FINAL

ANNUAL MONITORING REPORT

UT TO HAW (GWYNN) SITE
ALAMANCE COUNTY, NORTH CAROLINA
(EEP Project No. 92753)

Monitoring Year 2 of 5 (2011)

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

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Prepared by:
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Axiom Environmental, Inc.

Ecosystem Enhancement PROGRAM

June 2011

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 B. This report (compiled based on NCEEP's *Revised Table of Contents for 2009 Monitoring Report Submissions* Version 1.2.1 dated 6/1/09) summarizes data for year 2 (2011) 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. Three bankfull events were documented to occur in 2010 with one occurring in February during planting and the remaining two occurring in May and September. No additional bankfull events have been documented to date.

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 1093 planted stems per acre surviving in year 2 (2011). The dominant species identified at the Site were planted stems of 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 for the 2011 (year 2) monitoring. In addition, all individual plots met success criteria and there is abundant seed source adjacent to the Site. Plants within the wetland enhancement area will continue to be monitored closely throughout subsequent monitoring years.

In summary, the Site achieved success criteria for vegetation and stream attributes in the Second Monitoring Year (2011). 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.

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APPENDICES

2.0 METHODOLOGY

2.1 Stream

Annual stream monitoring will include vegetation survival (Section 2.2 Vegetation) 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.

2.2 Vegetation

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 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 photographs included in Appendix C.

3.0 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.

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.

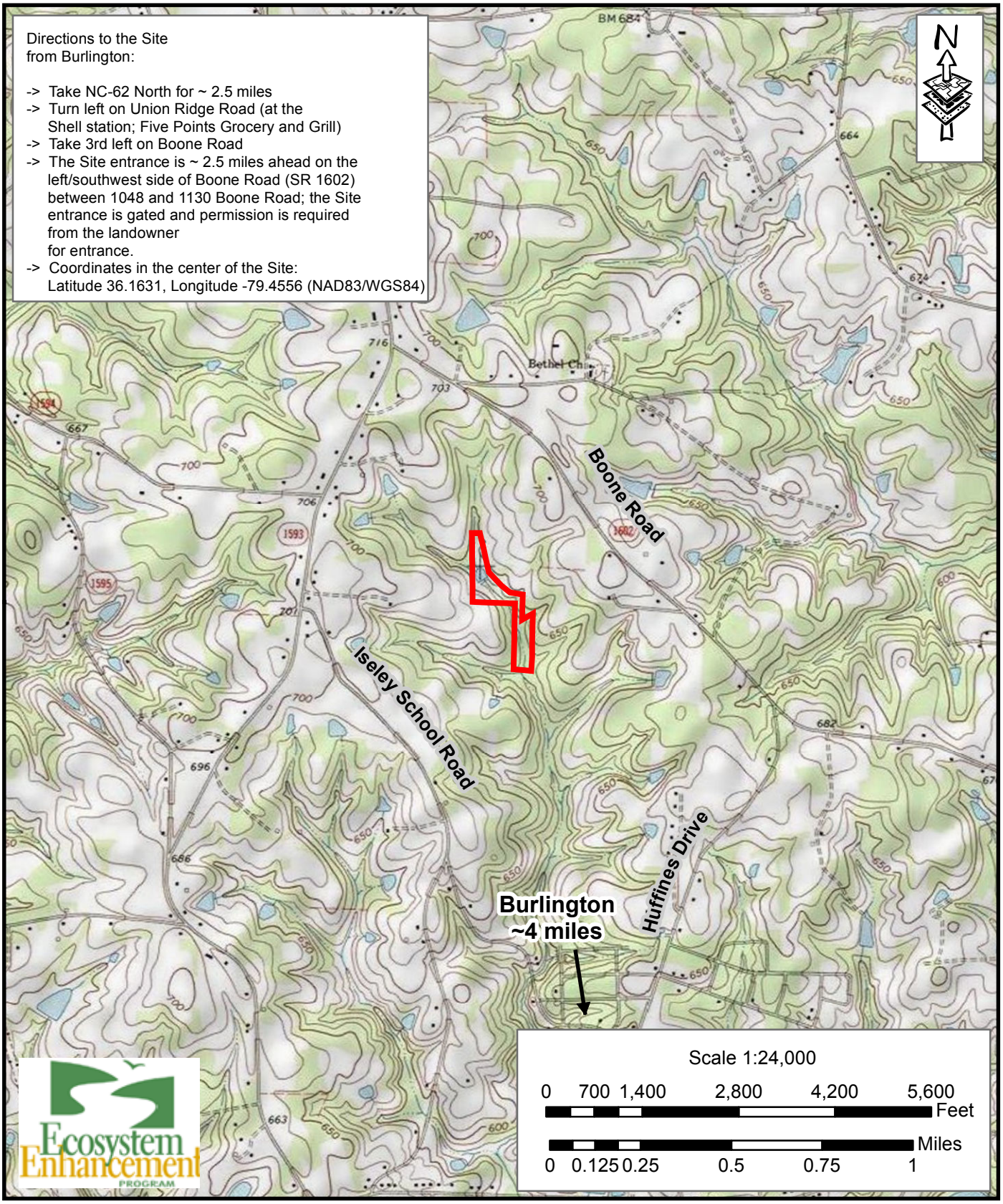
Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, North Carolina Department of Environment, Health, and Natural Resources. Raleigh, North Carolina.

