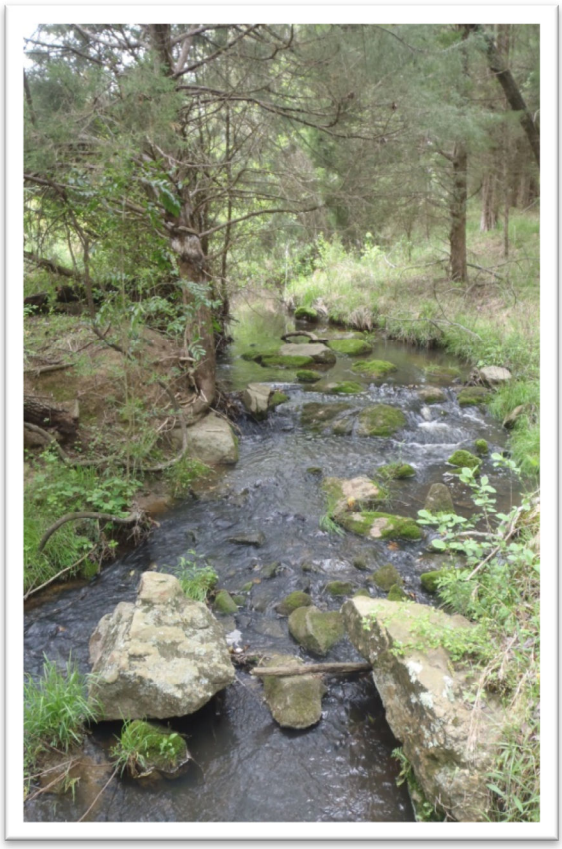
FINAL
ANNUAL MONITORING REPORT
UT TO HAW BECKOM RESTORATION SITE
ALAMANCE COUNTY, NORTH CAROLINA
(EEP Project No. 92694, Contract No. 004545)

Monitoring Year 3 of 5 (2013)



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

Ecosystem Enhancement PROGRAM

September 2013

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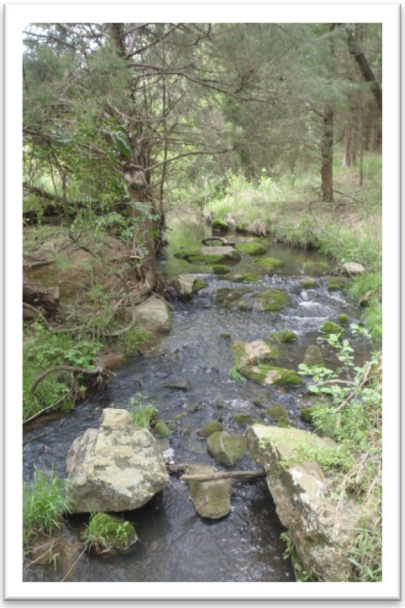

Submitted to:
North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
Raleigh, North Carolina

Prepared by:
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Axiom Environmental, Inc.

Ecosystem Enhancement PROGRAM

September 2013

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1.0 EXECUTIVE SUMMARY

The North Carolina Ecosystem Enhancement Program (NCEEP) has completed stream and wetland enhancement and preservation at the UT to Haw Beckom Restoration Site (hereafter referred to as the "Site") to assist in fulfilling stream and wetland mitigation goals in the area. The Site is located approximately 4 miles north of Burlington, in Alamance County, North Carolina. This portion of Alamance County is located within Cape Fear River Basin Hydrologic Unit and Targeted Local Watershed 03030002030010. 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 (2013) monitoring.

Site drainage features provide water quality function to an approximately 385-acre (0.6-square mile) watershed. The Site is located within a NCEEP Targeted Local Watershed; in addition, this Site was identified for preservation as part of Site 15 (Travis & Tickle 15.2) in the 2008 NCEEP *Little Alamance and Travis and Tickle Creek Local Watershed Plan* (pages 72-73). Site streams drain to a section of the Haw River, which was included on North Carolina's 2010 final 303(d) list for impaired ecological/biological integrity of benthic communities.

Prior to construction, Site land use consisted of cleared pasture for livestock grazing and disturbed forest. Site streams were characterized by eroding stream banks and a riparian buffer dominated by active livestock pasture and disturbed forest.

The primary goals of this mitigation project were obtained through removal of livestock from streams, buffers, and wetlands; reforestation of pasture land with native species; and installation of forded crossings to safely move animals and equipment across the Site. The goals of this project focused on improving water quality, enhancing flood attenuation, and restoring aquatic and riparian habitat and include the following.

