36.163601	-79.455592

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(919) 215-1693

MONITORING PLAN VIEW
UT TO HAW (GWYNN) SITE
Alamance County, North Carolina

Dwn. by: CLF
Date: July 2012
Project: 12-004.04

FIGURE 2

Table 5 **Vegetation Condition Assessment**

UT Haw Gwynn/EEP Project Number 92753

Planted Acreage[1] **8.3**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	NA	NA	NA	NA	NA	NA
2. Low Stem Density Areas	NA	NA	NA	NA	NA	NA
			Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	NA	NA	NA	NA	2.00	24.1%
			Cumulative Total	0	2.00	24.1%

Easement Acreage[2] **10**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern [4]	NA	NA	NA	NA	NA	NA
5. Easement Encroachment Areas [3]	NA	NA	NA	NA	NA	NA

UT to Haw (Gwynn) Restoration Site
Year 3 (2012) Annual Monitoring
Vegetation Plot Photos (taken June 2012)

APPENDIX C

VEGETATION PLOT DATA

Table 6. Vegetation Plot Criteria Attainment

Table 7. CVS Vegetation Plot Metadata

Table 8. Total Planted and Natural Recruit Stems by Plot and Species

Table 6. Vegetation Plot Criteria Attainment

Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	100%
2	Yes	
3	Yes	
4	Yes	
5	Yes	

Table 7. CVS Vegetation Plot Metadata

Report Prepared By	Corri Faquin
Date Prepared	7/16/2012 17:37
database name	Axiom-EEP-2012-A.mdb
database location	C:\Axiom\Business\CVS
computer name	CORRI-PC
file size	41238528
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
ALL Stems by Plot and spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	92753
project Name	UT to Haw (Gwynn)
Description	Stream/wetland enhancement site
River Basin	Cape Fear
length(ft)	
stream-to-edge width	
area (sq m)	
Required Plots	
Sampled Plots	5

Table 8. Total Planted and Natural Recruits Stems by Plot and Species

UT to Haw (Gwynn)

			Current Plot Data (MY3 2012)															Annual Means											
			E92753-AXE-0001			E92753-AXE-0002			E92753-AXE-0003			E92753-AXE-0004			E92753-AXE-0005			MY3 (2012)			MY2 (2011)			MY1 (2010)			MY0 (2009)		
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			2			1						9						12			10			6			8
Betula nigra	river birch	Tree																					1			2			
Carpinus caroliniana	American hornbeam	Tree																			1	1	1						
Carya	hickory	Tree									1									1									
Cephalanthus occidentalis	common buttonbush	Shrub	3	3	4												2	3	3	6			1			2			
Cercis canadensis	eastern redbud	Tree												1						1									
Cornus amomum	silky dogwood	Shrub	4	4	5	9	9	9										13	13	14	17	17	17	13	13	13	31	31	31
Diospyros virginiana	common persimmon	Tree	1	1	1				22	22	38			2				23	23	41	18	18	35	18	18	18	35	35	35
Fraxinus pennsylvanica	green ash	Tree	10	10	10	1	1	1	3	3	18	1	1	30			9	15	15	68	14	14	23	18	18	26	13	13	14
Gleditsia triacanthos	honeylocust	Tree									3									3						1			
Juglans nigra	black walnut	Tree																											2
Juniperus virginiana	eastern redcedar	Tree									2			3						5			1						
Liquidambar styraciflua	sweetgum	Tree									2			152						154			110			47			71
Liriodendron tulipifera	tuliptree	Tree												14						14			5			4			
Platanus occidentalis	American sycamore	Tree				1	1	1									2	1	1	3	1	1	1	1	1	1	2	2	4
Populus deltoides	eastern cottonwood	Tree																								1			
Prunus serotina	black cherry	Tree										2	2	2				2	2	2	2	2	2	4	4	4	10	10	10
Quercus	oak	Tree							1	1	1	1	1	1				2	2	2	1	1	1	10	10	11	62	62	62
Quercus alba	white oak	Tree										3	3	3	5	5	5	8	8	8	9	9	9	4	4	4	5	5	5
Quercus lyrata	overcup oak	Tree				2	2	2	2	2	2	1	1	1				5	5	5	4	4	4	1	1	1	8	8	8
Quercus michauxii	swamp chestnut oak	Tree							10	10	10	21	21	21	16	16	16	47	47	47	46	46	46	44	44	44	15	15	15
Quercus pagoda	cherrybark oak	Tree							3	3	3				13	13	13	16	16	16	16	16	16	24	24	24	8	8	8
Quercus phellos	willow oak	Tree				1	1	1	2	2	2	1	1	1				4	4	4	5	5	5	5	5	5	5	5	5
Quercus rubra	northern red oak	Tree																						1	1	1	4	4	4
Salix nigra	black willow	Tree																											1
Sambucus canadensis	Common Elderberry	Shrub			1															1									
Ulmus	elm	Tree									5						5			10			16			1			9
Ulmus alata	winged elm	Tree							3	3	3			31				3	3	34						4			
Ulmus americana	American elm	Tree																			1	1	1						
Unknown		Shrub or Tree																						2	2	2	1	1	1
		Stem count	18	18	23	14	14	15	46	46	90	30	30	271	34	34	52	142	142	451	135	135	305	145	145	222	199	199	293
		size (ares)	1			1			1			1			1			5			5			5			5		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.12			0.12			0.12			0.12		
		Species count	4	4	6	5	5	6	8	8	13	7	7	14	3	3	7	13	13	22	13	13	20	13	13	22	13	13	18
		Stems per ACRE	728.4	728.4	930.8	566.6	566.6	607	1862	1862	3642	1214	1214	10967	1376	1376	2104	1149	1149	3650	1093	1093	2469	1174	1174	1797	1611	1611	2371

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 stems excluding livestakes

P-all= Planted stems including livestakes

T = Planted stems and natural recruits

Total includes stems of natural recruits

APPENDIX D

STREAM DATA

Fixed-Station Photos

UT to Haw (Gwynn) Site
Fixed Station Photo Points
Taken June 6, 2012

Photo Point 4

Photo Point 5

APPENDIX E

HYDROLOGY DATA

Table 9. Verification of Bankfull Events

Table 9. Verification of Bankfull Events

Date of Data Collection	Date of Occurrence	Method	Photo (if available)
February 17, 2010	February 5, 2010	Visual observations of overbank event including wrack lines and sediment deposition resulting from a 1.36 inch* rainfall event on February 5, 2010 that occurred after numerous rainfall events, within the 3 weeks prior, that totaled 3.52 inches.	1-2
June 16, 2010	May 17, 2010	Visual observations of overbank event including wrack lines and sediment deposition resulting from a 4.1 inch* rainfall event on May 16-17, 2010.	--
October 5, 2010	September 30, 2010	A 4.43-inch* rainfall event occurring between September 26-October 2, 2010.	--
September 30, 2011	June 28, 2011	Total of 2.83 inches* of rain reported to fall over 2 days (June 27-28, 2011)	--
September 30, 2011	September 24, 2011	Total of 3.61 inches* of rain reported to fall over 4 days (September 21-24, 2011) with an additional 0.85 inches* of rain the following 3 days (Septe 25-27, 2011)	--
July 18, 2012	July 11, 2012	Total of 4.84 inches* of rain reported to fall over 3 days (July 9-11, 2012)	--

* Reported at KBUY Weather Station in Burlington.

Bankfull Event Photos 1-2 showing wrack lines resulting from an overbank event