



MONITORING YEAR 4 ANNUAL REPORT

Final

BURNETTS CHAPEL BUFFER MITIGATION SITE

Guilford County, NC
NCDEQ Contract No. 003996
NCDMS ID No. 95009

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EXECUTIVE SUMMARY

The Burnetts Chapel Buffer Mitigation Site, hereafter referred to as the Site, is located within the Randleman Regional Reservoir watershed of the Cape Fear River Basin. The Site is located in the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998) approximately three miles west of the Town of Pleasant Garden and four miles south of the City of Greensboro in Guilford County, NC. Directions and a map of the Site are provided in Figure 1 (Appendix 1). The Site has historically been forested or used for agricultural purposes. The project is surrounded by fields that are alternately used for cattle and crop production. A conservation easement has been recorded to protect 12.0 acres of riparian corridor resources in perpetuity. The project is being completed to provide buffer mitigation units (BMUs) in the Cape Fear River Basin, and will include 9.2 acres in buffer restoration. The remaining protected acreage is buffer preservation not sought for credit. See Table 1 (Appendix 1) for a summary of project components and mitigation credits. A map of the conservation easement and project reaches is provided in Figure 2 (Appendix 1).

The goals of the Site address water quality improvements identified in the Cape Fear River Basin Restoration Priorities Report (RBRP) (NCEEP, 2009) and include the following:

- Remove harmful nutrients from creek flow;
- Reduce pollution of creek by excess sediment;
- Restore terrestrial habitat; and
- Improve aesthetics.

The following project objectives were established in the Burnetts Chapel Buffer Mitigation Site Mitigation Plan (2012) to meet the RBRP goals:

- Riparian areas will be fenced off from adjacent agricultural activities and runoff will be filtered through buffer zones. Flood flows will be filtered through restored riparian areas, where flood flow will spread through native vegetation. Vegetation will be planted to uptake excess nutrients;
- Streambanks will be further stabilized by increased woody root mass in the banks. Storm flow containing grit and fine sediment will be filtered through restored riparian buffer areas, where flow will spread through native vegetation;
- The establishment and maintenance of riparian buffers will create long-term shading of the channel bed, reducing thermal heating and improving aquatic habitat; and
- Adjacent buffer and riparian habitats will be restored with native vegetation and invasive species will be treated as part of the project. Native vegetation will provide cover and food for terrestrial creatures.

Overall, the Site has met the required buffer mitigation success criteria for the fourth year of annual monitoring (MY4). Although two vegetation plots (6 and 17) did not meet the MY4 stem density criteria, the average stem density of the Site is greater than the required MY4 success criteria. Continual maintenance checks on the Site and spot treatments for invasive species is planned for the upcoming monitoring year.



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1.0 PROJECT OVERVIEW

The Burnetts Chapel Buffer Mitigation Site, hereafter referred to as the Site, is located within the Randleman Regional Reservoir watershed (North Carolina Division of Water Resources (NCDWR) Subbasin 03-06-08) of the Cape Fear River Basin (United States Geological Survey (USGS) Hydrologic Unit Code (HUC) 03030003010050). The Site is located in the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998) approximately three miles west of the Town of Pleasant Garden and four miles south of the City of Greensboro in Guilford County, NC. Directions and a map of the Site are provided in Figure 1 (Appendix 1).

The Site has historically been forested or used for agricultural purposes. The current property owner has confirmed that the Site has been farmed for more than 100 years and has included activities such as crop production, livestock pastures, and timber. The project is surrounded by fields that are alternately used for cattle and crop production. The Deep River is the primary river in this HUC which flows into the Randleman Reservoir. The reservoir is a regional water supply and stream buffer protection rules are in place throughout the watershed. The Site is comprised of two areas on one parcel of land along three perennial streams (Reaches A, B1, and B2) and four intermittent streams (Reaches B2, B3, B4, and B5) with upstream ephemeral channels that drain to the Randleman Reservoir. At the downstream limits of the project, the drainage area is 366 acres (0.6 square miles).

The NCDWR assigns best usage classifications to State Waters that reflect water quality conditions and potential resource usage. Deep River is classified as Class WS-IV; Critical Area (CA) waters. Class WS-IV waters are used as sources of water supply for drinking or food processing purposes where a more restrictive WS-I, WS-II, or WS-III classification is not feasible. These waters are also protected for Class C uses such as secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, and agriculture. WS-IV waters are generally in moderately to highly-developed watersheds or Protected Areas.

A conservation easement has been recorded to protect 12.0 acres of riparian corridor resources in perpetuity. The project is being completed to provide buffer mitigation units (BMUs) in the Cape Fear River Basin, and will include 9.2 acres in buffer restoration. The remaining protected acreage is buffer preservation not sought for credit. See Table 1 (Appendix 1) for a summary of project components and mitigation credits. A map of the conservation easement and project reaches is provided in Figure 2 (Appendix 1).

1.1 Project Goals and Objectives

Prior to construction activities, the primary watershed stressor was the lack of a vegetated buffer and subsequent moderate stream incision from agricultural maintenance activities. Some reaches (A and B1) exhibited only moderate incision with stable bedform and stream banks throughout, while other reaches (B2) exhibited stable geomorphic conditions with no active bed incision or bank erosion. The riparian zones within these areas were maintained in the past and mowed on an annual basis resulting in varying buffer widths. The smaller intermittent channels with small upstream ephemeral channels are located entirely within existing open pasture. These reaches (B3, B4, and B5) entirely lacked suitable woody riparian species and were dominated by various grass and sedge species. As a result of the aforementioned land activities, the Site had poor water quality due to sediment and nutrient pollution and poor in-stream habitat due to lack of riparian vegetation and lack of in-stream bed diversity. The restored riparian buffer areas within the Site will filter harmful nutrients from runoff, reduce pollution of creek by excess sediment, restore the terrestrial habitat, and improve aesthetics.



As part of the site preparation, two small surface water impoundments, located on Reaches B4 and B5, were removed in order to allow for stable stream channels to be constructed and for these areas to qualify for buffer restoration credit. Riparian stream buffers were planted and restored to the dominant natural plant community that exists within the project watershed. This natural community within and adjacent to the project easement is classified as Piedmont Bottomland Forest and was determined based on existing canopy and herbaceous species (Schafale and Weakley, 1990). Plant and seed materials were installed on stream banks out to the project easement limits. These areas were planted with bare root trees and a seed mixture of permanent herbaceous vegetation ground cover. Tables 1-4 in Appendix 1 presents detailed information for pre and post restoration conditions.

