

**FINAL MONITORING REPORT
YEAR 3 of 5**

**Green Valley Farm Site
Riparian Buffer Restoration
DMS Project ID Number 003994-DMS Site 95012**

**Randolph County, North Carolina
Cape Fear River Basin
HUC 03030003010070**



Submitted to:

**North Carolina Division of Mitigation Services
North Carolina Department of Environmental Quality
1652 Mail Service Center
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**Construction Completed: June 2012
Data Collection Period: January 2016
Submission Date: February 2016**

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1.0 EXECUTIVE SUMMARY / PROJECT ABSTRACT

1.1 Project Goals and Objectives

The Green Valley Buffer Mitigation Project is located in the 03030003 Catalog Unit (CU), in the Cape Fear River Basin. Assets of this CU include the Deep River, the Randleman Reservoir, and major communities including High Point, Asheboro, Siler City, and Sanford. Restoration goals for CU 03030003 as identified in the 2009 Cape Fear River Basin RBRP include protection of several species of mussel and the Cape Fear Shiner. Additional goals include the improvement in water quality to waters draining to Randleman Reservoir.

The Green Valley Buffer Mitigation Project was identified as an opportunity to improve water quality and habitat within the CU. The project goals address stressors identified in the CU. The following table lists the project goals and the project objectives through which the goals will be addressed:

Goals	Objectives
1. Nutrient removal	• Restore minimum 50-foot riparian buffer by planting appropriate bottomland hardwood species to filter runoff.
2. Sediment removal	• Convert active farm fields to forested buffers.
3. Runoff filtration	• Plant buffer vegetation to shade channel.
4. Increase dissolved oxygen concentration	• Restore riparian buffer habitat to appropriate bottomland hardwood ecosystem.
5. Restore riparian habitats	• Restore canopy tree species in the stream buffer areas to shade channel.
6. Reduce water temperature	• Eliminate and control exotic invasive species.
	• Replace three (two culverts and one ford) undersized and/or failing channel crossings with appropriately sized structures.

1.2 Project Background

The Green Valley Farms Riparian Buffer Mitigation Site is located on Hockett Dairy Road (SR 1938) in Randolph County approximately 12 miles north of Asheboro, NC (**Figure 1**). The site is located in the Cape Fear River Basin within Cataloging Unit 03030003010070 (NCDWQ sub-basin 03-06-08). The site has four unnamed tributaries (UT) that drain into Randleman Lake (**Figure 2**). The proposed project will result in 8.74 to 9.6 acres of buffer restoration. The upper 400 linear feet of UT 4, which account for the 0.86-acre difference in the buffer restoration acreage range, are not subject to the Randleman Buffer Rules. It is anticipated that performing buffer restoration along the entire length of UT 4 (590 linear feet) will result in a defined channel within the five-year monitoring period, and that the Site will ultimately yield the full 9.6 acres of buffer restoration.

The project site is located in the Piedmont Physiographic Province and in the Carolina Slate Belt. The region is underlain by felsic metavolcanic rocks, which can be seen in the streambed of UT 1 and UT 3. The topography of the project area is generally rolling with elevations ranging from 670 to 760 feet. The four unnamed tributaries to Randleman Lake comprise the principle drainage features. The project's watershed is primarily used for agricultural production. Much of the site is currently used for row crop production for dairy silage. These tributaries have limited hardwood trees present within the buffer and lack significant ground cover. The mature trees have a density of less than 100 stems per acre. The project area has been in agricultural use for several decades.

The Green Valley Farms mitigation project offers an opportunity for high quality riparian buffer restoration. Stream buffer mitigation for the Green Valley Farms Site involves buffering four streams that flow directly and indirectly into Randleman Lake. The mitigation design divides the site into four distinct reaches (**Figure 2**). Buffer restoration is proposed along all four channels. Three existing farm access crossings have been upgraded and stabilized to prevent erosion.