- 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.
- Reducing sedimentation/siltation within onsite and downstream receiving waters by a) reducing 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.
- Promoting floodwater attenuation and improving stream stability by revegetating Site floodplains to reduce floodwater velocities through increased frictional resistance on floodwaters crossing Site floodplains.
- 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.
- Providing wildlife habitat including a minimum of a 50-foot forested riparian corridor from the top of each stream bank within a region of the state increasingly dissected by residential/agricultural land use.
- Protecting a Site identified in the 2008 Piedmont Triad Council of Government *Little Alamance, Travis, and Tickle Creek Watersheds Restoration Plan* (PTCG 2008) for preservation due to its location within a remote, rural area with increasing development pressure and appeal to developers.

This project was constructed between December 23, 2010 and January 6, 2011. All stream channels have a minimum of a 50-foot wide riparian buffer from the top of each stream bank, which was verified in the field on January 22, 2011. The project consisted of enhancement (level II) of 2200 linear feet of stream and enhancement of 1.75 acres of riparian wetlands by removing livestock and reforesting with native species. The project includes preservation of 1465 linear feet of perennial stream and 0.05 acre of riparian wetlands. Site activities provide 1173 Stream Mitigation Units and 0.89 riparian riverine Wetland Mitigation Units. The Site will be protected by a permanent conservation easement held by the State of North Carolina.

Success criteria for stream enhancement will include 1) success of riparian vegetation, 2) bank stability, and 3) documentation of two bankfull channel events. One bankfull event was documented to date during year 3 monitoring (2013) for a total of four documented bankfull events with at least one event documented to occur in each monitoring year.

Vegetation success criteria dictate that an average density of 320 stems per acre must be surviving in the first three monitoring years. Subsequently, 290 stems per acre must be surviving in year 4 and 260 stems per acre in year 5. Stem counts will be based on an average of the evaluated vegetation plots. Based on the number of stems counted, average densities were measured at 712 stems per acre (excluding livestakes) surviving in year 3 (2013). The dominant species identified at the Site were planted stems of cherrybark oak (*Quercus pagoda*), swamp chestnut oak (*Quercus michauxii*), and American elm (*Ulmus americana*). In addition, each individual vegetation plot met success criteria when counting planted stems alone.

In general herbaceous grasses within the Site, primarily tearthumb (*Polygonum sagittatum*) and rushes (*Juncus* spp.) in wetter areas and fescue (*Festuca* sp.) in drier areas, are vigorous and overtopping many of the smaller planted trees. As a result some of the smaller trees died due to grasses and some of the larger trees died over the summer of 2011 from dry, hot conditions. The Site was replanted as part of the planting warranty on November 1, 2011 including 369 bare root seedlings planted in Swamp Forest areas and 28 bare root seedlings planted in floodplain areas of the Site. Planted species and number of stems of each are as follows.

Swamp Forest (bare root trees)
45 swamp chestnut oak (*Quercus michauxii)*
135 sycamore (*Platanus occidentalis*)
99 American elm (*Ulmus americana*)
90 willow oak (*Quercus phellos*)
TOTAL 369 trees

Floodplain (bare root trees)
13 sycamore (*Platanus occidentalis*)
10 American elm (*Ulmus americana*)
5 silky dogwood (*Cornus amomum*)
TOTAL 28 trees

Planted stems in the majority of the site, including bare roots planted in 2011, appear to be vigorous in all areas except for portions of the Site previously ponded by beaver where no stems were observed. Herbaceous species in ponded areas contributed to low planted stem densities; fescue does not appear to be of concern at this time for planted stem survival.

Success criteria for wetland enhancement will include success of riparian vegetation. Wetland enhancement areas are jurisdictional; therefore, hydrology is not being monitored.

Signs of continuing beaver activity have been observed on the upstream portion of the Site. One large dam is located just off-site, but no dams currently exist on the Site. The previously ponded area upstream of the breached dam continues to have poor vegetation. APHIS personnel are providing beaver management and continue to trap at the Site as necessary. The beaver dam location and the previously ponded area are depicted on Figure 2 (Appendix B).

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 post-construction conditions. Photographs of the enhancement (level II) reach will be taken for each year of the monitoring period. In addition, visual assessments of the stream will be conducted by walking the length of stream and bankfull flow events will be documented during the monitoring period.

