

**“Manning Farm Property”
Buffer Restoration Project**

**Edgecombe County, NC
Tar-Pamlico River Basin
(Cataloging Unit #03020103)**

**2007 Annual Monitoring Report (Year 2 of 5)
(Task 8)**

NC EEP Contract #D05026



Prepared For:

**North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
1652 Mail Service Center
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EXECUTIVE SUMMARY

Prior to project implementation, the Manning Farm Property was farmed for soybean and cotton production. The site consisted entirely of open agricultural fields with no existing riparian buffer (i.e. trees and shrubs are absent within 200 ft of existing surface waters). Under contract with the North Carolina Ecosystem Enhancement Program (EEP), Land Management Group, Inc. (LMG) implemented the restoration of 10.0 acres of riparian buffer habitat along Knight Canal (a tributary of Conetoe Creek) and contiguous surface-waters (i.e. field ditches) in Edgecombe County, NC.

The entire 10.0-ac project area has been planted with characteristic tree and shrub species on an average density of 900 stems/ac. Planting was completed in February 2006. Five (5) permanent 0.10-ac monitoring plots (equivalent to 5% of the restoration area) were established subsequent to planting. Annual monitoring will be conducted near the end of each growing season for a period of five years beginning in October 2006. Vegetative planting will be deemed successful if survivorship of plantings and volunteers of desirable species meets or exceeds a target stem density of 320 stems/acre. Based upon Year 2 monitoring, the buffer restoration area appears to be progressing well toward the targeted stem density. A total of 338 stems (excluding red maple, sweet gum, and privet) were enumerated within the five plots (corresponding to an average density of 676 stems/acre).

The following monitoring report summarizes the restoration project and includes specific plot data from the October 2007 (Year 2) monitoring event.

I. PROJECT BACKGROUND

1. Location and Setting

Under contract with the North Carolina Ecosystem Enhancement Program (EEP), Land Management Group, Inc. (LMG) implemented the restoration of 10.0 acres of farmland located adjacent to Knight Canal (a tributary of the Tar River) and a series of contiguous surface waters (i.e. field ditches). The project area is part of the “Manning Farm”, located approximately 4.0 miles southeast of Tarboro in Edgecombe County, NC (refer to Figure 1). The site is bordered to the north by US 64 Alternate and to the west by Knight Canal (refer to Figure 2). The property is situated within TAR-3 of the lower Tar-Pamlico River Basin (USGS Cataloging Unit 03020103).

2. Mitigation Structure and Objectives

The restoration project is intended to provide suitable, high-quality riparian buffer restoration as compensatory mitigation for riparian buffer impacts authorized through the North Carolina Division of Water Quality (NC DWQ). The objective of the project is to restore riparian buffer vegetation and diffuse flow conditions to help reduce non-point source discharge of contaminants into adjacent water bodies. The restoration project has resulted in the removal of agricultural fields adjacent to Knight Creek and surface-water ditches contiguous with the creek. In doing so, the restoration project helps to reduce non-point source loading of nitrogen (N) into surface waters while increasing the nutrient removal capacity of the adjacent land. The following monitoring report summarizes conditions related to restoration site development.

3. Project History and Background

Table 1 provides the reporting and milestone history of the Manning Farm restoration project.

II. PROJECT CONDITIONS

1. Pre-Construction Conditions

The 10.0-acre riparian buffer restoration area represents a portion of a larger 250-acre tract (“Manning Farm”) formerly farmed for the production of soybean and cotton. Land use practices, including herbicide, pesticide, and fertilizer application, served as potential contributors to decreased water quality of adjacent surface waters (i.e. ditches and ‘blue-line’ streams). Application of nitrogen-rich fertilizer represented the most significant non-point source of nitrogen within the immediate project area. Woody vegetation along ditches was either absent or sparse (less than 100 stems per acre that are > 5 inches diameter at breast height). As a result, nutrient-laden runoff was discharged from agricultural fields directly into surface waters with little or no nutrient filtration/transformation. Photographs documenting pre-project conditions are provided in Appendix A.

2. Soils

The site consists predominantly of Cape Fear loam, a very poorly drained soil occurring along stream terraces and depressional drainageways. Infiltration is slow and surface runoff is slow in these areas. The seasonal high water table occurs at or near the soil surface, assuming no ditching in the vicinity. The remaining portion of the buffer area consists of Roanoke loam – a poorly drained soil characteristic of broader flats of stream terraces. Roanoke soils exhibit slow infiltration with a seasonal high water table occurring at or near the soil surface (Figure 3).

3. Restoration Activities

The restoration project included the planting of characteristic tree and shrub seedlings adjacent to open ditches and blue-line streams on the 10.0-ac restoration site (refer to Figure 4). No federal or state permits were necessary to conduct the restoration activities. The riparian buffer was planted with characteristic tree species including river birch (*Betula nigra*), sycamore (*Platanus occidentalis*), water oak (*Quercus nigra*), overcup oak (*Quercus lyrata*), tulip poplar

(*Liriodendron tulipifera*), and red bay (*Persea borbonia*). Bare-root seedlings were planted at a density of 600 trees per acre. The outer 50 feet of the proposed buffer areas were planted with characteristic shrub species including wax myrtle (*Myrica cerifera*), American beautyberry (*Callicarpa americana*), and elderberry (*Sambucus canadensis*). Shrubs were planted at a density of 1,200 plants per acre. These species are considered to be well suited for site-specific conditions, including soil characteristics and moisture regimes. In addition, each of these species is listed within NCDENR's "Guidelines for Riparian Buffer Restoration" as appropriate species for use in riparian buffer restoration projects. Approximately 7,500 trees and shrubs were planted throughout the project footprint. On-site planting was completed in February 2006. Refer to Table 1 for a list of species planted (with corresponding quantities) within the buffer restoration area.