1.3 Vegetation Condition

The measure of vegetative success for the site is the survival of at least 320 five-year old planted trees per acre at the end of year five of the monitoring period. CVS Level 2 was performed in monitoring Year 3 to document any volunteer generation. Vegetation monitoring was pushed back until January 2016 because of access constraints (landowner did not harvest crops until very late in 2015). A total of 16 volunteers were observed across all 11 vegetation plots. Year 3 monitoring recorded an average of 574 planted stems per acre and 633 total stems per acre (planted and volunteers) across all vegetation plots. In general the site is trending towards success, but plots 8 and 10 recorded less than 300 stems per acre in Year 3. Plot 10 caught fire previous to Year 1 monitoring and caused a high rate of mortality. Year 2 and 3 surveys confirm that this plot needs to be re-planted. The only other vegetation issue noted during Year 3 monitoring was the presence of invasive species within the easement. The invasive Johnsongrass (*Sorghum halepense*) was common across the site, but was less problematic than observed during the Year 2 monitoring, likely due to increased shade from the larger planted stems. Field crews will continue to monitor the prevalence of the Johnsongrass, but as the planted riparian stems trend towards canopy closure it is anticipated that the Johnsongrass will not be a problem. Along plot 4, Chinese privet (*Ligustrum sinense*) is beginning to encroach on the stream side of the plot. Field crews will continue to monitor these areas. Adaptive management has included mowing herbaceous vegetation (including Johnsongrass) along UT2 and UT3 and supplemental planting. After the Year 2 monitoring season, field crews planted 1,535 one gallon hardwood stems throughout the site. The Current Condition Plan View is provided in **Appendix B, Figure 2**.

1.4 Summary Information / Data

Summary information/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 the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly the Restoration Plan) documents available on the DMS website. All raw data supporting the tables and figures in the appendices is available from DMS upon request.

2.0 METHODOLOGY

In order to determine if the success criteria are achieved and the planted areas are developing toward the target community, NCEEP-CVS Protocol for Recording Vegetation Version 4.2 will be utilized. The vegetation monitoring will include Level I and Level II plots distributed across the planted area. An interim vegetation monitoring will occur in spring after leaf-out has occurred. The CVS monitoring will be conducted toward the end of the growing season. Individual plot data will be provided to DMS and CVS following NCEEP-CVS guidance. The annual monitoring requirements are summarized in the following table:

Required	Parameter	Quantity	Frequency	Notes
X	Vegetation	11 Plots Located randomly across the project area	Annual	Vegetation will be monitored using the Carolina Vegetation Survey (CVS) protocols (Level I & Level II)
X	Exotic and nuisance vegetation	N/A	Semi-Annual	Exotic vegetation will be evaluated and spot treatment applied as needed
X	Project boundary	N/A	Semi-annual	Locations of fence damage, vegetation damage, boundary encroachments, etc. will be mapped

Photographs will be used to visually document restoration success. Reference photos will be taken once a year and will be used to visually document restoration success. Reference photo stations are marked with wooden stakes. Reference stations will be photographed immediately following planting and continued annually for at least five years following construction. Photographers will make every effort to maintain the same area in each photo over time. Photographs will be used to subjectively evaluate vegetation establishment. A series of photos over time should indicate successional maturation of riparian vegetation.

3.0 REFERENCES

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- N.C. Department of Environment and Natural Resources Ecosystem Enhancement Program. 2004. *Guidelines for Riparian Buffer Restoration*. Available online at <http://portal.ncdenr.org/web/eep/process-and-protocol>.
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- United States Geological Survey. 1982. 7.5 Minute Topographic Map, Pleasant Garden, NC.
- Young, T.F. and Sanzone, S. (editors). (2002), *A framework for assessing and reporting on ecological condition*. Ecological Reporting Panel, Ecological Processes and Effects Committee. EPA Science Advisory Board. Washington, DC.

Appendix A

Project Vicinity Map and Background Tables

The subject project site is an environmental restoration site of the NCDMS Division of Mitigation Services (DMS) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, monitoring, and stewardship of the restoration site is permitted within the terms and timeframes of their defined, pre-approved roles. Any intended site visitation or activity by any person outside of these previously sanctioned activities/roles requires prior coordination with DMS.