2.2 Vegetation Assessment

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 July 2013 for the year 3 (2013) 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

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APPENDIX A

PROJECT VICINITY MAP AND BACKGROUND TABLES

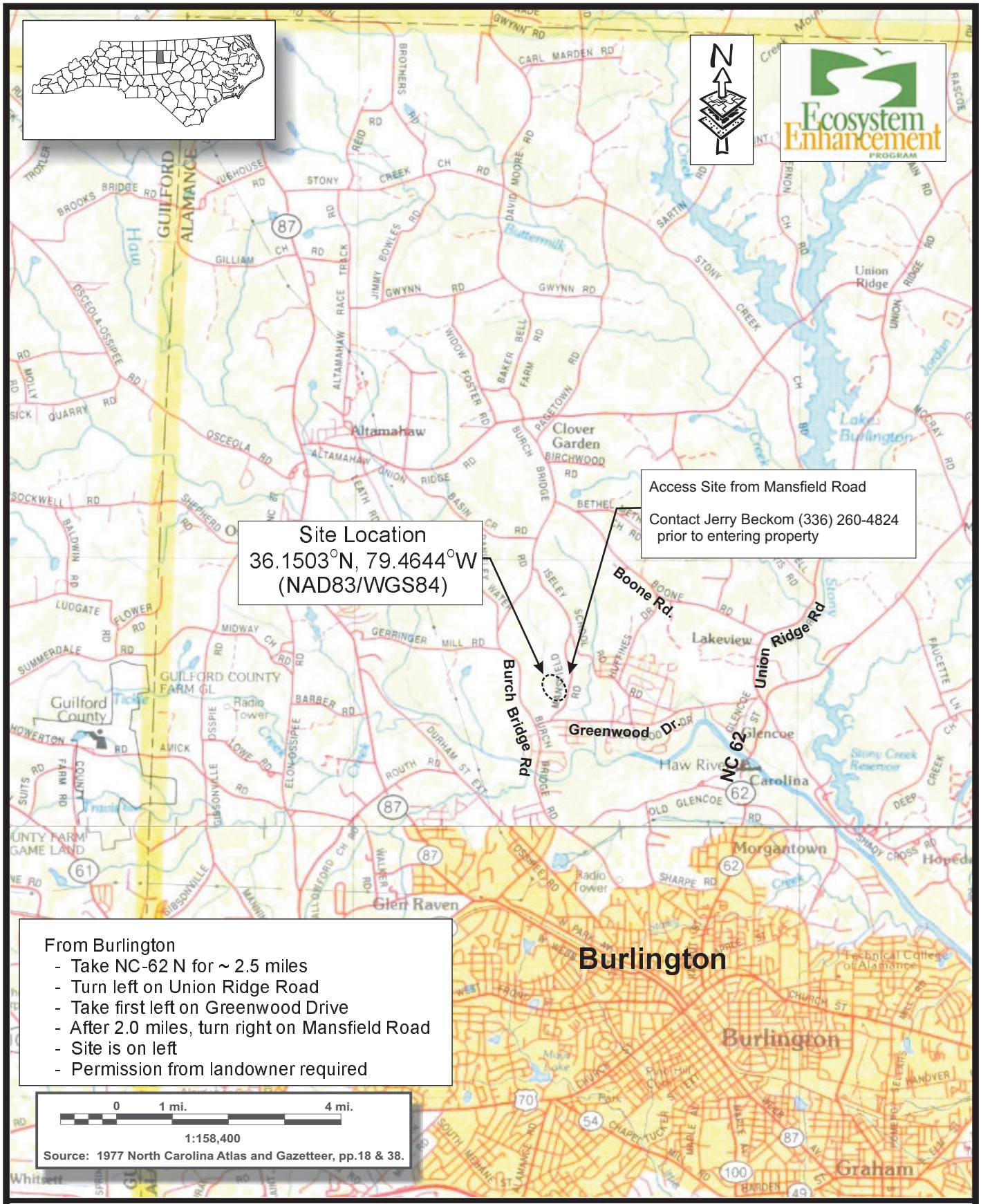
Figure 1. Vicinity Map

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



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SITE LOCATION
UT TO HAW (BECKOM) SITE (EEP #92694)
Alamance County, North Carolina