LMG arranged for the execution of the conservation easement deed to ensure the protection of the riparian buffer restoration area in perpetuity. The easement prohibits any activities (e.g. timbering, farming, building, etc.) that would alter the environmental state of the restoration project. Post-restoration management will be consistent with allowable activities as identified in the Tar-Pamlico Buffer Rule (15A NCAC 02B.0233). The conservation easement has been transferred to the North Carolina State Property Office for long-term protection and management of the site.

III. METHODOLOGY & SUCCESS CRITERIA

Based upon standard mitigation site monitoring requirements, annual monitoring will be conducted at the end of each growing season over a period of five years. Five (5) 0.10-acre permanent plots corresponding to a total of 0.5 acres (equivalent to 5% of the restoration area) were established subsequent to site planting. The locations of the monitoring plots are depicted in Figure 5. Monitoring includes the identification and enumeration of individuals (including shrubs and trees, planted or volunteer) occurring within each plot. All tree and shrub species within the plots are identified, flagged, and recorded on field data sheets during each monitoring event. Site planting is to be deemed successful if survivorship of plantings and volunteers of desirable

species¹ meets or exceeds a target stem density of 320 stems/acre. Non-preferred and invasive species are not counted toward success criteria. Thus species such as red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), and privet (*Ligustrum sinense*) are excluded from the recorded plot density data.

Monitoring reports are being submitted annually to the EEP (by January 1 of each year). These reports include results of vegetative monitoring and photographic documentation of site conditions. Monitoring reports will also identify any contingency measures that may need to be employed to remedy any site deficiencies. For instance, deer browse tubes and fencing may need to be used if evidence of significant herbivory or deer browse is observed. In addition, supplemental planting may be necessary in areas of reduced survivorship.

IV. MONITORING

A total of 558 stems (planted and volunteer shrubs/trees) were observed within the five 0.10-acre plots. Of the total observed, 338 stems (total excluding privet, red maple and sweet gum) were counted toward the success criteria (corresponding to 676 stems/acre). Of the species planted, river birch (*Betula nigra*) was the most abundant tree observed and elderberry (*Sambucus canadensis*) was the most abundant shrub observed within the five monitoring plots.

While the observed totals were sufficient to meet the success criteria, Plot #4 registered the lowest total with only 25 individuals. This represents a 36% decline in density compared to Year 1 results. Poor survivorship within the plot is likely due to the exceptional drought (D4) conditions occurring in Edgecombe County where current precipitation totals are 20 inches below average.

Refer to Table 2 for a comprehensive list of monitoring plot totals. Site photographs from the 2006 monitoring event are included in Appendix A and individual plot data sheets are included in Appendix B.

¹ Desirable species are considered as noninvasive species characteristic of riparian habitats.
Manning Farm Riparian Buffer Restoration
Annual Monitoring Report (Year 2 of 5)
Land Management Group, Inc.
November 2007
Contract No. D05026

V. CONCLUSION

Restoration activities have demonstrated to be successful at the 10.0-acre project site through the first year of annual monitoring. The observed density (676 stems/acre) indicates that the site is progressing well toward a maturity density of 320 stems/acre (considered the target density five years post-planting).

Reversion of agricultural land to wooded riparian buffer will decrease source nutrient loading and concurrently increase nutrient removal capacity. In addition, the project will provide ancillary benefits to aquatic and wildlife habitat via enhanced niche habitat, microclimate modification and shade, and increased food-web support. By doing so, the proposed project will help to effectively mitigate for authorized loss of riparian buffers within the Tar-Pamlico River Basin.

TABLES

Table 1. Reporting and Milestone History

Task	Project Milestone	Completion Date	COMMENTS
1	Feasibility Study, CE Document, and Public Meeting	July 1, 2005	
2	Record a Conservation Easement on the Site	January 25, 2006	Recorded in Edgecombe County Register of Deeds
3	Restoration Plan Approved by EEP	January 2006	Restoration Plan complete
4	Mitigation Site Earthwork Completed	January 15, 2006	Minimal earthwork required (only disking)
5	Mitigation Site Planting and Installation of Monitoring Devices	February 15, 2006	Approved by EEP
6	Submittal of Mitigation Plan (including as-built drawings)	June, 2006	Approved by EEP
7	Submittal of Monitoring Report #1 to EEP	December 31, 2006	Approved by EEP
8	Submittal of Monitoring Report #2 to EEP	December 31, 2007	
9	Submittal of Monitoring Report #3 to EEP	December 31, 2008	
10	Submittal of Monitoring Report #4 to EEP	December 31, 2009	
11	Submittal of Monitoring Report #5 to EEP	December 31, 2010	

Table 2. Manning Farm Plant List.