The goals of the Site address water quality improvements identified in the Cape Fear River Basin Restoration Priorities Report (RBRP) (NCDMS, 2009) and include the following:

- Remove harmful nutrients from creek flow;
- Reduce pollution of creek by excess sediment;
- Restore terrestrial habitat; and
- Improve aesthetics.

The following project objectives were established in the Burnetts Chapel Buffer Mitigation Site Mitigation Plan (2012) to meet the RBRP goals:

- Riparian areas will be fenced off from adjacent agricultural activities and runoff will be filtered through buffer zones. Flood flows will be filtered through restored riparian areas, where flood flow will spread through native vegetation. Vegetation will be planted to uptake excess nutrients;
- Streambanks will be further stabilized by increased woody root mass in the banks. Storm flow containing grit and fine sediment will be filtered through restored riparian buffer areas, where flow will spread through native vegetation;
- The establishment and maintenance of riparian buffers will create long-term shading of the channel bed, reducing thermal heating and improving aquatic habitat; and
- Adjacent buffer and riparian habitats will be restored with native vegetation and invasive species will be treated as part of the project. Native vegetation will provide cover and food for terrestrial creatures.

1.2 Monitoring Year 4 Data Assessment

The final mitigation plan was submitted and accepted by the North Carolina Department of Mitigation Services (NCDMS) in February 2012. Grading activities were completed by the landowner in December 2011. Planting activities were completed by Bruton Natural Systems, Inc. in March 2012. The baseline monitoring and as-built survey were completed in April 2012. There were no significant deviations reported in the project elements in comparison to the design plans. Appendix 1 provides more detailed project activity, history, contact information, and watershed/site background information for this project.

The buffer restoration success criteria for the Site follows the approved success criteria presented in the NCEEP Mitigation Plan Guidance (Version 2.0, 10/01/2010). Biannual monitoring was conducted to assess the Site conditions in April and July 2015.



1.2.1 Vegetative Assessment

A total of 22 vegetation plots were established within the project easement area using standard 10 meter by 10 meter vegetation monitoring plots. Plots were randomly established within planted portions of the riparian buffer areas to capture the heterogeneity of the designed vegetative communities. The plot corners have been marked and are recoverable either through field identification or with the use of a GPS unit. Reference photographs at the origin looking diagonally across the plot to the opposite corner were taken. The final vegetative success criteria will be the survival of 320 planted stems per acre in the buffer corridor at the end of year five (MY5) of the monitoring period. Along with the stem density requirement, the final planted vegetation community must also include at least two different planted species to be considered successful. The extent of invasive species coverage will also be monitored and controlled as necessary.

The annual vegetation monitoring resulted in an average stem density of 541 stems per acre, which is 71% of the baseline (MY0) density recorded (763 stems per acre) in April 2012. There was an average of 13 stems per plot in MY4 compared to 14 stems per plot in MY3, 13 stems per plot in MY2, 16 stems per plot in MY1, and 19 stems per plot in MY0. The small increase in average stems per plot between MY2 and MY3 is due to recovered planted stems that were missing in MY2. The MY4 stem density requirement was not met in vegetation plot 6 or vegetation plot 17. Vegetation plot 17 is within an isolated area intensely graded after the removal of a dam. Poor soil quality and compaction, possibly due to grading, contributed to stem mortality in this area. Vegetation plot 6 has experienced uncharacteristically low growth rates and vigor ratings throughout the entire monitoring period, and was just barely meeting the density criteria in MY3. An unseasonably hot and dry spring may have contributed to additional stem mortality at this location in MY4. Vegetation plot 1 meets the stem density requirements for MY4, but many surviving stems have a low vigor due to an infestation of Japanese beetles which in some cases have left trees nearly completely defoliated. While plots 6 and 17 did not meet the interim success criteria, the plots are on track to meet the final mitigation success requirements with the inclusion of volunteer species.

Small patches of, Chinese lespedeza (*Lespedeza cuneata*), tree of heaven (*Ailanthus altissima*), multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*) and callery pear (*Pyrus calleryana*) were observed within the Site. Areas of Johnson grass (*Sorghum halepense*) were observed outside of the easement. Spot treatment of invasive plants with herbicide is planned for the current year to control these species and prevent further spreading. There are two areas with sparse vegetation observed onsite, which correspond to compacted soils from grading below the pond on reach B4 and an old road bed on Reach B2. These areas will be treated with fertilizer and reseeded in the upcoming monitoring year to assist in recovery. Please refer to Appendix 2 for vegetation plot photographs and visual assessment data and Appendix 3 for vegetation plot data.

1.3 Monitoring Year 4 Summary

Overall, the Site has met the required buffer mitigation success criteria for MY4. Although two vegetation plots (6 and 17) did not meet the MY4 stem density criteria, the average stem density of the Site is greater than the required MY4 success criteria. Continual maintenance checks on the Site, fertilization and reseeded of the sparsely vegetated areas, and spot treatments for invasive species is planned for the current monitoring year.

Summary information/data and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Mitigation Plan documents



available on NCDMS's website. All raw data supporting the tables and figures in the appendices are available from NCDMS upon request.

2.0 METHODOLOGY

Vegetation monitoring protocols followed the Carolina Vegetation Survey-NCEEP Level Two Protocol (Lee et al., 2008).

3.0 REFERENCES

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Wildlands Engineering, Inc. 2012. Burnetts Chapel Buffer Mitigation Site Baseline Monitoring Document and As-Built Baseline Report. NCDMS, Raleigh, NC.