Dwn. by:	WGL
Ckd by:	CLF
Date:	January 2009
Project:	09-025

FIGURE
1

Table 1. Project Components and Mitigation Credits
UT to Haw (Beckom) Site, EEP Project No. 92964

Mitigation Credits

	Stream		Riparian Wetland		Non-Riparian Wetland	Buffer	Nitrogen Offset	Phosphorus Nutrient Offset
Type	R	RE	R	RE	--	--	--	--
Totals	--	1173 SMUs	--	0.89 WMUs	--	--	--	--

Project Components

Project Component/ Reach ID	Station/Location	Existing Footage	Approach	Restoration or Restoration Equivalent	Restoration Footage/ Acreage	Mitigation Ratio
Main Channel	--	1550	--	Enhancement (Level II)/	1550	2.5:1
	--	635	--	Preservation	635	5:1
UT1	--	15	--	Enhancement (Level II)	15	2.5:1
	--	665	--	Preservation	665	5:1
UT2	--	635	--	Enhancement (Level II)	635	2.5:1
UT3	--	165	--	Preservation	165	5:1
Wetland 1	--	1.15	--	Enhancement	1.15	2:1
Wetland 2	--	0.25	--	Enhancement	0.25	2:1
Wetland 3	--	0.05	--	Enhancement	0.05	2:1
Wetland 4	--	0.15	--	Enhancement	0.15	2:1
Wetland 5	--	0.05	--	Enhancement	0.05	2:1
Wetland 6	--	0.10	--	Enhancement	0.10	2:1
Wetland 7	--	0.01	--	Preservation	0.01	5:1
Wetland 8	--	0.04	--	Preservation	0.04	5:1

Component Summation

Restoration Level	Stream (linear footage)	Riverine Riparian Wetland (acreage)	Planted Riparian Buffer (acreage)
Enhancement (Level II)	2200	--	--
Enhancement	--	1.75	--
Preservation	1465	0.05	--
Totals	**3665**	**1.8**	**5.1**
Mitigation Units	**1173 SMUs**	**0.89 WMUs**	**--**

Table 2. Project Activity and Reporting History
UT to Haw (Beckom) Site, EEP Project No. 92964

Activity or Report	Data Collection Complete	Completion or Delivery
Mitigation Plan	March 2010	March 2010
Soil Amendments, Site Planting, & Baseline Monitoring Document	January 2011	January 2011
Year 1 (2011) Annual Monitoring	September 2011	October 2011
Year 2 (2012) Annual Monitoring	June 2012	August 2012
Year 3 (2013) Annual Monitoring	July 2013	September 2013

Table 3. Project Contacts Table
UT to Haw (Beckom) Site, EEP Project No. 92964

Designer	Axiom Environmental 218 Snow Ave Raleigh,NC 27603 Grant Lewis (919-215-1693)
Planting and Soil Amendment Contractor	Riverworks Inc. PO Box 31768 Raleigh NC 27622 George Morris (919-459-9043)

Table 4. Project Baseline Information and Attributes
UT to Haw (Beckom) Site, EEP Project No. 92964

Project Information			
Project name	UT to Haw Beckom		
County	Alamance		
Project Area	10 acres		
Project Coordinates	36.1503°N, -79.4644°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	385 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**
Length of reach (linear feet)	2185	680	635	165
Valley classification	VIII	VIII	VIII	VIII
Drainage area (acres)	150	75	50	30
NCDWQ stream identification score	42	51	60	68
NCDWQ Water Quality Classification	WS-V			
Morphological Description (stream type)	-	-	-	-
Evolutionary trend	-	-	-	-
Underlying mapped soils	Local Alluvial Land			
Drainage class	Poorly drained			
Soil Hydric status	Hydric			
Slope	.009 feet	.005 feet	.025 feet	.024 feet
FEMA classification	-	-	-	
Percent composition of exotic invasive vegetation	<5	<5	<5	<5

Wetland Summary Information								
Parameters	**Wetland 1**	**Wetland 2**	**Wetland 3**	**Wetland 4**	**Wetland 5**	**Wetland 6**	**Wetland 7**	**Wetland 8**
Size of Wetland (acres)	1.15 acres	0.25 acres	0.05 acres	0.15 acres	0.05 acres	0.10 acres	0.01 acres	0.04 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						P/M BHF*	P/M BHF*
Percent composition of exotic invasive vegetation	0	0	0	0	0	0	0	0