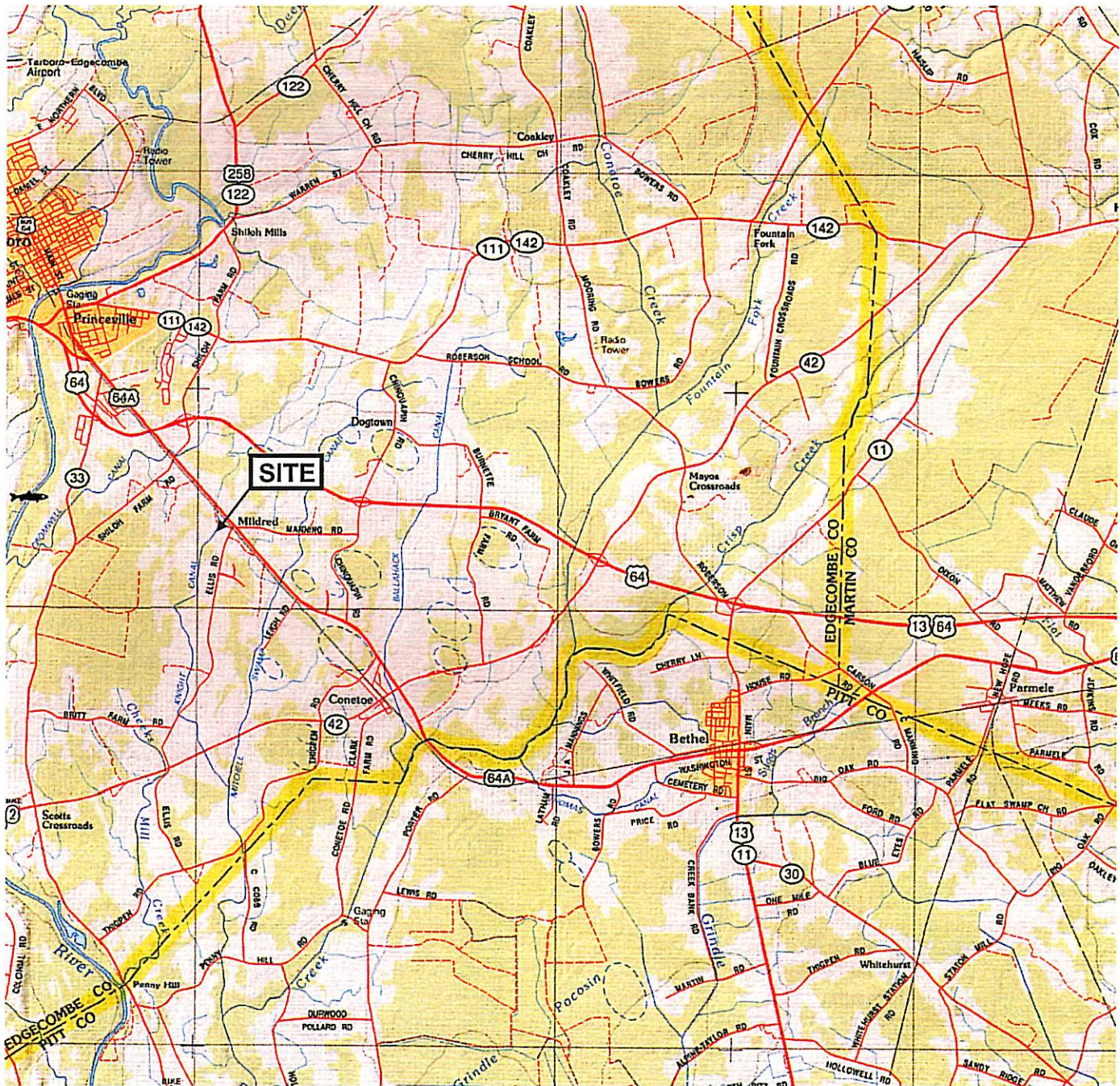
Buffer Zone	Zone 1 (Trees)	Zone 2 (Shrubs)		
Stem Target:	600/ac.	4,500 (% of total)	1,200/ac. # planted	3,000 (% of total)
Species	# planted			
River Birch (<i>Betula nigra</i>)	1,200	26.67%		
Sycamore (<i>Platanus occidentalis</i>)	800	17.78%		
Green Ash (<i>Fraxinus pennsylvanica</i>)	500	11.11%		
Overcup Oak (<i>Quercus lyrata</i>)	200	4.44%		
Water Oak (<i>Quercus nigra</i>)	500	11.11%		
Red Bay (<i>Persea borbonia</i>)	500	11.11%		
Tulip Poplar (<i>Liriodendron tulipifera</i>)	1,000	22.22%		
Sweet pepperbush (<i>Clethra alnifolia</i>)			500	16.67%
Elderberry (<i>Sambucus canadensis</i>)			1,000	33.33%
American Beautyberry (<i>Callicarpa americana</i>)			1,000	33.33%
Wax Myrtle (<i>Myrica cerifera</i>)			500	16.67%
			TOTAL	7,700