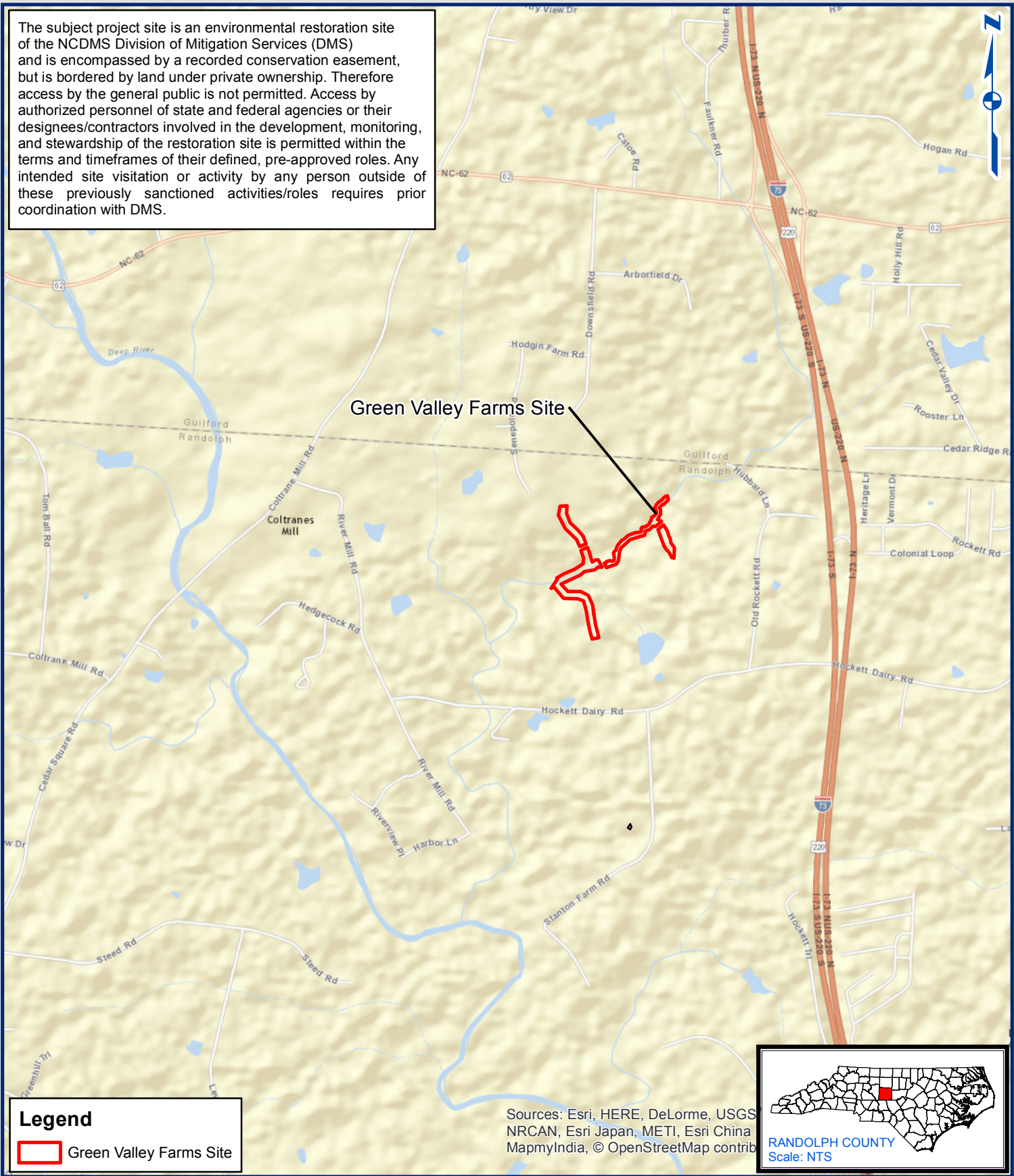


Figure 1. Project Vicinity Map
 Green Valley Farms Riparian Buffer Restoration Site
 Randolph County, North Carolina
 DMS Project ID# 003994