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		

***Piedmont/Mountain Bottomland Hardwood Forest (Schafale and Weakley)**

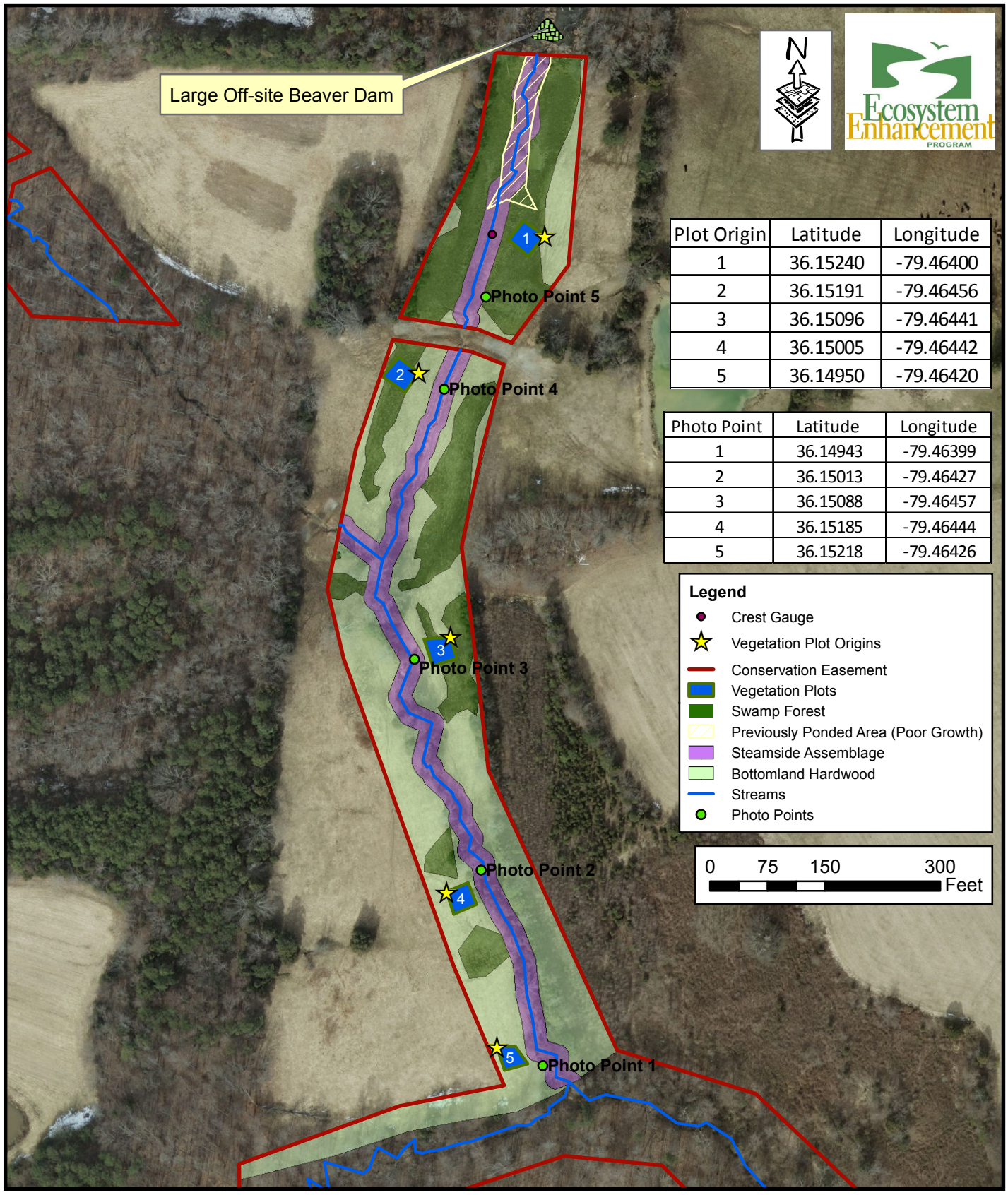
APPENDIX B

VISUAL ASSESSMENT DATA

Figure 2. Current Conditions Plan View

Table 5. Vegetation Condition Assessment Table

Vegetation Monitoring Plot Photos



Plot Origin	Latitude	Longitude
1	36.15240	-79.46400
2	36.15191	-79.46456
3	36.15096	-79.46441
4	36.15005	-79.46442
5	36.14950	-79.46420