Table 3. Annual Monitoring Data (Year 2) – Vegetation Plots

Manning Farm Riparian Buffer Site

SPECIES	PLOT 1	PLOT 2	PLOT 3	PLOT 4	PLOT 5	TOTAL
American beautyberry				11	36	47
Baccharis	14	14	1		20	49
Elderberry		23		5	29	57
Green Ash						0
Overcup Oak						0
Persimmon	4					4
Privet						0
Red Bay						0
River Birch	22	6	25			53
Sweet Gum	50	20	40	50	60	220
Sweet Pepperbush						0
Sycamore	13	16	22			51
Tulip Poplar	12		22			34
Water Oak				8	19	27
Willow Oak	8			1	4	13
Wax Myrtle	2					2
Winged Sumac			1			1
TOTAL	125	79	111	75	168	558
Total Counted toward Success	75	59	71	25	108	338
Stem Density (per ac)	750	590	710	250	1080	676

FIGURES



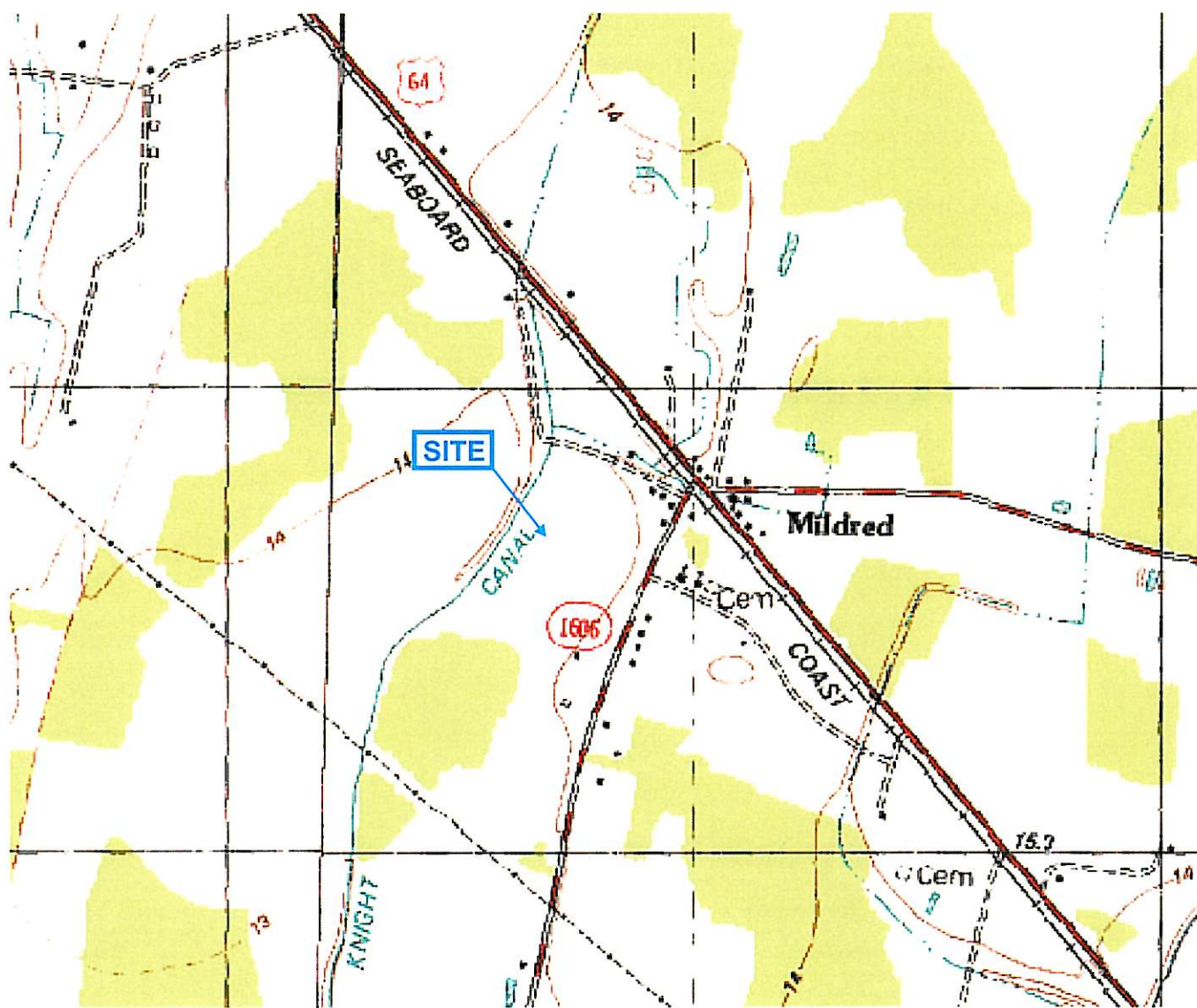
SCALE 1" = 2.0 miles

Map Source: DeLorme: North Carolina Atlas and Gazetteer., 1997 p. 46.

NC EEP
 Manning Farm
 Buffer Restoration Project
 Edgemcombe County

Land Management Group, Inc.
 Environmental Consultants
 Wilmington, N.C.
 November 2007

Figure 1.
 Site Location Map



Boundaries are approximate and not meant to be absolute.

