

**FINAL MONITORING REPORT
YEAR 3 of 5**

**Hockett Dairy Site
Riparian Buffer Restoration
DMS Project ID Number 003993 – DMS Site 95013**

**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
Raleigh, NC 27699-1652**

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Provided by:



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1.0 EXECUTIVE SUMMARY / PROJECT ABSTRACT

1.1 Project Goals and Objectives

The Hockett Dairy 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 (*Notropis mekistocholas*). Additional goals include the improvement in water quality to waters draining to Randleman Reservoir.

The Hockett Dairy 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 two undersized and failing channel crossings with appropriately sized culverts or ford.
	• Stabilize two small dams on small farm ponds.

1.2 Project Background

The Hockett Dairy 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 five unnamed tributaries (UT) that drain into Randleman Lake. The project consists of 11.82 acres of buffer restoration.

The Hockett Dairy Buffer 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 2 and UT 3. The topography of the project area is generally rolling with elevations ranging from 670 to 760 feet. The five unnamed tributaries to Randleman Lake comprise the principle drainage features. These tributaries have limited hardwood trees present within the buffer and lack significant ground cover. The mature trees are less than 100 stems per acres. The project's watershed is primarily used for agricultural production. Much of the surrounding land use is currently dairy cows and calves or row crop production for dairy silage. Cattle have direct access to streams channels and ponds and are a source of ongoing erosion along the banks and within the adjacent buffer. Cattle are excluded from some channels with fencing on or near the top of bank, resulting in a degraded riparian buffer. The project area has been in agricultural use for several decades.

The Hockett Dairy mitigation project provides high quality riparian buffer restoration. Stream buffer mitigation for the Hockett Dairy Site involved buffering five streams that flow directly and indirectly into

Randleman Lake. The mitigation design divides the site into five distinct reaches (**Figure 2**). Buffer restoration was performed along five channels. Two undersized and failing channel crossings were replaced with appropriately sized culverts to prevent erosion. Two small dams on small farm ponds have been stabilized.

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 Year 3 to document any volunteer generation. A total of 10 volunteers were observed across all 12 vegetation plots. Year 3 monitoring recorded an average of 502 planted stems per acre and 536 total stems per acre (planted and volunteers) across all vegetation plots. Plots 2, 6, and 7 each had less than 300 stems per acre. All other plots achieved success criteria in Year 3. Other than the low stem density areas, other vegetation issues included invasive species (Johnsongrass, *Sorghum halepense*) along portions of UT 4 and vegetation trampled by cattle near Plot 2. The cattle had gained access to the easement prior to Year 1 monitoring when a tree fell onto the fence near Plot 2. This fence was repaired prior to year 1 monitoring and the cattle have been excluded. Between Years 2 and 3 monitoring field crews planted 9,000 bare root stems across the site to supplement areas with low stem densities. 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 DMS’s 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, NCDMS-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 NCDMS and CVS following NCDMS-CVS guidance. The annual monitoring requirements are summarized in the following table:

Required	Parameter	Quantity	Frequency	Notes
X	Vegetation	12 Plots Located randomly across the project area	Annual	Vegetation will be monitored using the Carolina Vegetation Survey (CVS) protocols
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. 2005. "Basinwide Planning Program : October 2005 Cape Fear River Basinwide Water Quality Plan." October 2005. Available online at <http://portal.ncdenr.org/web/wq/ps>. [Accessed 01 February 2012].
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- N.C. Division of Water Quality. 2010. Methodology for Identification of Intermittent and Perennial Streams and their Origins, Version 4.11. North Carolina Department of Environment and Natural Resources, Division of Water Quality. Raleigh, NC.
- Peet, R.K., Wentworth, T.S., and White, P.S. (1998), *A flexible, multipurpose method for recording vegetation composition and structure*. *Castanea* 63:262-274
- Radford, A.E., H.E. Ahles and F.R. Bell. 1968. *Manual of the Vascular Flora of the Carolinas*. The University of North Carolina Press, Chapel Hill, North Carolina.
- Schafale, M.P. and Weakley, A. S. (1990), *Classification of the Natural Communities of North Carolina, Third Approximation*, NC Natural Heritage Program, Raleigh, NC
- 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.