APPENDIX 1. General Tables and Figures

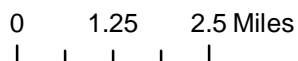
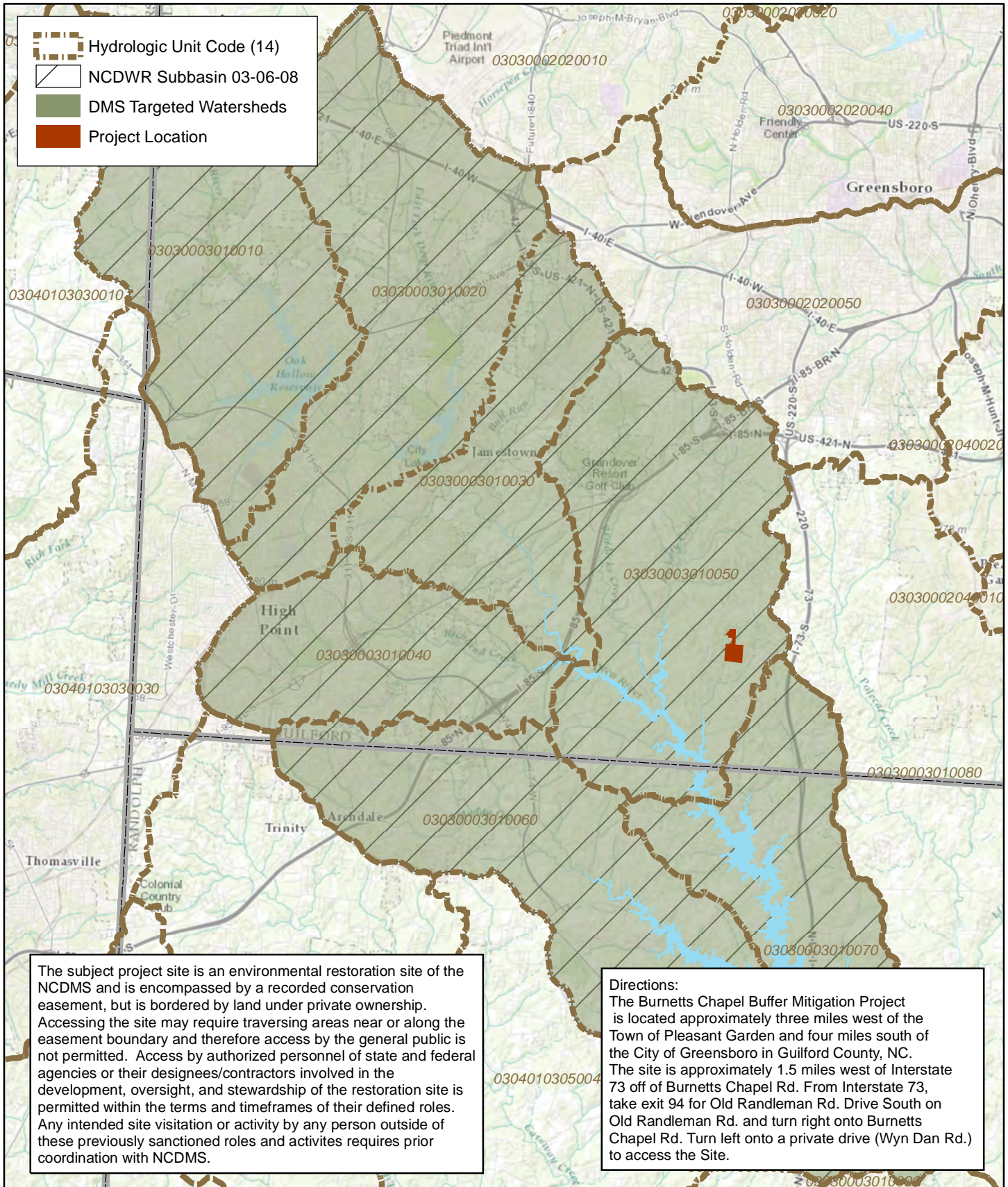
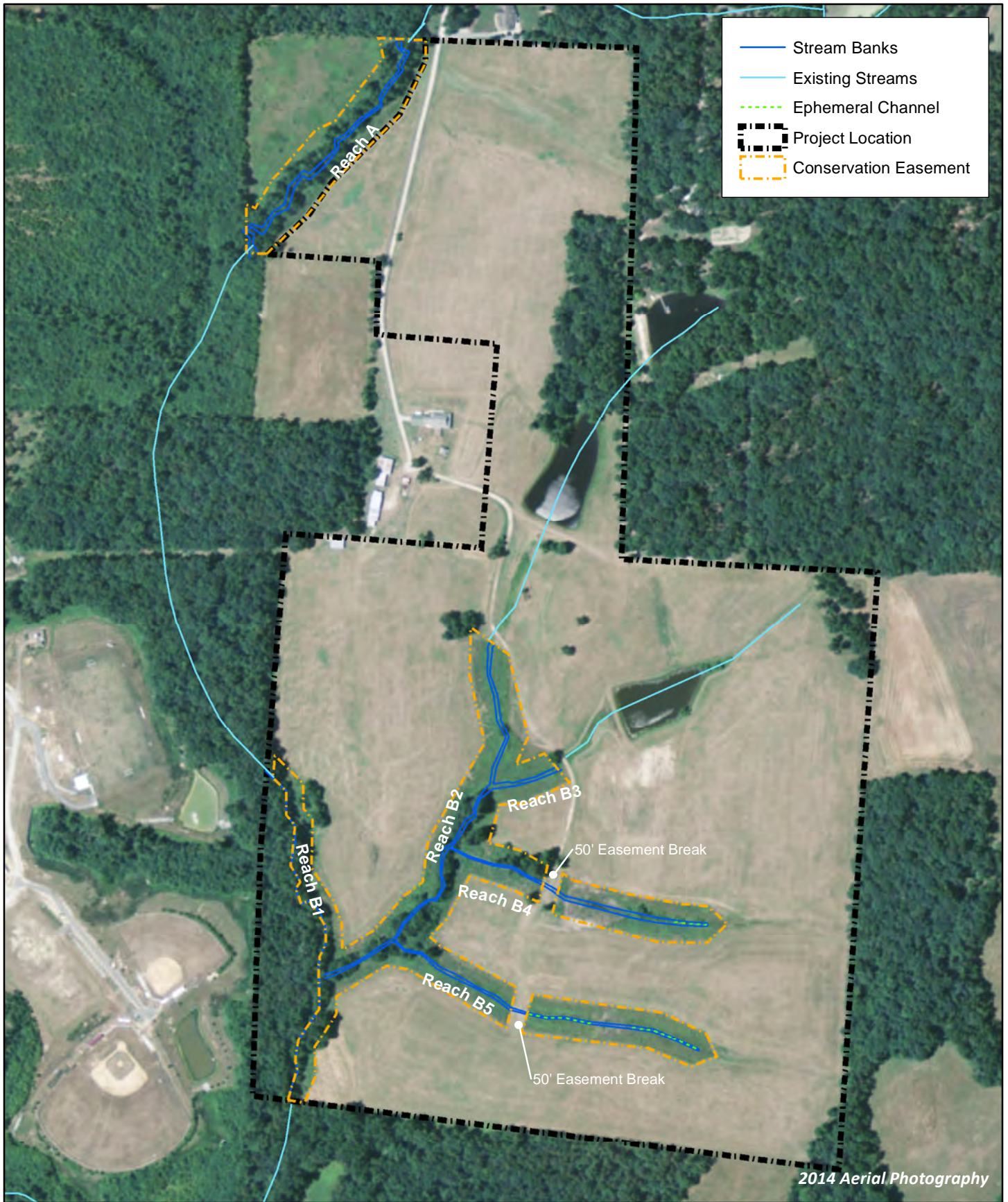