Map Source: 1990, USGS 7.5' Topographic Quadrangle. Conetoe Quadrangle

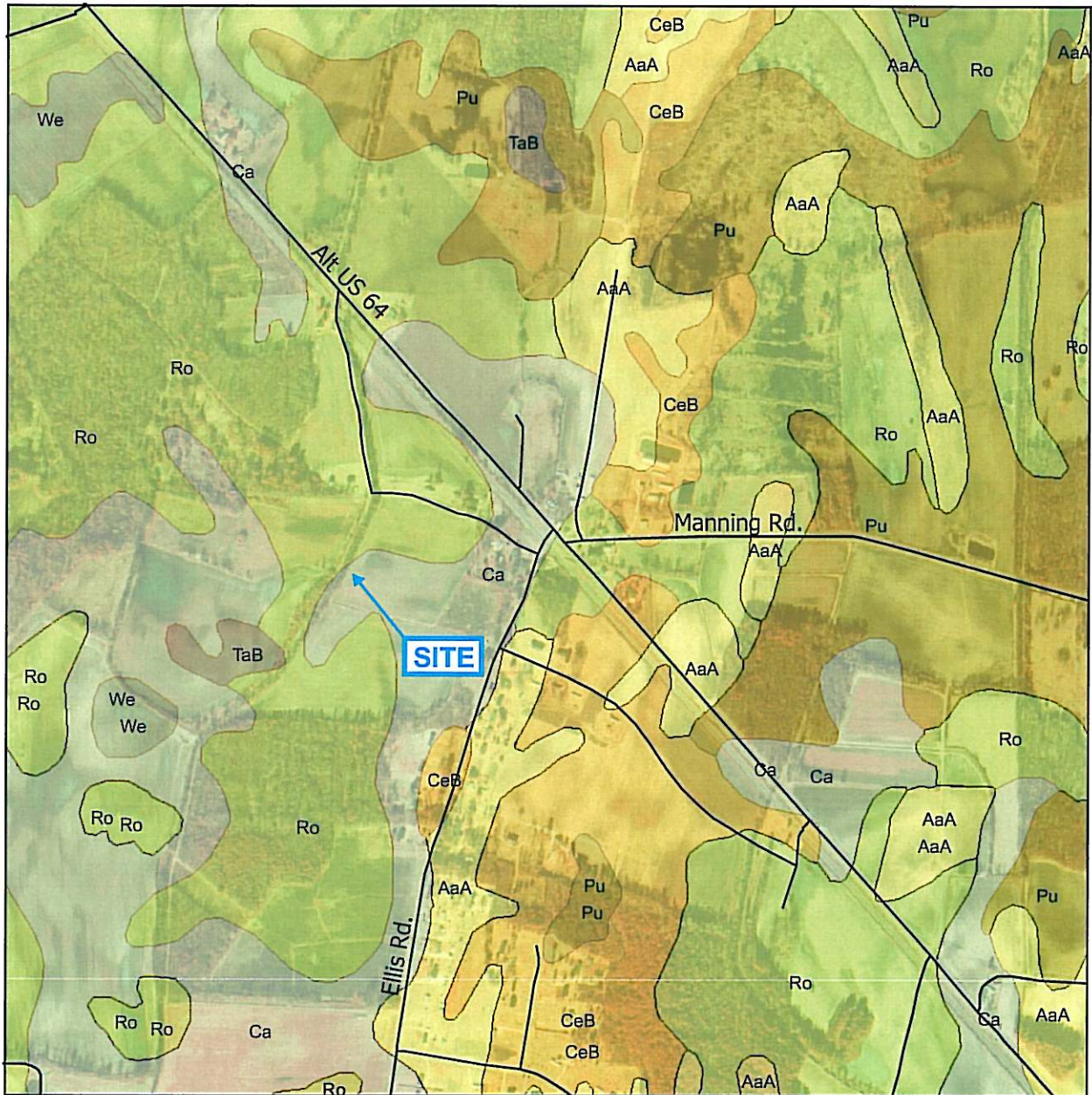


SCALE 1" = 2000'

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Figure 2.
 1990 Topographic Quad