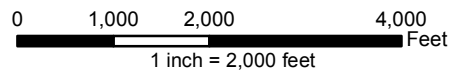


Table 1. Project Components and Mitigation Credits
Green Valley, Randolph County
DMS Project ID Number 003994-DMS Site 95012

Mitigation Credits									
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	N/A	N/A	N/A	N/A	N/A	N/A	Restoration	N/A	N/A
Totals*	N/A	N/A	N/A	N/A	N/A	N/A	8.74 Ac. to 9.6 Ac.	N/A	N/A

Project Components						
Reach ID	Stationing/ Location	Existing Footage (LF)	Approach (PI, PII, etc.)	Restoration -or- Restoration Equivalent	Restoration Area (acres)	Mitigation Ratio
Reach UT1	N/A	2,450	N/A	Buffer	3.51	1:1
Reach UT2	N/A	1,156	N/A	Buffer	2.65	1:1
Reach UT3	N/A	1,105	N/A	Buffer	2.30	1:1
Reach UT4*	N/A	190 to 590	N/A	Buffer	0.28 to 1.14	1:1

Component Summation						
Restoration Level	Stream (linear feet)	Riparian Wetland		Non-Riparian Wetland (acres)	Buffer (acres)	Upland (acres)
		Riverine	Non-Riverine			
Restoration*	N/A	N/A	N/A	N/A	8.74 to 9.60	N/A

*Currently, the upper 400 LF of UT4 is not subject to the Randleman Buffer Rules; however, the lower 190 LF is subject to the buffer rules and consists of 0.28 acres of proposed buffer restoration. It is anticipated that performing buffer restoration along the entire reach (590 LF) will result in a defined channel within the 5-year monitoring period and ultimately yield 1.14 acres of buffer restoration.

Table 2. Project Activity and Reporting History
Green Valley, Randolph County
DMS Project ID Number 003994-DMS Site 95012

Elapsed time since planting complete: 3 year, 6 months		
Number of reporting years: 3		
Activity or Report	Data Collection Complete	Completion or Delivery
Mitigation Plan	January 2012	May 2012
Final Design - Construction Plans	N/A	May 2012
Construction	N/A	October 2012
Temporary S&E mix applied to project area	N/A	June 2012
Permanent seed mix applied to project area	N/A	June 2012
Containerized and B&B plantings planted in project area	N/A	June 2012
Baseline Monitoring Document (Year 0 Monitoring - baseline)	June 2012	May 2013
Year 1 Monitoring	October 2013	October 2013
Year 2 Monitoring	September 2014	September 2014
Year 3 Monitoring	January 2016	February 2016
Year 4 Monitoring	Fall 2016*	Fall 2016*
Year 5 Monitoring	Fall 2017*	Fall 2017*

Table 3. Project Contact Table Green Valley, Randolph County DMS Project ID Number 003994-DMS Site 95012	
Designer	WK Dickson & Co., Inc.
Primary project design POC	Frasier Mullen - (919) 782-0495
Construction Contractor	KBS Earthworks
Construction contractor POC	Kory Strader - (336) 362-0289
Planting Contractor	Taylors Lawn and Landscape
Planting contractor POC	Brant Taylor - (919) 606-2431
Seeding Contractor	Taylors Lawn and Landscape
Planting contractor POC	Brant Taylor - (919) 606-2431
Seed Mix Sources	Evergreen Seed, Inc
Nursery Stock Suppliers	ArborGen
Monitoring Performers	Resource Environmental Solutions, LLC
Vegetation Monitoring POC	Brian Hockett- (919)-209-1054