Figure 1 Project Vicinity Map
 Burnetts Chapel Buffer Mitigation Site
 NCDMS Project Number 95009
 Monitoring Year 4



- Stream Banks
- Existing Streams
- - - Ephemeral Channel
- Project Location
- Conservation Easement

2014 Aerial Photography



0 200 400 Feet



Figure 2 Project Component/Asset Map
 Burnetts Chapel Buffer Mitigation Site
 NCDMS Project Number 95009
 Monitoring Year 4

Guilford County, NC

**Table 1. Project Components and Mitigation Credits
Burnetts Chapel Buffer Mitigation Site (NCDMS Project No.95009)
Monitoring Year 4**

Mitigation Credits									
	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	N/A	N/A	N/A	N/A	N/A	N/A	9.2	N/A	N/A
Project Components									
Reach ID	Stationing/ Location	Existing Footage (LF)	Approach	Restoration or Restoration Equivalent		Area (acres)	Mitigation Ratio		
Reach A	Area A		N/A	Restoration		1.5	1:1		
Reach B1	Area B		N/A	Restoration		0.7	1:1		
Reach B2	Area B		N/A	Restoration		2.7	1:1		
Reach B3	Area B		N/A	Restoration		0.4	1:1		
Reach B4	Area B		N/A	Restoration		1.7	1:1		
Reach B5	Area B		N/A	Restoration		2.2	1:1		
Component Summation									
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-Riparian Wetland (acres)		Buffer (square feet)	Upland (acres)		
		Riverine	Non-Riverine						
Restoration						400,752			
Enhancement									
Enhancement I									
Enhancement II									
Creation									
Preservation									
High Quality Preservation									
BMP Elements									
Elements	Location		Purpose/Function			Notes			

BR = Bioretention Cell; S F= Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer

**Table 2. Project Activity and Reporting History
Burnetts Chapel Buffer Mitigation Site (NCDMS Project No.95009)
Monitoring Year 4**

Activity or Report	Date Collection Complete	Completion or Delivery
Mitigation Plan	December 2011	February 2012
Final Design - Construction Plans	December 2011	February 2012
Construction*	January 2012	January 2012
Temporary S&E mix applied to entire project area**	January 2012	January 2012
Permanent seed mix applied to reach/segments	January 2012	
Containerized and B&B plantings for reach/segments	March 2012	March 2012
Baseline Monitoring Document (Year 0 Monitoring - baseline)	April 2012	June 2012
Year 1 Monitoring	September 2012	December 2012
Year 2 Monitoring	June 2013	August 2013
Year 3 Monitoring	July 2014	December 2014
Year 4 Monitoring	July 2015	December 2015
Year 5 Monitoring	2016	December 2016

*Grading of existing ponds was completed in January

**Seed and mulch is added as each section of construction is completed.

**Table 3. Project Contacts Table
Burnetts Chapel Buffer Mitigation Site (NCDMS Project No.95009)
Monitoring Year 4**

Designer	Wildlands Engineering, Inc. 312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986
Daniel Taylor	
Construction Contractor	Landowner 1323 Burnetts Chapel Road Greensboro, NC 27403
Richard L. Ingram	
Planting Contractor	Bruton Natural Systems, Inc. PO Box 1197 Freemont, NC 27830 919.242.6555
Charlie Bruton	
Seeding Contractor	Bruton Natural Systems, Inc. PO Box 1197 Freemont, NC 27830 919.242.6555
Charlie Bruton	
Seed Mix Sources	Mellow Marsh Farm
Nursery Stock Suppliers	Arborgen Dykes and Son Nursery NC Forestry Service, Claridge Nursery
Monitoring Performers	Wildlands Engineering, Inc. Kirsten Y. Gimbirt 704.332.7754, ext. 110
Vegetation Monitoring, POC	

**Table 4. Project Baseline Information and Attributes
Burnetts Chapel Buffer Mitigation Site (NCDMS Project No.95009)
Monitoring Year 4**

Project Information						
Project Name	Burnetts Chapel Buffer Mitigation Site					
County	Guilford					
Project Area (acres)	12					
Project Coordinates (latitude and longitude)	35° 56' 46.0"N, 79° 50' 44.2"W					
Project Watershed Summary Information						
Physiographic Province	Carolina Slate Belt of the Piedmont					
River Basin	Cape Fear					
USGS Hydrologic Unit 8-digit	03030003					
USGS Hydrologic Unit 14-digit	03030003010050					
DWQ Sub-basin	03-06-08					
Project Drainage Area (acres)	366					
Project Drainage Area Percentage of Impervious Area	3%					
CGIA Land Use Classification	52% Forest Land, 41% Cultivated Land, 7% Institutional					
Reach Summary Information						
Parameters	Reach A	Reach B1	Reach B2	Reach B3	Reach B4	Reach B5
Length of reach (linear feet) - Post-Restoration	699	1,025	1,653	768	475	800
Drainage area (acres)	94	366	99	33	12	10
NCDWR stream identification score	31	41	24.25/	23.25	19.75	22.75
NCDWR Water Quality Classification	WS-IV; CA, C					
Morphological Description (stream type)	Perennial	Perennial	Int./Per.	Intermittent	Int./ Ephem.	Int./ Ephem.
Evolutionary trend (Simon's Model) - Pre- Restoration	N/A	N/A	N/A	N/A	N/A	N/A
Underlying mapped soils	Ch	HeC	HeC	VaD	HeC	EnB
Drainage class	Poorly-drained	Mod. well-drained	Mod. well-drained	Well-drained	Mod. well-drained	Well-drained
Soil Hydric status	Yes	No	No	No	No	Yes
Slope	0-2%	6-10%	6-10%	10-15%	6-10%	2-6%
FEMA classification	no regulated floodplain					
Native vegetation community	Piedmont Bottom-land forest					
Percent composition of exotic invasive vegetation - Post-Restoration	0%					
Regulatory Considerations						
Regulation	Applicable?	Resolved?	Supporting Documentation			
Waters of the United States - Section 404	X	X	Burnetts Chapel Buffer Mitigation Plan; USACE Nationwide Permit No.27 and DWQ 401 Water			
Waters of the United States - Section 401	X	X				
Division of Land Quality (Dam Safety)	N/A	N/A	N/A			
Endangered Species Act	X	X	Burnetts Chapel Buffer Mitigation Plan; studies found "no effect" (letter from USFWS)			
Historic Preservation Act	X	X	Burnetts Chapel Buffer Mitigation Plan; No historic resources were found to be impacted (letter from SHPO)			
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	N/A	N/A	N/A			
FEMA Floodplain Compliance	N/A	N/A	N/A			
Essential Fisheries Habitat	N/A	N/A	N/A			