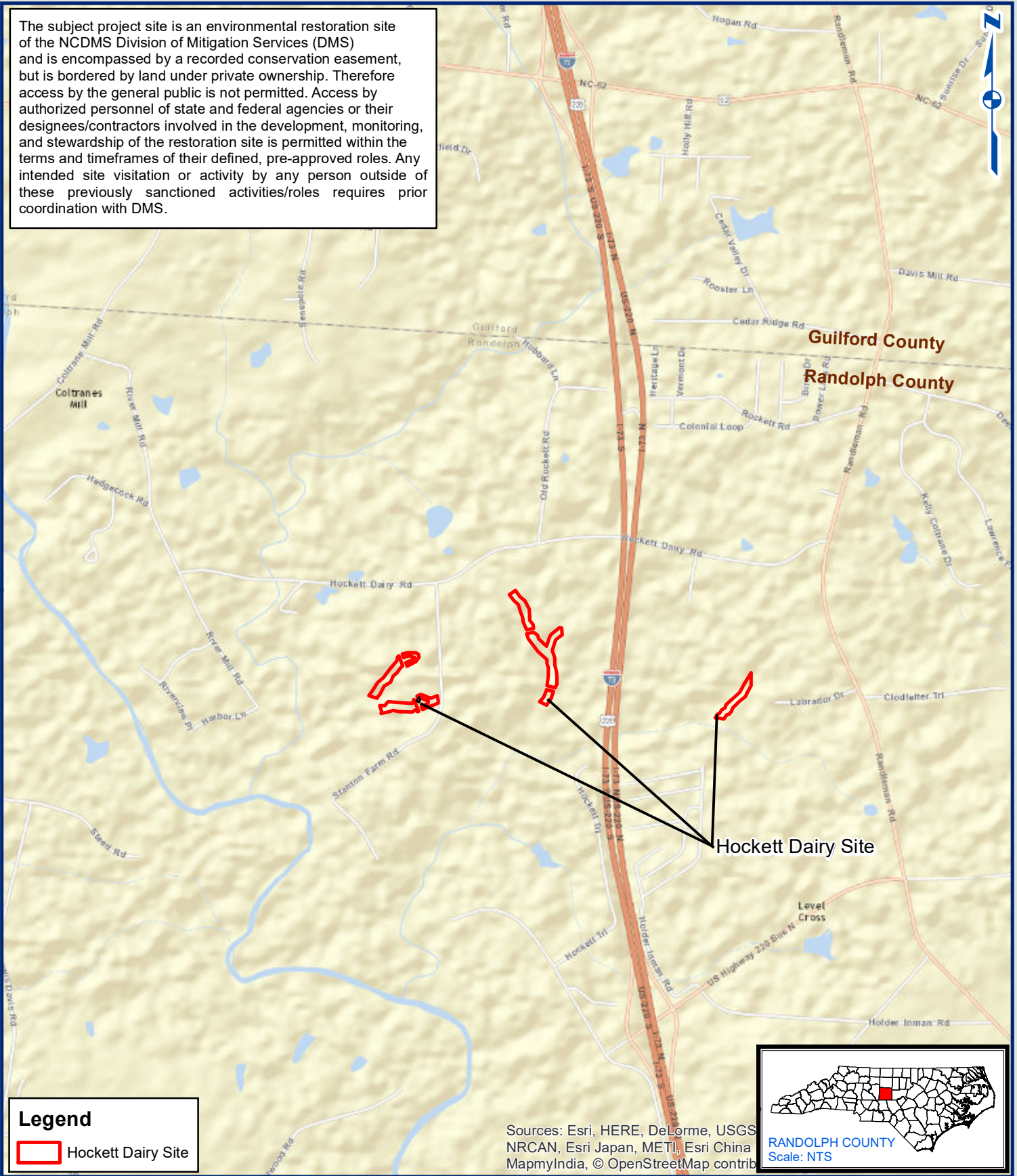


Figure 1. Project Vicinity Map
 Hockett Dairy Riparian Buffer Restoration Site
 Randolph County, North Carolina
 DMS Project ID# 003993