Table 4. Project Baseline Information and Attributes Green Valley, Randolph County DMS Project ID Number 003994-DMS Site 95012	
Project Information	
Project Name	Green Valley Farm Site - Riparian Buffer Restoration
County	Randolph
Project Area (acres)	11.45
Project Coordinates (latitude and longitude)	35° 54' 17.672" N, 79° 50' 3.490"W
Project Watershed Summary Information	
Physiographic Province	Piedmont Physiographic Province
River Basin	Cape Fear River Basin
USGS Hydrologic Unit 8-digit	03030003
USGS Hydrologic Unit 14-digit	03030003010070
DWQ Sub-basin	03-06-08
Project Drainage Area (acres)	389.1
Project Drainage Area Percentage of Impervious Area	1%
CGIA Land Use Classification	1.01 Residential 2.01 Cropland and Pasture 2.03 Confined Animal Operations 2.99 Other Agricultural Land 3.02 Passively Managed Forest Stands

**Table 4 (cont.). Project Baseline Information and Attributes
Green Valley, Randolph County
DMS Project ID Number 003994-DMS Site 95012**

Parameters	Reach UT1	Reach UT2	Reach UT3	Reach UT4*
Length of reach (linear feet)	2,450	1,156	1,105	190 to 590
Valley Classification	X	X	X	X
Drainage area (acres)	221	18.5	64	19.4
NCDWQ stream identification score	38	20.5	23	26
NCDWQ Water Quality Classification	WS-IV;CA	WS-IV;CA	WS-IV;CA	WS-IV;CA
Morphological Description (stream type)	C	C	C	C
Evolutionary trend	Stable	Stable	Stable	Stable
Underlying mapped soils	Chewacla loam ChA	Mecklenburg CL MeC2, Wynott-Enon complex WvC2	Wynott-Enon complex WtC	Wynott-Enon complex WtC
Drainage class	somewhat poorly drained	well drained	well drained	well drained
Soil Hydric status	Non-hydric	Non-hydric	Non-hydric	Non-hydric
Slope (ft/ft)	0.002	0.024	0.014	0.010
FEMA classification	Zone AE	Zone AE	Zone AE	N/A
Native vegetation community	Cultivated	Cultivated	Cultivated	Cultivated
Percent composition of exotic invasive vegetation	<1%	<1%	<1%	<1%
Regulatory Considerations				
Regulation	Applicable	Resolved	Supporting Documentation	
Waters of the United States - Section 404	Yes	Yes	see Mitigation Plan	
Waters of the United States - Section 401	Yes	Yes	see Mitigation Plan	
Endangered Species Act	Yes	Yes	see Mitigation Plan	
Historic Preservation Act	Yes	Yes	see Mitigation Plan	
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	N/A	N/A	
FEMA Floodplain Compliance	No	N/A	N/A	
Essential Fisheries Habitat	No	N/A	N/A	