APPENDIX 2. Visual Assessment Data

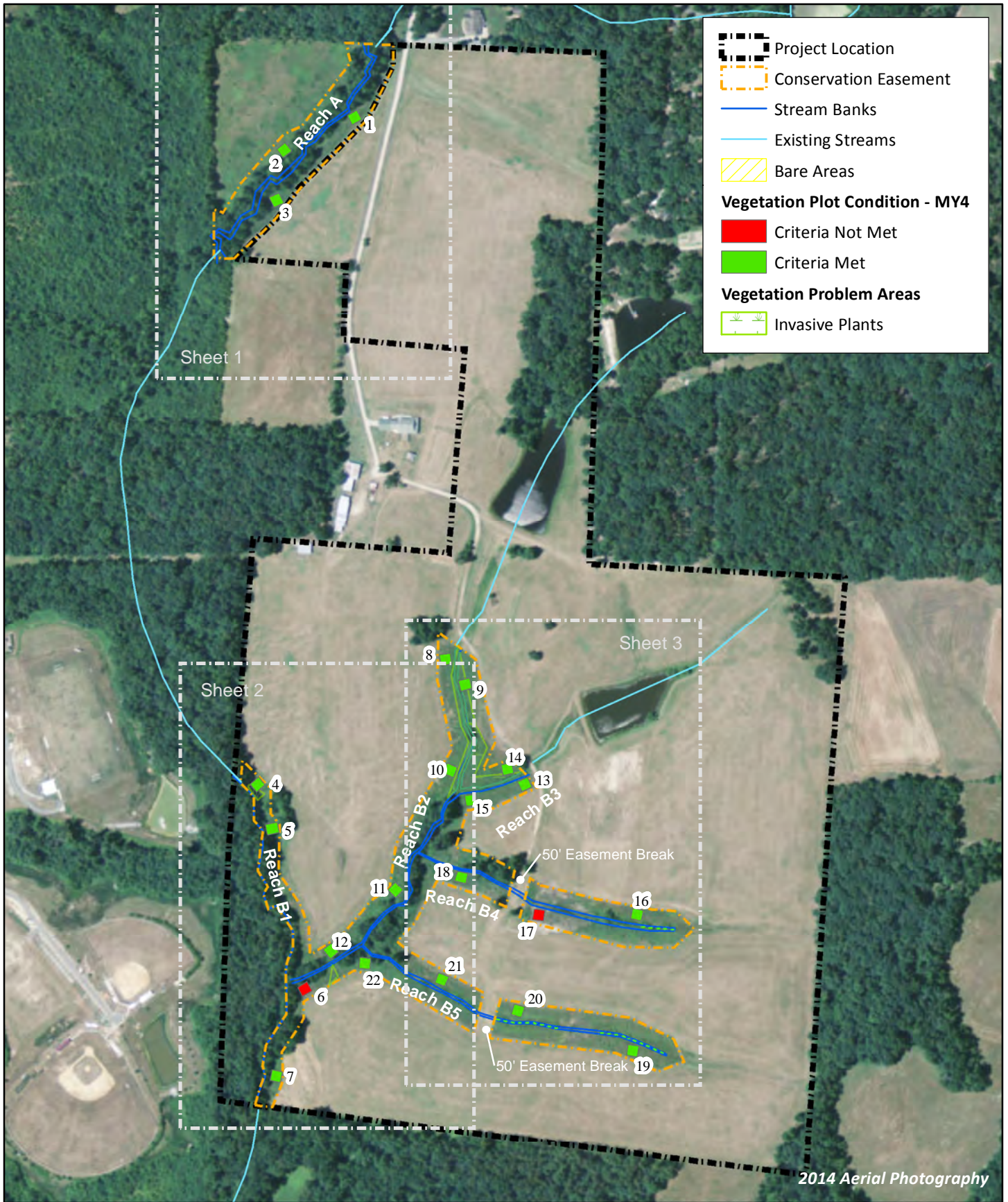
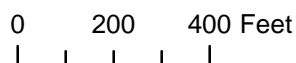
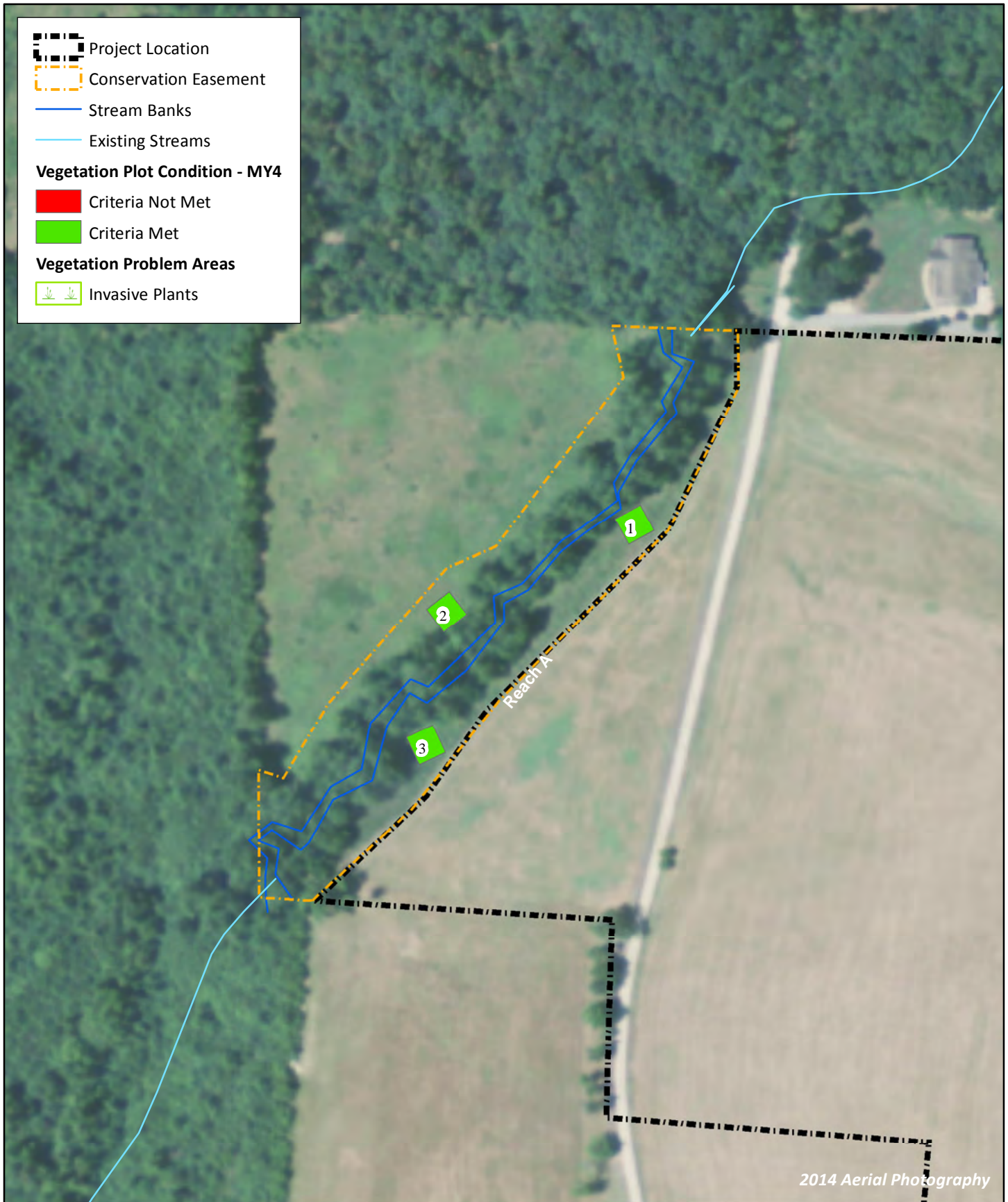