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.
Figures

Figure 1. Site Location Map
Figure 2. Monitoring Plan View



Ecosystem Enhancement Program

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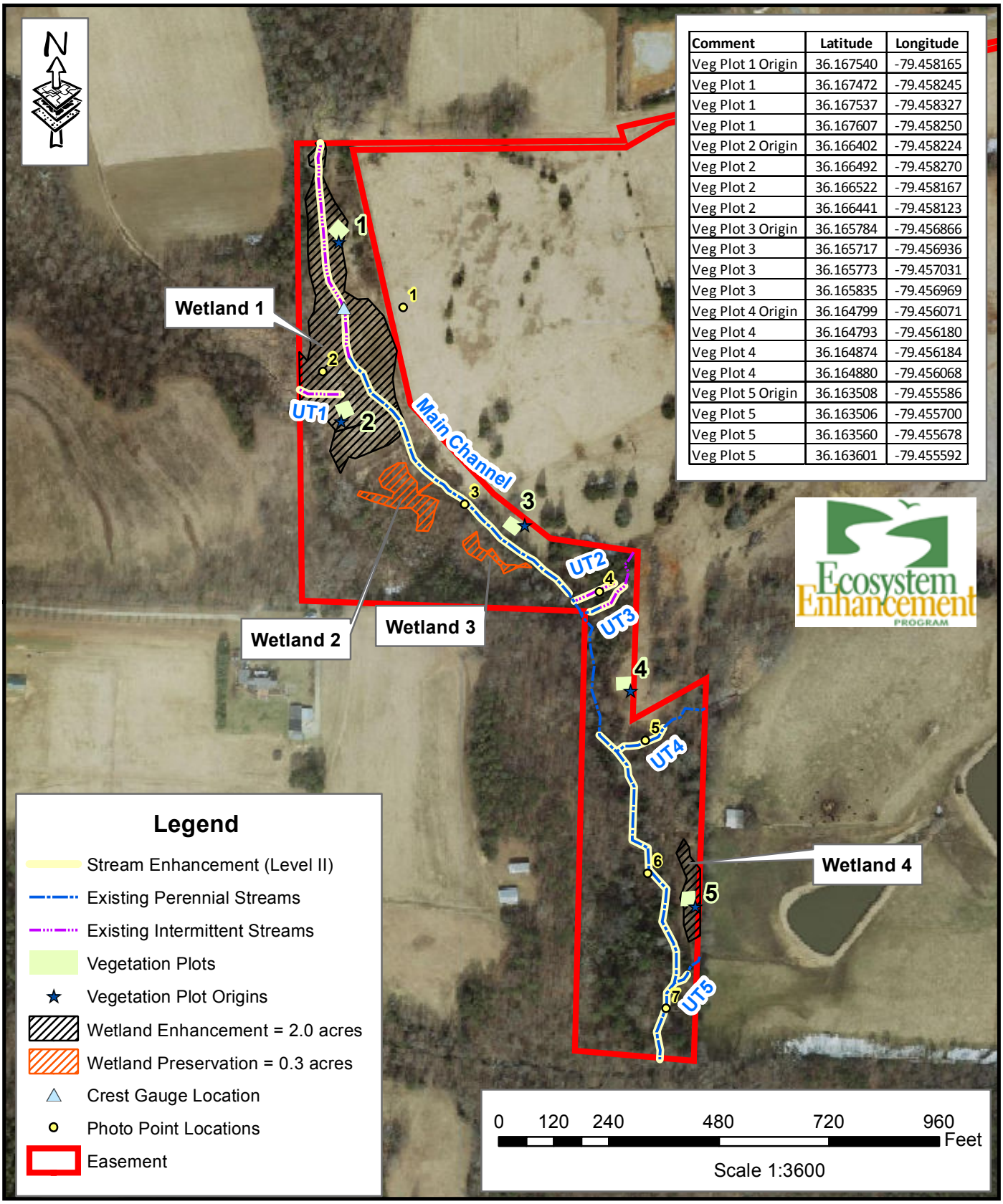
SITE LOCATION
UT TO HAW (GWYNN) SITE
Alamance County, North Carolina