Appendix B

Visual Assessment Data

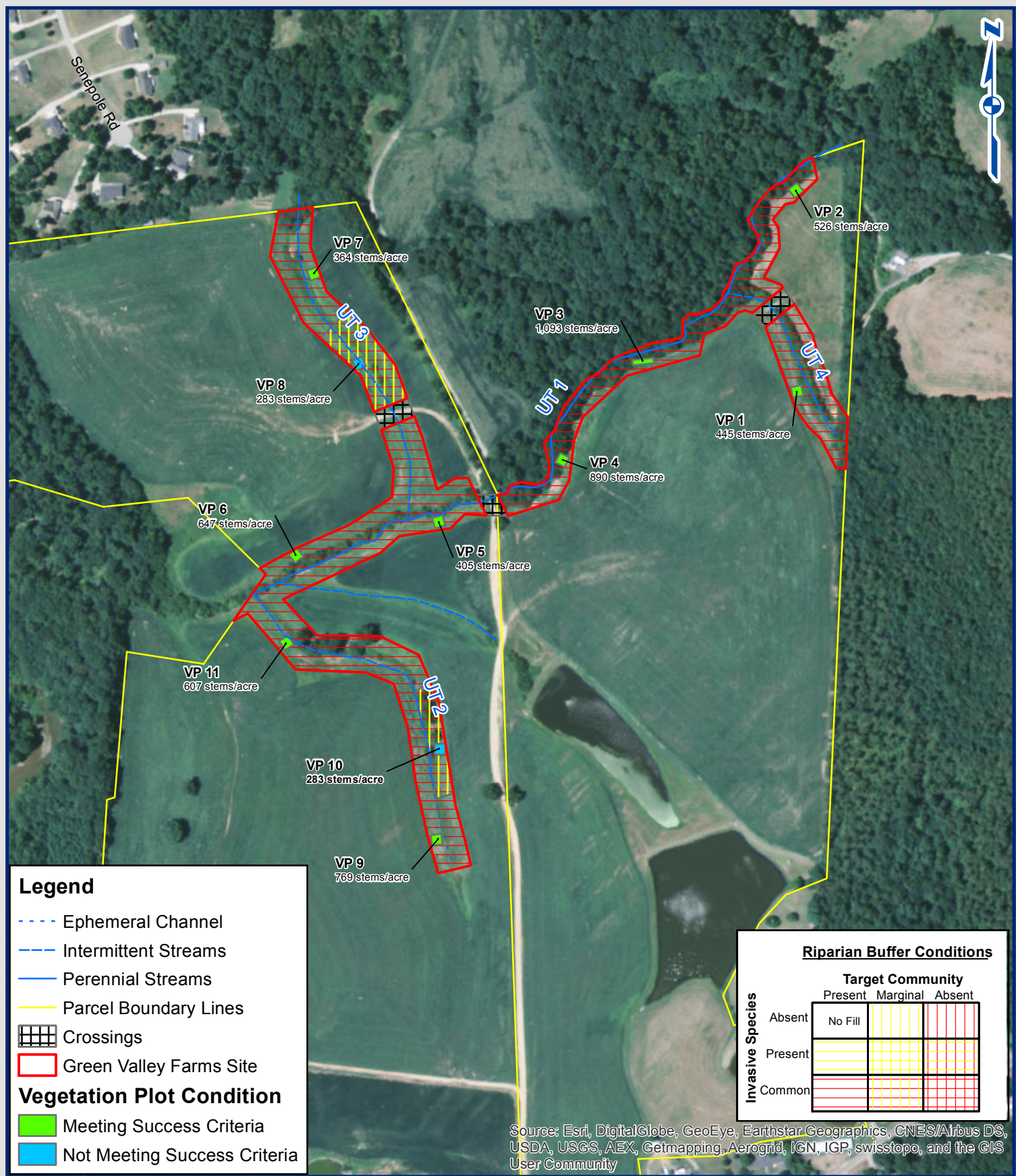
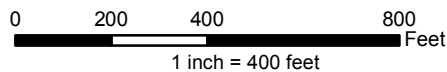


Figure 2. Current Condition Plan View
 Green Valley Farms Riparian Buffer Restoration Site

Randolph County, North Carolina
 DMS Project ID# 003994



Date: January 2016



Table 5. Vegetation Condition Assessment Green Valley, Randolph County DMS Project ID Number 003994-DMS Site 95012						
Planted Acreage:	11.45					
Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbacious material.	0.1 acres	N/A	0	0.00	0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.*	0.1 acres	vertical yellow line	2	1.27	11%
				Total:	2	11%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size that are obviously small given the monitoring year.	0.25 acres	N/A	0	0.00	0%
				*Cumulative Total:	2	11%
Easement Acreage:	11.45					
Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale)	1000 SF	horizontal red line fill	4	10.17	89%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale)	none	N/A	0	0.00	0%