Photo Point	Latitude	Longitude
1	36.14943	-79.46399
2	36.15013	-79.46427
3	36.15088	-79.46457
4	36.15185	-79.46444
5	36.15218	-79.46426

Legend

- Crest Gauge
- Vegetation Plot Origins
- Conservation Easement
- Vegetation Plots
- Swamp Forest
- Previously Ponded Area (Poor Growth)
- Steamside Assemblage
- Bottomland Hardwood
- Streams
- Photo Points

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CURRENT CONDITIONS PLAN VEIW
UT TO HAW BECKOM SITE
Alamance County, North Carolina

Dwn. by: ND/CLF/KRJ
Date: August 2013
Project: 12-004.05

FIGURE 2

Table 5 **Vegetation Condition Assessment**

UT Haw Beckom/EEP Project Number 92694

Planted Acreage[1] **5.1**

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	Competition from herbaceous vegetation within the northern portion of the Site has resulted in poor growth rates and vigor of smaller trees (2 acres). There is also a small area located in the northernmost portion of the site that was previously ponded do to beaver activity (0.14 acres). This area is now mostly bare with poor growth.	NA	Tan Hatched Polygon	1	2.14	42.0%
			Cumulative Total	1	2.14	42.0%

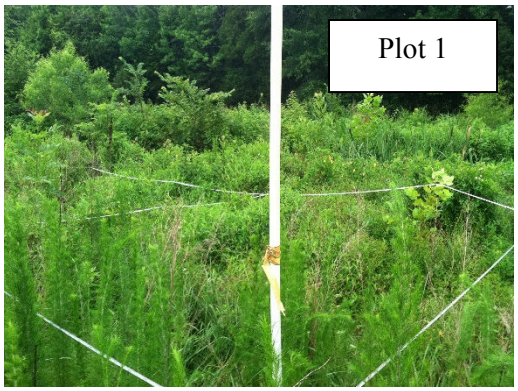
Easement Acreage[2] **10**

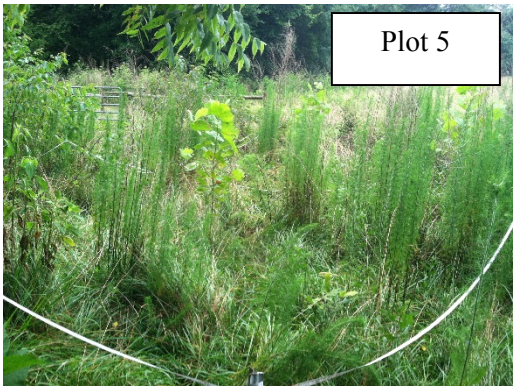
Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern [4]	NA	NA	NA	NA	NA	NA
5. Easement Encroachment Areas [3]	NA	NA	NA	NA	NA	NA

UT Haw (Beckom) Year 3 - 2013

Vegetation Monitoring Photographs

Taken July 2013





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
UT to Haw (Beckom) Site, EEP Project No. 92964

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
UT to Haw (Beckom) Site, EEP Project No. 92964

Report Prepared By	Corri Faquin
Date Prepared	7/29/2013 12:32
database name	Axiom-EEP-2013-A-v2.3.1.mdb
database location	C:\Axiom\Business\CVS
computer name	
file size	50696192
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	
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted 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.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	92694
project Name	UT Haw (Beckom)
Description	buffer and wetland mitigation
River Basin	
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	5

Table 8. Total Planted and Natural Recruit Stems by Plot and Species. UT Haw (Beckom) 2013