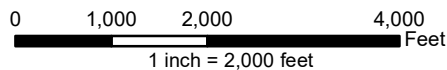


Table 1. Project Components and Mitigation Credits									
Hockett Dairy, Randolph County									
DMS Project ID Number 003993 DMSS Site 95013									
Mitigation Credits									
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	N/A	N/A	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	11.82 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 UT2	N/A	733	N/A	Buffer Restoration	1.72	1:1			
Reach UT3	N/A	817	N/A	Buffer Restoration	1.85	1:1			
Reach UT4	N/A	1884	N/A	Buffer Restoration	4.62	1:1			
Reach UT5	N/A	466	N/A	Buffer Restoration	0.89	1:1			
Reach UT6	N/A	797	N/A	Buffer Restoration	1.84	1:1			
Pond 2	N/A	378*	N/A	Buffer Restoration	0.52	1:1			
Pond 3	N/A	338*	N/A	Buffer Restoration	0.38	1:1			
Total					11.82				
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	11.82	N/A			

Table 2. Project Activity and Reporting History		
Hockett Dairy, Randolph County		
DMS Project ID Number 003993 DMS Site 95013		
Elapsed time since planting complete: 2 year, 11 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	February 2013
Baseline Monitoring Document (Year 0 Monitoring - baseline)	February 2013	March 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 Hockett Dairy, Randolph County DMS Project ID Number 003993 DMS Site 95013	
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	Strader Fencing
Planting contractor POC	Kenneth Strader - (336) 697-7005
Seeding Contractor	Strader Fencing
Planting contractor POC	Kenneth Strader - (336) 697-7005
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 Hockett Dairy, Randolph County DMS Project ID Number 003993 DMS Site 95013	
Project Information	
Project Name	Hockett Dairy Buffer Mitigation Site
County	Randolph
Project Area (acres)	12.99
Project Coordinates (latitude and longitude)	35° 53' 55.219" N, 79° 49' 37.381"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)	Reach UT2 19.4 acres Reach UT3 31.2 acres Reach UT4 76.3 acres Reach UT5 9.1 acres Reach UT6 34.4 acres
Project Drainage Area Percentage of Impervious Area	0.6%
CGIA Land Use Classification	2.5 Residential 144.3 Cropland and Pasture 12.6 Other Agricultural Land 19.1 Passively Managed Forest Stands

Table 4 (cont.). Project Baseline Information and Attributes Hockett Dairy, Randolph County DMS Project ID Number 003993 DMS Site 95013					
Parameters	Reach UT2	Reach UT3	Reach UT4	Reach UT5	Reach UT6
Length of reach (linear feet)	733	817	1884	466	797
Valley Classification	X	X	X	X	X
Drainage area (acres)	19.4	31.2	76.3	9.1	34.4
NCDWQ stream identification score	29	27.5	19-25.5	21	13
NCDWQ Water Quality Classification	WS-IV;CA	WS-IV;CA	WS-IV;CA	WS-IV;CA	WS-IV;CA
Morphological Description (stream type)	E	E	G	G	G
Evolutionary trend	Stable	Stable	Stable	Stable	Stable
Underlying mapped soils	Wynott-Enon complex WvC2	Mecklenburg CL MeC2,	Mecklenburg CL MeC2, Wynott-Enon complex WvC2	Mecklenburg CL MeC2	Wynott-Enon complex WvC2
Drainage class	well	well	well	well	well
Soil Hydric status	Non-hydric	Non-hydric	Non-hydric	Non-hydric	Non-hydric
Slope (ft/ft)	0.0004	0.03%	0.02%	0.04%	0.02%
FEMA classification	Zone AE	Zone AE	Zone AE	Zone AE	Zone AE
Native vegetation community	Pasture	Pasture	Pasture	Pasture	Pasture
Percent composition of exotic invasive vegetation	0.1	10%	15%	5%	20%
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