Figure 3.0 Integrated Current Condition Plan View (Key)

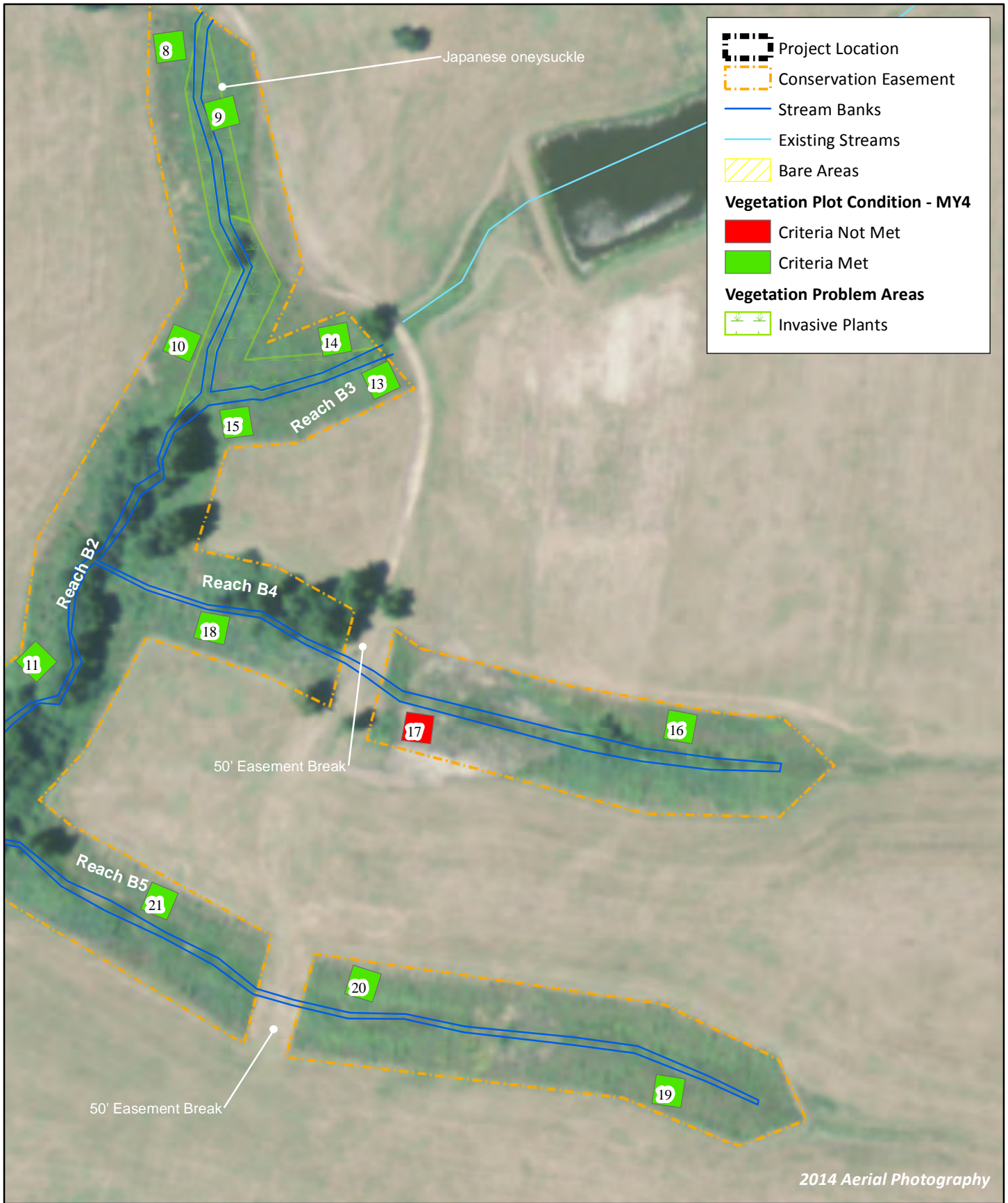
Burnetts Chapel Buffer Mitigation Site
 NCDMS Project Number 95009
 Monitoring Year 4

Guilford County, NC









**Table 5. Vegetation Condition Assessment Table
Burnetts Chapel Buffer Mitigation Site (NCDMS Project No. 95009)
Monitoring Year 4**

Planted Acreage 9.2

Vegetation Category	Definitions	Mapping Threshold (acres)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	0	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1	2	0.50	5.4%
			Total	2	5.4%
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	1	0.25	2.7%
			Cumulative Total	3	8.2%

Easement Acreage 12

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Planted Acreage
Invasive Areas of Concern	Areas of points (if too small to render as polygons at map scale).	1000	5	0.44	5%
Easement Encroachment Areas	Areas of points (if too small to render as polygons at map scale).	none	0	0	0%

Vegetation Photographs



Vegetation Plot 1 (07/08/2015)



Vegetation Plot 2 (07/08/2015)