			Current Plot Data (MY3 2013)															Annual Means											
			E92694-AXE-0001			E92694-AXE-0002			E92694-AXE-0003			E92694-AXE-0004			E92694-AXE-0005			MY3 (2013)			MY2 (2012)			MY1 (2011)			MY0 (2011)		
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			2						
Carya	hickory	Tree															1			1			1						
Cephalanthus occide	common buttonbus	Shrub	6	6	6			12										6	6	18	6	6	47	6	6	31	2	2	2
Cornus amomum	silky dogwood	Shrub							1	1	1	2	2	2	1	1	1	4	4	4	4	4	4	1	1	1	3	3	3
Diospyros virginiana	common persimmo	Tree												2			19			21			38			21			
Fraxinus pennsylvani	green ash	Tree	4	4	4				1	1	1	4	4	4				9	9	9	9	9	10	9	9	9	11	11	11
Liquidambar styracifl	sweetgum	Tree									2			1						3			8			2			
Platanus occidentalis	American sycamore	Tree	2	2	2	1	1	1	5	5	5	1	1	1	5	5	5	14	14	14	15	15	17	7	7	7	12	12	12
Quercus	oak	Tree																						2	2	2	20	20	20
Quercus alba	white oak	Tree										1	1	1				1	1	1	1	1	1						
Quercus michauxii	swamp chestnut oa	Tree	2	2	2	5	5	5	4	4	4	3	3	3	4	4	4	18	18	18	19	19	19	18	18	18	11	11	11
Quercus minima	dwarf live oak	Shrub																						1	1	1			
Quercus pagoda	cherrybark oak	Tree	3	3	3	3	3	3	3	3	3	3	3	3				12	12	12	14	14	14	17	17	17	23	23	23
Quercus phellos	willow oak	Tree	1	1	1				2	2	2							3	3	3	5	5	5	8	8	8	10	10	10
Ulmus	elm	Tree																					23			2			
Ulmus alata	winged elm	Tree				1	1	1										1	1	1	1	1	1	1	1	1			
Ulmus americana	American elm	Tree	1	1	1				4	4	4	6	6	6	9	9	14	20	20	25	18	18	18	15	15	15	16	16	16
		Stem count	19	19	19	10	10	22	20	20	22	20	20	24	19	19	44	88	88	131	92	92	208	85	85	135	108	108	108
		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	7	7	7	4	4	5	7	7	8	7	7	10	4	4	6	10	10	14	10	10	15	11	11	14	9	9	9
		Stems per ACRE	768.9	768.9	768.9	404.7	404.7	890.3	809.4	809.4	890.3	809.4	809.4	971.2	768.9	768.9	1781	712.2	712.2	1060	744.6	744.6	1683	688	688	1093	874.1	874.1	874.1

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 live stakes

P-all = Planted stems including live stakes

T = Planted stems and natural recruits

Total includes stems of natural recruits

APPENDIX D

STREAM DATA

Fixed-Station Photos

UT Haw (Beckom) Year 3 - 2013
Fixed-Station Photos
Taken July 11, 2013

Photo Point 1

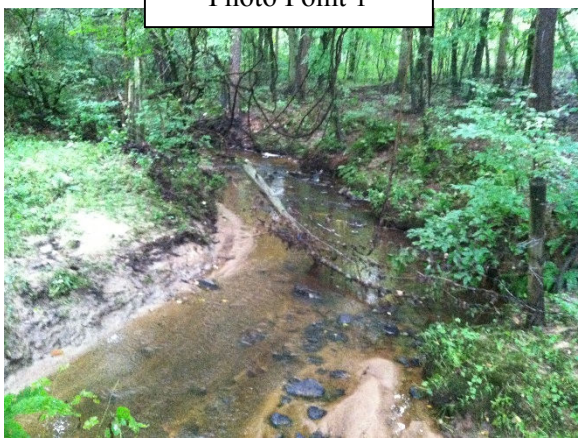
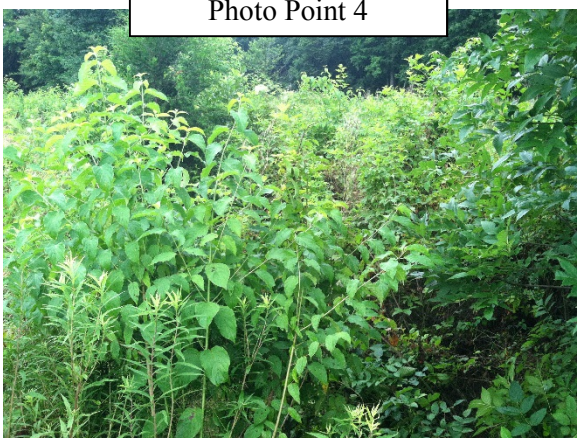


Photo Point 2

Photo Point 3

Photo Point 5

Photo Point 4



APPENDIX E

HYDROLOGY DATA

Table 9. Verification of Bankfull Events

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UT to Haw (Beckom) Site, EEP Project No. 92964

Date of Data Collection	Date of Occurrence	Method	Photo (if available)
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 (Sept 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)	--
July 11, 2013	June 31, 2013	Visual observations of overbank event including wrack lines and sediment deposition resulting from 14 days (June 25-July 8) of heavy rainfall totaling 6.27 inches.	1-2

* Reported at KBUY Weather Station in Burlington.

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