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

FIGURE
1



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

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

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

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

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 Attribute Table

Project County	Alamance County, North Carolina
Physiographic Region	Piedmont
Ecoregion	Southern Outer Piedmont
Project River Basin	Cape Fear
USGS 14-digit HUC	03030002030010
NCDWQ Subbasin	03-06-02
Within EEP Watershed Plan Extent?	Yes-Targeted Local Watershed
WRC Class	Warm
% of project easement fenced	70 %
Beaver activity observed during design phase	No

Appendix C.
Vegetation Data

Table 5. Vegetation Plot Mitigation Success Summary
Vegetation Monitoring Plot Photos
CVS Summary Data Tables
Table 6. Vegetation Metadata Table
Table 7. Total and Planted Stems by Plot and Species

Table 5. Vegetation Plot Mitigation Success Summary Table

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

UT to Haw (Gwynn) Restoration Site
Year 2 (2011) Annual Monitoring
Vegetation Plot Photos (taken June 17, 2011)

Table 6. Vegetation Metadata Table

Report Prepared By	Corri Faquin
Date Prepared	6/17/2011 15:49
database name	Axiom-EEP-2011-B.mdb
database location	C:\Axiom\Business\CVS
computer name	CORRI-PC
file size	40574976
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 7. Total and Planted Stems by Plot and Species
EEP Project Code 92753. Project Name: UT to Haw (Gwynn)

			Current Plot Data (MY2 2011)														Annual Means								
			E92753-AXE-0002			E92753-AXE-0003			E92753-AXE-0004			E92753-AXE-0005			E92753-AXE-0001			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
Acer rubrum	red maple	Tree			1						4						5			10			6			
Betula nigra	river birch	Tree			1															1			2			
Carpinus caroliniana	American hornbeam	Shrub Tree													1	1	1	1	1	1						
Cephalanthus occidentalis	common buttonbush	Shrub Tree															1			1			2			
Cornus amomum	silky dogwood	Shrub	12	12	12										5	5	5	17	17	17	13	13	13	31	31	31
Diospyros virginiana	common persimmon	Tree				17	17	34							1	1	1	18	18	35	18	18	18	35	35	35
Fraxinus pennsylvanica	green ash	Tree	1	1	1	2	2	4	1	1	8				10	10	10	14	14	23	18	18	26	13	13	13
Gleditsia triacanthos	honeylocust	Shrub Tree																					1			
Juniperus virginiana	eastern redcedar	Tree									1									1						
Liquidambar styraciflua	sweetgum	Tree						2			107			1						110			47			
Liriodendron tulipifera	tuliptree	Tree									5									5			4			
Platanus occidentalis	American sycamore	Tree	1	1	1													1	1	1	1	1	1	2	2	2
Populus deltoides	eastern cottonwood	Tree																					1			
Prunus serotina	black cherry	Shrub Tree							2	2	2							2	2	2	4	4	4	10	10	10
Quercus	oak	Shrub Tree							1	1	1							1	1	1	10	10	11	62	62	62
Quercus alba	white oak	Tree							4	4	4	5	5	5				9	9	9	4	4	4	5	5	5
Quercus lyrata	overcup oak	Tree	2	2	2	1	1	1	1	1	1							4	4	4	1	1	1	8	8	8
Quercus michauxii	swamp chestnut oak	Tree				11	11	11	20	20	20	15	15	15				46	46	46	44	44	44	15	15	15
Quercus pagoda	cherrybark oak	Tree				4	4	4				12	12	12				16	16	16	24	24	24	8	8	8
Quercus phellos	willow oak	Tree	1	1	1	3	3	3	1	1	1							5	5	5	5	5	5	5	5	5
Quercus rubra	northern red oak	Tree																			1	1	1	4	4	4
Ulmus	elm	Tree						1			14						1			16			1			
Ulmus alata	winged elm	Tree																					4			
Ulmus americana	American elm	Tree				1	1	1										1	1	1						
Unknown		unknown																			2	2	2	1	1	1
		Stem count	17	17	19	39	39	61	30	30	168	32	32	33	17	17	24	135	135	305	145	145	222	199	199	199
		size (ares)	1			1			1			1			1			5			5			5		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.12			0.12			0.12		
		Species count	5	5	7	7	7	9	7	7	12	3	3	4	4	4	7	13	13	20	13	13	22	13	13	13
		Stems per ACRE	688	688	768.9	1578	1578	2469	1214	1214	6799	1295	1295	1335	688	688	971.2	1093	1093	2469	1174	1174	1797	1611	1611	1611

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 exclusing livestakes
P-all = All planted stems including livestakes
T = All planted and natural recruit stems including livestakes
Total includes natural recruit stems

APPENDIX D
STREAM ASSESSMENT DATA

Table 8. Verification of Bankfull Events
Stream Fixed Station Photographs

Table 8. 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.	--

* Reported at KBUY Weather Station in Burlington.

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

UT to Haw (Gwynn) Site
Fixed Station Photo Points
Taken June 21, 2011


Photo Point 4