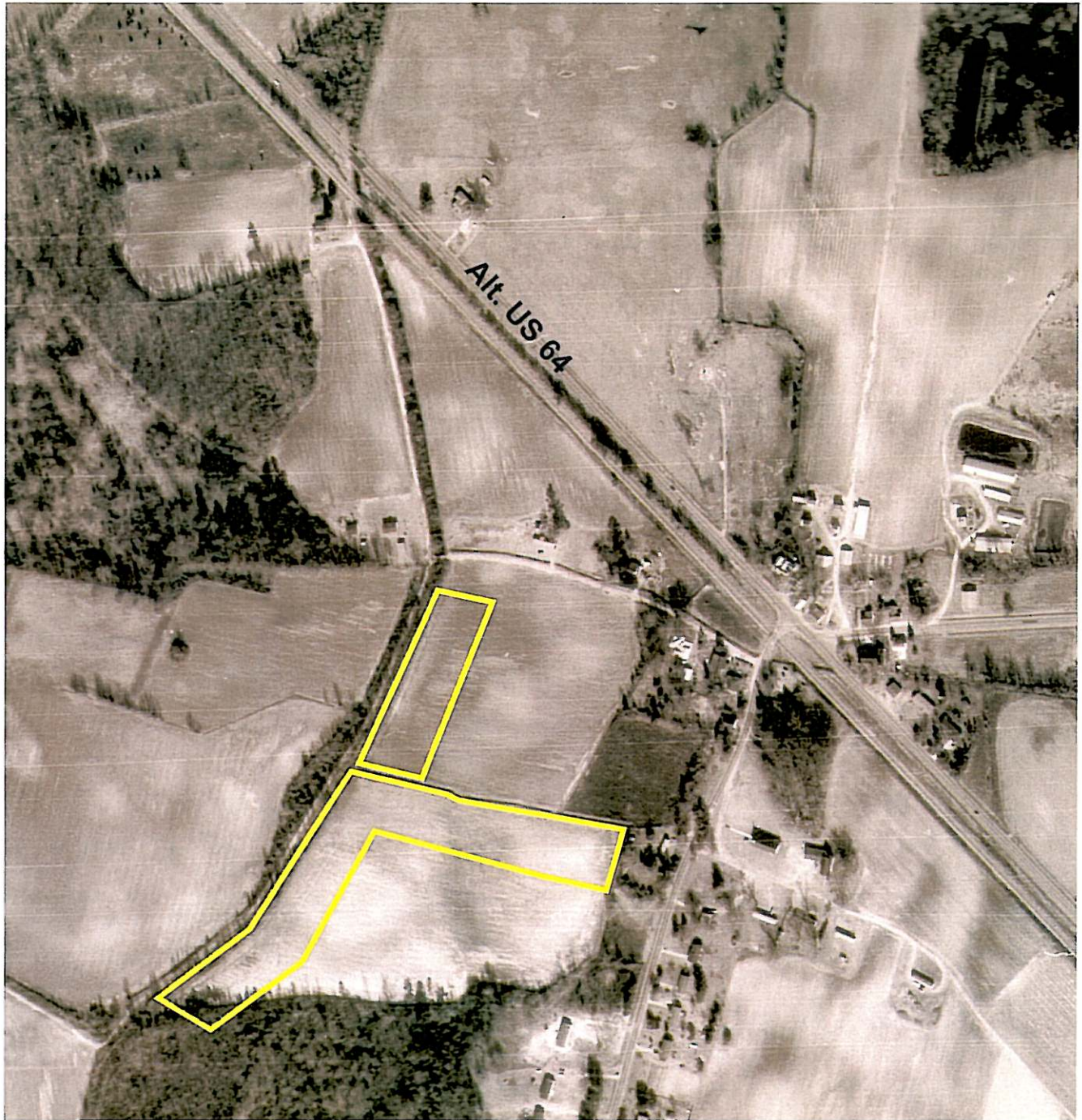
SCALE 1" = 1000'

Map Source: Soil Survey of Edgecombe County, 1977.

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Figure 3.
Generalized Soil Map
Edgecombe County, NC



 200' Buffer Planting Area (10.0 acres)

Boundaries are approximate
and not meant to be absolute.

Map Source: 1993 Aerial Photography NCGIA



SCALE 1" = 500'

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Figure 4.
Buffer Planting Overview

APPENDIX A.

SITE PHOTOGRAPHS (OCTOBER 2007, YEAR 2 OF 5)

**(1) Overview of buffer restoration project area
with the agricultural field in the foreground adjacent
to Plot 1**



(2) Typical view of a 2nd year River Birch in Plot #2



(3) View of Plot #3



(4) View of Plot #4



(5) View of Plot #5



(6) Typical view of 2nd year Willow Oak in Plot #5



APPENDIX B.

VEGETATION SURVEY DATA BY PLOT

**MANNING FARM RIPARIAN BUFFER SITE
ANNUAL MONITORING DATA SHEET - VEGETATION PLOTS**

PLOT NUMBER

1

SPECIES	STRATUM (T, SA, or SH)	Number of Individuals	HEIGHT	Planted vs. Volunteer Species	Number of Individuals Counted toward Success Criteria
River Birch	SA	4	<2ft.	Planted	4
River Birch	SA	1	2ft.	Planted	1
River Birch	SA	7	3ft.	Planted	7
River Birch	SA	5	4ft.	Planted	5
River Birch	SA	3	5ft.	Planted	3
River Birch	SA	2	6ft.	Planted	2
Tulip Poplar	SA	1	1ft.	Planted	1
Tulip Poplar	SA	8	2ft.	Planted	8
Tulip Poplar	SA	3	3ft.	Planted	3
American Sycamore	SA	2	3ft.	Planted	2
American Sycamore	SA	4	4ft.	Planted	4
American Sycamore	SA	2	5ft.	Planted	2
American Sycamore	SA	3	6ft.	Planted	3
American Sycamore	SA	1	7ft.	Planted	1
American Sycamore	SA	1	9ft.	Planted	1
Willow Oak	SA	2	<2ft.	Planted	2
Willow Oak	SA	2	2ft.	Planted	2
Willow Oak	SA	3	3ft.	Planted	3
Willow Oak	SA	1	6ft.	Planted	1
Persimmon	SA	2	<2ft.	Planted	2
Persimmon	SA	1	2ft.	Planted	1
Persimmon	SA	1	3ft.	Planted	1
Wax Myrtle	SH	2	3ft.	Planted	2
Baccharis	SH	2	<2ft.	Volunteer	2
Baccharis	SH	1	2ft.	Volunteer	1

Baccharis	SH	7	3ft.	Volunteer	7
Baccharis	SH	3	4ft.	Volunteer	3
Baccharis	SH	1	5ft.	Volunteer	1
Sweet Gum	SA	50	<2ft.	Volunteer	0
	TOTAL SHRUBS	16		OBSERVED DENSITY (PER PLOT)	75
	TOTAL TREES OF PLANTED SPECIES	59		OBSERVED DENSITY (PER ACRE)	750
	TOTAL TREES OF VOLUNTEER SPECIES	50			
	TOTAL INDIVIDUALS	125			