*2 vegetation plots have densities below success criteria

Vegetation Plot Photos



Vegetation Plot 1



Vegetation Plot 2



Vegetation Plot 3



Vegetation Plot 4



Vegetation Plot 5



Vegetation Plot 6



Vegetation Plot 7



Vegetation Plot 8



Vegetation Plot 9



Vegetation Plot 10



Vegetation Plot 11

Appendix C

Vegetation Plot Data

Table 6. Riparian Buffer Vegetation Totals Green Valley, Randolph County DMS Project ID Number 003994-DMS Site 95012		
Plot #	Riparian Buffer Stems¹	Success Criteria Met?
01	445	Yes
2	526	Yes
3	1093	Yes
4	890	Yes
5	405	Yes
6	647	Yes
7	364	Yes
8	283	No
9	769	Yes
10	283	No
11	607	Yes
Project Avg	574	Yes

Stem Class

characteristics

¹Buffer Stems

Native planted hardwood trees. Does NOT include shrubs. No pines. No vines.

**Table 7. CVS Stem Count Total and Planted with/without Livestakes by Plot and Species
Green Valley, Randolph County
DMS Project ID Number 003994-DMS Site 95012**

Scientific Name	Common Name	Species Type	95012-01-0001			95012-01-0002			95012-01-0003			95012-01-0004			95012-01-0005			95012-01-0006			95012-01-0007			95012-01-0008		
			P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T
Betula nigra	River Birch	Tree							2	2	2													1	1	1
Fraxinus pennsylvanica	Green Ash	Tree	2	2	2	7	7	7	4	4	4	9	9	9	1	1	1	4	4	4	1	1	1	3	3	3
Liquidambar styraciflua	Sweetgum	Tree						5																		
Platanus occidentalis	American Sycam	Tree	8	8	8	6	6	6	21	21	21	5	5	5	7	7	7	5	5	5	3	3	3	3	3	3
Quercus	Oak	Tree										1	1	1				6	6	6	3	3	3			
Quercus falcata	Southern Red O	Tree	1	1	1							4	4	4	2	2	2	1	1	1	2	2	2			
Quercus michauxii	Swamp Chestnu	Tree										3	3	3												
Unknown		Shrub or Tree						1																		
Stem count			11	11	11	13	13	19	27	27	27	22	22	22	10	10	10	16	16	16	9	9	9	7	7	7
size (ares)			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		
Species count			3	3	3	2	2	4	3	3	3	5	5	5	3	3	3	4	4	4	4	4	4	3	3	3
Stems per ACRE			445	445	445	526	526	769	1093	1093	1093	890	890	890	405	405	405	647	647	647	364	364	364	283	283	283

Scientific Name	Common Name	Species Type	Current Plot Data (MY3 2016)																							
			95012-01-0009			95012-01-0010			95012-01-0011			MY3 (2016)			MY2 (2014)			MY1 (2013)			MY0 (2012)					
			P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T			
Betula nigra	River Birch	Tree							2	2	2	5	5	5	5	5	5	5	5	5	5	5	37	37	37	
Fraxinus pennsylvanica	Green Ash	Tree	11	11	11				8	8	10	50	50	52	55	55	56	58	58	58	61	61	61			
Liquidambar styraciflua	Sweetgum	Tree									8			13												
Platanus occidentalis	American Sycam	Tree	3	3	3	2	2	2	5	5	5	68	68	68	68	68	69	72	72	72	99	99	99			
Quercus	Oak	Tree	4	4	4	1	1	1				15	15	15	17	17	17	30	30	30	55	55	55			
Quercus falcata	Southern Red O	Tree	1	1	1	2	2	2				13	13	13	7	7	8	5	5	5						
Quercus michauxii	Swamp Chestnu	Tree				2	2	2				5	5	5	3	3	3									
Unknown		Shrub or Tree												1												
Stem count			19	19	19	7	7	7	15	15	25	156	156	172	155	155	158	170	170	170	252	252	252			
size (ares)			1			1			1			11			11			11			11			11		
size (ACRES)			0.02			0.02			0.02			0.27			0.27			0.27			0.27			0.27		
Species count			4	4	4	4	4	4	3	3	4	6	6	8	6	6	6	5	5	5	4	4	4			
Stems per ACRE			769	769	769	283	283	283	607	607	1012	574	574	633	570	570	581	625	625	625	927	927	927			

Color Key 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%