Vegetation Plot 3 (07/08/2015)



Vegetation Plot 4 (07/07/2015)



Vegetation Plot 5 (07/07/2015)



Vegetation Plot 6 (07/07/2015)



Vegetation Plot 7 (07/07/2015)



Vegetation Plot 8 (07/08/2015)



Vegetation Plot 9 (07/07/2015)



Vegetation Plot 10 (07/08/2015)



Vegetation Plot 11 (07/07/2015)



Vegetation Plot 12 (07/07/2015)



Vegetation Plot 13 (07/07/2015)



Vegetation Plot 14 (07/07/2015)



Vegetation Plot 15 (07/07/2015)



Vegetation Plot 16 (07/07/2015)



Vegetation Plot 17 (07/07/2015)



Vegetation Plot 18 (07/07/2015)



Vegetation Plot 19 (07/07/2015)



Vegetation Plot 20 (07/07/2015)



Vegetation Plot 21 (07/07/2015)



Vegetation Plot 22 (07/07/2015)

APPENDIX 3. Vegetation Plot Data

**Table 6. Vegetation Plot Criteria Attainment
 Burnetts Chapel Buffer Mitigation Site (NCDMS Project No. 95009)
 Monitoring Year 4**

Plot	MY4 Success Criteria Met (Y/N)	Tract Mean
1	Y	91%
2	Y	
3	Y	
4	Y	
5	Y	
6	N	
7	Y	
8	Y	
9	Y	
10	Y	
11	Y	
12	Y	
13	Y	
14	Y	
15	Y	
16	Y	
17	N	
18	Y	
19	Y	
20	Y	
21	Y	
22	Y	

**Table 7. CVS Vegetation Plot Metadata
Burnetts Chapel Buffer Mitigation Site (NCDMS Project No. 95009)
Monitoring Year 4**

Report Prepared By	Alea Tuttle
Date Prepared	7/14/2015 16:31
database name	Burnetts Chapel MY4 cvs-eep-entrytool-v2.3.1.mdb
database location	Q:\ActiveProjects\005-02130 Burnetts Chapel Buffer Mitigation Site\Monitoring\Monitoring Year 4\Vegetation Assessment
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----	
Metadata	<i>Description of database file, the report worksheets, and a summary of project(s) and project data.</i>
Plots	<i>Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.</i>
Stem Count by Plot and Spp	<i>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.</i>
PROJECT SUMMARY-----	
Project Code	95009
project Name	Burnetts Chapel Mitigation Site
Description	Buffer Mitigation
length (ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	22
Sampled Plots	22

Table 8. Planted and Total Stem Counts
Burnetts Chapel Mitigation Site (NCDMS Project No. 95009)
Monitoring Year 4

Scientific Name	Common Name	Species Type	Current Plot Data (MY4 2015)																													
			95009-WEI-0001			95009-WEI-0002			95009-WEI-0003			95009-WEI-0004			95009-WEI-0005			95009-WEI-0006			95009-WEI-0007			95009-WEI-0008			95009-WEI-0009			95009-WEI-0010		
			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
<i>Acer rubrum</i>	red maple	Tree																														
<i>Betula nigra</i>	river birch	Tree	1	1	1				1	1	1	1	1	1				1	1	1	2	2	2				1	1	1	3	3	3
<i>Carpinus caroliniana</i>	American hornbeam	Tree	1	1	1							1	1	1																		
<i>Cephalanthus occidentalis</i>	common buttonbush	Shrub																														
<i>Cercis canadensis</i>	eastern redbud	Tree														1			8													
<i>Cornus florida</i>	flowering dogwood	Tree														3																
<i>Diospyros virginiana</i>	common persimmon	Tree						1			1			1																		
<i>Fraxinus pennsylvanica</i>	green ash	Tree	1	1	1				1	1	1	1	1	1	2	2	2	2	2	2	1	1	2	6	6	6			4	4	4	
<i>Juglans nigra</i>	black walnut	Tree																														
<i>Juniperus virginiana</i>	eastern redcedar	Tree			1																											
<i>Liquidambar styraciflua</i>	sweetgum	Tree			18			7			37		1			20			1			2			1					2		
<i>Liriodendron tulipifera</i>	tuliptree	Tree			1	8	8	11	6	6	12		6			25			4			13	10	10	12	1	1	1		1		
<i>Nyssa sylvatica</i>	blackgum	Tree																														
<i>Pinus</i>	pine	Tree																														
<i>Pinus rigida</i>	pitch pine	Tree																														
<i>Platanus occidentalis</i>	American sycamore	Tree	6	6	6	4	4	4	5	5	5	9	9	9	5	5	5	1	1	1	4	4	4				4	4	4			
<i>Quercus michauxii</i>	swamp chestnut oak	Tree	1	1	1	1	1	1										1	1	1							2	2	2	2	2	2
<i>Quercus nigra</i>	water oak	Tree																														
<i>Quercus phellos</i>	willow oak	Tree							1	1	1	1	1	1				1	1	1	2	2	2				2	2	2	2	2	2
<i>Quercus rubra</i>	northern red oak	Tree			1	1	1	1				1	1	1	2	2	2				1	1	1				7	7	7			
<i>Robinia pseudoacacia</i>	black locust	Tree																														
<i>Rosa palustris</i>	swamp rose	Shrub																														
<i>Symphoricarpos orbiculatus</i>	coralberry	Shrub						1																								
<i>Ulmus alata</i>	winged elm	Tree						2			1			1					1													
<i>Ulmus rubra</i>	slippery elm	Tree																														
Stem count			10	10	31	14	14	28	14	14	59	14	14	23	9	9	58	6	6	20	10	10	26	16	16	19	17	17	17	11	11	14
size (ares)			1			1			1			1			1			1			1			1			1					
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02					
Species count			5	5	9	4	4	8	5	5	8	6	6	10	3	3	7	5	5	9	5	5	7	2	2	3	6	6	6	4	4	6
Stems per ACRE			405	405	1255	567	567	1133	567	567	2388	567	567	931	364	364	2347	243	243	809	405	405	1052	647	647	769	688	688	688	445	445	567

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Color for Density

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PnoLS: Number of Planted stems excluding live stakes
P-all: Number of planted stems including live stakes
T: Total Stems

Table 8. Planted and Total Stem Counts
Burnetts Chapel Mitigation Site (NCDMS Project No. 9500
Monitoring Year 4