**MANNING FARM RIPARIAN BUFFER SITE
ANNUAL MONITORING DATA SHEET - VEGETATION PLOTS**

PLOT NUMBER 3

SPECIES	STRATUM (T, SA, or SH)	Number of Individuals	HEIGHT	Planted vs. Volunteer Species	Number of Individuals Counted toward Success Criteria
River Birch	SA	1	2ft.	Planted	1
River Birch	SA	1	3ft	Planted	1
River Birch	SA	3	3.5ft	Planted	3
River Birch	SA	3	4ft.	Planted	3
River Birch	SA	3	4.5ft	Planted	3
River Birch	SA	3	5ft	Planted	3
River Birch	SA	3	5.5ft	Planted	3
River Birch	SA	5	6ft	Planted	5
River Birch	SA	1	6.5ft	Planted	1
River Birch	SA	1	7ft	Planted	1
River Birch	SA	1	8ft	Planted	1
Sycamore	SA	1	3ft	Planted	1
Sycamore	SA	2	4.5ft	Planted	2
Sycamore	SA	1	5.5ft	Planted	1
Sycamore	SA	2	6ft	Planted	2
Sycamore	SA	6	7ft	Planted	6
Sycamore	SA	4	8ft	Planted	4
Sycamore	SA	3	9ft	Planted	3
Sycamore	SA	3	10ft	Planted	3
Tulip Poplar	SA	1	2ft.	Planted	1
Tulip Poplar	SA	5	3ft	Planted	5
Tulip Poplar	SA	5	4ft.	Planted	5
Tulip Poplar	SA	4	4.5ft	Planted	4
Tulip Poplar	SA	4	5ft	Planted	4
Tulip Poplar	SA	1	5.5ft	Planted	1
Tulip Poplar	SA	1	6ft	Planted	1
Tulip Poplar	SA	1	6.5ft	Planted	1
Winged Sumac	SA	1	4ft.	Volunteer	1
Baccharis	SH	1	4ft.	Volunteer	1
Sweet Gum	SA	40	3ft	Volunteer	0

	TOTAL SHRUBS	2		OBSERVED DENSITY (PER PLOT)	71
	TOTAL TREES OF PLANTED SPECIES	69		OBSERVED DENSITY (PER ACRE)	710
	TOTAL TREES OF VOLUNTEER SPECIES	40			
	TOTAL INDIVIDUALS	111			

**MANNING FARM RIPARIAN BUFFER SITE
ANNUAL MONITORING DATA SHEET - VEGETATION PLOTS**

PLOT NUMBER 4

SPECIES	STRATUM (T, SA, or SH)	Number of Individuals	HEIGHT	Planted vs. Volunteer Species	Number of Individuals Counted toward Success Criteria
American Beautyberry	SH	1	2.5ft	Planted	1
American Beautyberry	SH	3	3ft	Planted	3
American Beautyberry	SH	5	4ft	Planted	5
American Beautyberry	SH	2	5ft	Planted	2
Water Oak	SA	1	<2ft	Planted	1
Water Oak	SA	3	3ft	Planted	3
Water Oak	SA	1	3.5ft	Planted	1
Water Oak	SA	1	4ft	Planted	1
Water Oak	SA	2	4.5ft	Planted	2
Elderberry	SH	1	2.0ft	Planted	1
Elderberry	SH	1	4ft	Planted	1
Elderberry	SH	1	5.5ft	Planted	1
Elderberry	SH	2	6ft	Planted	2
Willow Oak	SA	1	2ft.	Planted	1
Sweet Gum	SA	50	1ft.	Volunteer	0
	TOTAL SHRUBS	16		OBSERVED DENSITY (PER PLOT)	25
	TOTAL TREES OF PLANTED SPECIES	9		OBSERVED DENSITY (PER ACRE)	250
	TOTAL TREES OF VOLUNTEER SPECIES	50			
	TOTAL INDIVIDUALS	75			