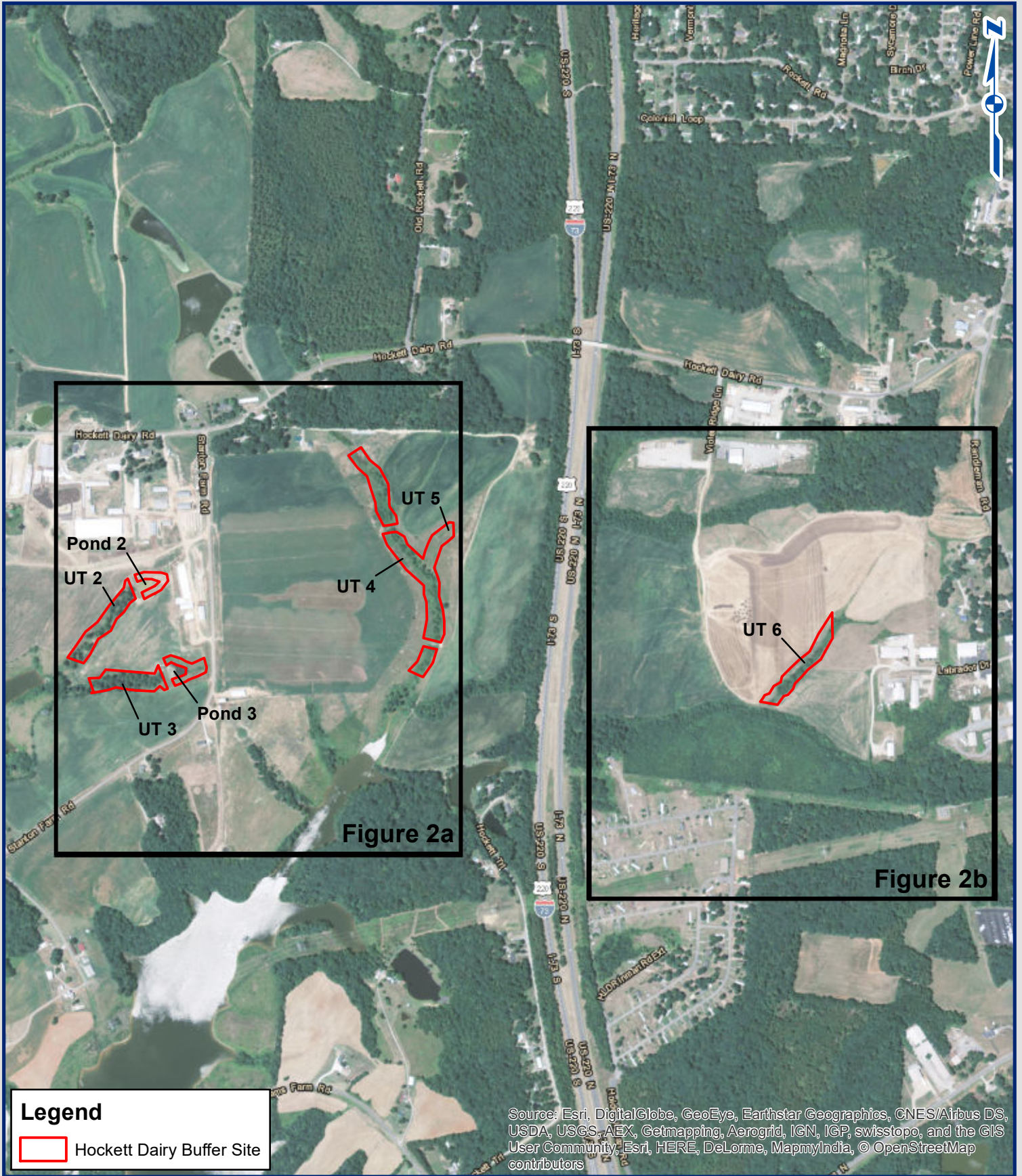
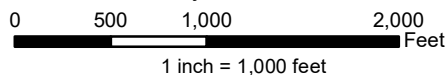


Figure 2-KEY. Current Condition Plan View
 Hockett Dairy Riparian Buffer Restoration Site