Scientific Name	Common Name	Species Type	Current Plot Data (MY4 2015)																																
			95009-WEI-0011			95009-WEI-0012			95009-WEI-0013			95009-WEI-0014			95009-WEI-0015			95009-WEI-0016			95009-WEI-0017			95009-WEI-0018			95009-WEI-0019			95009-WEI-0020					
			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			
<i>Acer rubrum</i>	red maple	Tree			11																														
<i>Betula nigra</i>	river birch	Tree	2	2	2				2	2	2	2	2	2	1	1	1							2	2	2				2	2	2			
<i>Carpinus caroliniana</i>	American hornbeam	Tree	1	1	1							1	1	1													6	6	6	3	3	3			
<i>Cephalanthus occidentalis</i>	common buttonbush	Shrub																																	
<i>Cercis canadensis</i>	eastern redbud	Tree																																	
<i>Cornus florida</i>	flowering dogwood	Tree																																	
<i>Diospyros virginiana</i>	common persimmon	Tree																														1			
<i>Fraxinus pennsylvanica</i>	green ash	Tree	3	3	3	10	10	10										4	4	4	2	2	2	5	5	5				2	2	2			
<i>Juglans nigra</i>	black walnut	Tree			2																					1									
<i>Juniperus virginiana</i>	eastern redcedar	Tree																																	
<i>Liquidambar styraciflua</i>	sweetgum	Tree			9			1			3												8			3			1						
<i>Liriodendron tulipifera</i>	tuliptree	Tree	1	1	6			1									5	1	1	1				2	2	5			1	4	4	4			
<i>Nyssa sylvatica</i>	blackgum	Tree																																	
<i>Pinus</i>	pine	Tree																																	
<i>Pinus rigida</i>	pitch pine	Tree																														2			
<i>Platanus occidentalis</i>	American sycamore	Tree	9	9	10	1	1	1	2	2	2	6	6	6	2	2	2	7	7	7	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1
<i>Quercus michauxii</i>	swamp chestnut oak	Tree	1	1	1				4	4	4	6	6	6	9	9	9																		
<i>Quercus nigra</i>	water oak	Tree			1																														
<i>Quercus phellos</i>	willow oak	Tree	1	1	1				4	4	4				6	6	6							3	3	3	5	5	5	2	2	2			
<i>Quercus rubra</i>	northern red oak	Tree				5	5	5	2	2	2				2	2	2																		
<i>Robinia pseudoacacia</i>	black locust	Tree																																	
<i>Rosa palustris</i>	swamp rose	Shrub																																	
<i>Symphoricarpos orbiculatus</i>	coralberry	Shrub			2																					5									
<i>Ulmus alata</i>	winged elm	Tree																																	
<i>Ulmus rubra</i>	slippery elm	Tree			1																														
Stem count			18	18	50	16	16	18	14	14	14	15	15	18	20	20	25	12	12	12	5	5	13	15	15	27	14	14	16	14	14	17			
size (ares)			1			1			1			1			1			1			1			1			1			1					
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02					
Species count			7	7	13	3	3	5	5	5	5	4	4	5	5	5	6	3	3	3	2	2	3	5	5	8	3	3	5	6	6	8			
Stems per ACRE			728	728	2023	647	647	728	567	567	567	607	607	728	809	809	1012	486	486	486	202	202	526	607	607	1093	567	567	647	567	567	688			

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Table 8. Planted and Total Stem Counts
Burnetts Chapel Mitigation Site (NCDMS Project No. 9500)
Monitoring Year 4

Scientific Name	Common Name	Species Type	Current Plot Data (MY4 2015)						Annual Summary														
			95009-WEI-0021			95009-WEI-0022			MY4 (2015)			MY3 (2014)			MY2 (2013)			MY1 (2012)			MY0 (2012)		
			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
<i>Acer rubrum</i>	red maple	Tree									11			1									
<i>Betula nigra</i>	river birch	Tree				4	4	4	25	25	25	26	26	26	25	25	25	37	37	37	76	76	76
<i>Carpinus caroliniana</i>	American hornbeam	Tree	1	1	1				14	14	14	13	13	13	13	13	13	31	31	31	43	43	43
<i>Cephalanthus occidentalis</i>	common buttonbush	Shrub												3		2							
<i>Cercis canadensis</i>	eastern redbud	Tree									9			3									
<i>Cornus florida</i>	flowering dogwood	Tree									3												
<i>Diospyros virginiana</i>	common persimmon	Tree									4			2									
<i>Fraxinus pennsylvanica</i>	green ash	Tree	5	5	5	2	2	2	51	51	52	52	52	54	51	51	51	52	52	52	51	51	51
<i>Juglans nigra</i>	black walnut	Tree									3												
<i>Juniperus virginiana</i>	eastern redcedar	Tree									1												
<i>Liquidambar styraciflua</i>	sweetgum	Tree					3				117			42		12							
<i>Liriodendron tulipifera</i>	tuliptree	Tree	5	5	5	1	1	5	39	39	119	42	42	128	41	41	41	44	44	44	53	53	53
<i>Nyssa sylvatica</i>	blackgum	Tree												2									
<i>Pinus</i>	pine	Tree												2									
<i>Pinus rigida</i>	pitch pine	Tree									2												
<i>Platanus occidentalis</i>	American sycamore	Tree				10	10	10	85	85	86	87	87	88	86	86	86	98	98	98	106	106	106
<i>Quercus michauxii</i>	swamp chestnut oak	Tree							27	27	27	28	28	28	28	28	28	30	30	30	28	28	28
<i>Quercus nigra</i>	water oak	Tree									1												
<i>Quercus phellos</i>	willow oak	Tree	2	2	2				32	32	32	31	31	31	30	30	30	32	32	32	23	23	23
<i>Quercus rubra</i>	northern red oak	Tree							21	21	22	21	21	21	22	22	22	25	25	25	35	35	35
<i>Robinia pseudoacacia</i>	black locust	Tree												4									
<i>Rosa palustris</i>	swamp rose	Shrub												2									
<i>Symphoricarpos orbiculatus</i>	coralberry	Shrub									8			3									
<i>Ulmus alata</i>	winged elm	Tree									5			8									
<i>Ulmus rubra</i>	slippery elm	Tree									1												
Stem count			13	13	13	17	17	24	294	294	542	300	300	461	296	296	310	349	349	349	415	415	415
size (ares)			1			1			22			22			22			22			22		
size (ACRES)			0.02			0.02			0.54			0.54			0.54			0.54			0.54		
Species count			4	4	4	4	4	5	8	8	20	8	8	19	8	8	10	8	8	8	8	8	8
Stems per ACRE			526	526	526	688	688	971	541	541	997	552	552	848	544	544	570	642	642	642	763	763	763

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