**MANNING FARM RIPARIAN BUFFER SITE
ANNUAL MONITORING DATA SHEET - VEGETATION PLOTS**

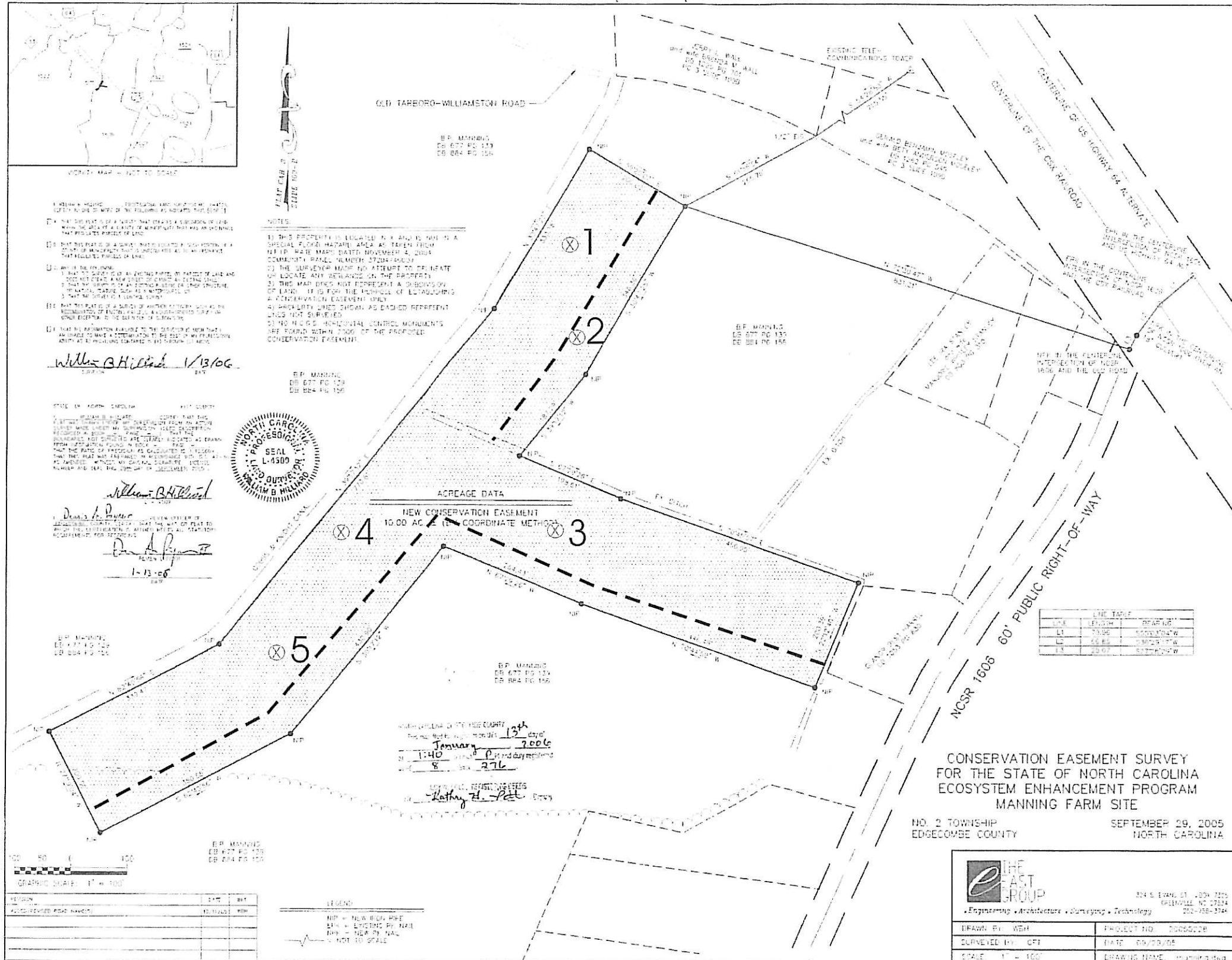
PLOT NUMBER 5

SPECIES	STRATUM (T, SA, or SH)	Number of Individuals	HEIGHT	Planted vs. Volunteer Species	Number of Individuals Counted toward Success Criteria
Willow Oak	SA	1	<2ft	Planted	1
Willow Oak	SA	1	3ft	Planted	1
Willow Oak	SA	1	3.5ft	Planted	1
Willow Oak	SA	1	4ft	Planted	1
American Beautyberry	SH	3	<2ft	Planted	3
American Beautyberry	SH	7	2ft	Planted	7
American Beautyberry	SH	10	2.5ft	Planted	10
American Beautyberry	SH	10	3ft	Planted	10
American Beautyberry	SH	3	3.5ft	Planted	3
American Beautyberry	SH	3	4ft	Planted	3
Elderberry	SH	3	<2ft	Planted	3
Elderberry	SH	4	2ft	Planted	4
Elderberry	SH	6	2.5ft	Planted	6
Elderberry	SH	2	3ft	Planted	2
Elderberry	SH	4	4ft	Planted	4
Elderberry	SH	3	4.5ft	Planted	3
Elderberry	SH	2	5ft	Planted	2
Elderberry	SH	2	5.5ft	Planted	2
Elderberry	SH	3	6ft	Planted	3
Water Oak	SA	5	<2ft	Planted	5
Water Oak	SA	3	3ft	Planted	3
Water Oak	SA	6	3.5ft	Planted	6
Water Oak	SA	3	4ft	Planted	3
Water Oak	SA	2	4.5ft	Planted	2
Baccharis	SH	20	<2ft	Volunteer	20
Sweet Gum	SA	60	<2ft	Volunteer	0
	TOTAL SHRUBS	85		OBSERVED DENSITY (PER PLOT)	108
	TOTAL TREES OF PLANTED SPECIES	43		OBSERVED DENSITY (PER ACRE)	1080

	TOTAL TREES OF VOLUNTEER SPECIES	60			
	TOTAL INDIVIDUALS	168			

**APPENDIX C.
CONSERVATION EASEMENT PLAT
(WITH PLOT LOCATIONS)**

PC8 1 S-214



PC8, S-216

PC8 1 S-214

Plot #	UTM Coordinates
1	745578.75002 233843.862283
2	745591.202791 233810.111316
3	745575.130088 233667.657117
4	745477.154439 233661.641541
5	745464.062895 233622.895396

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