Randolph County, North Carolina
 DMS Project ID# 003993



Date: January 2016



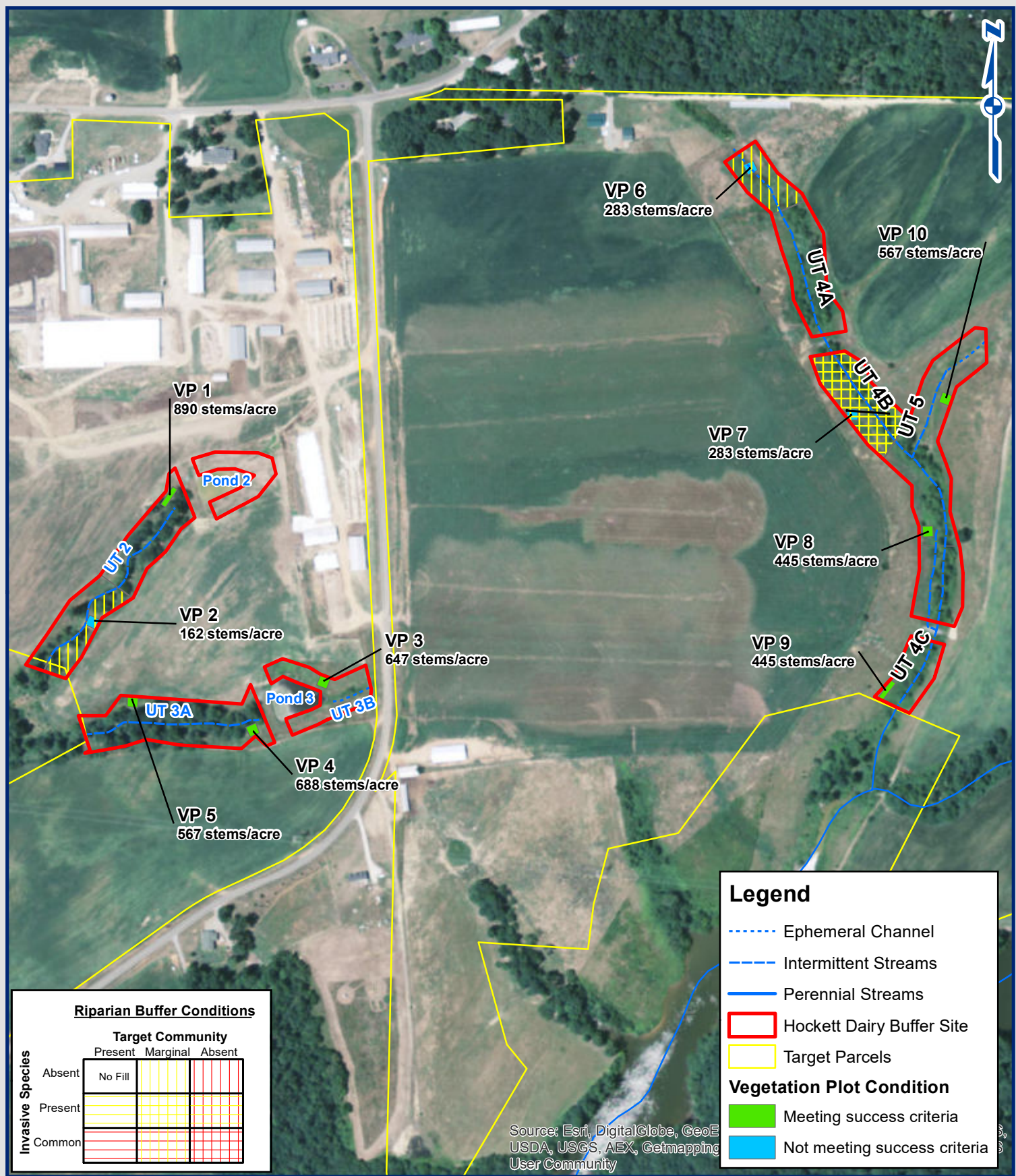


Figure 2a. Current Condition Plan View
 Hockett Dairy Riparian Buffer Restoration Site
 Randolph County, North Carolina
 DMS Project ID# 003993



0 200 400 800 Feet
 1 inch = 400 feet

Date: January 2016

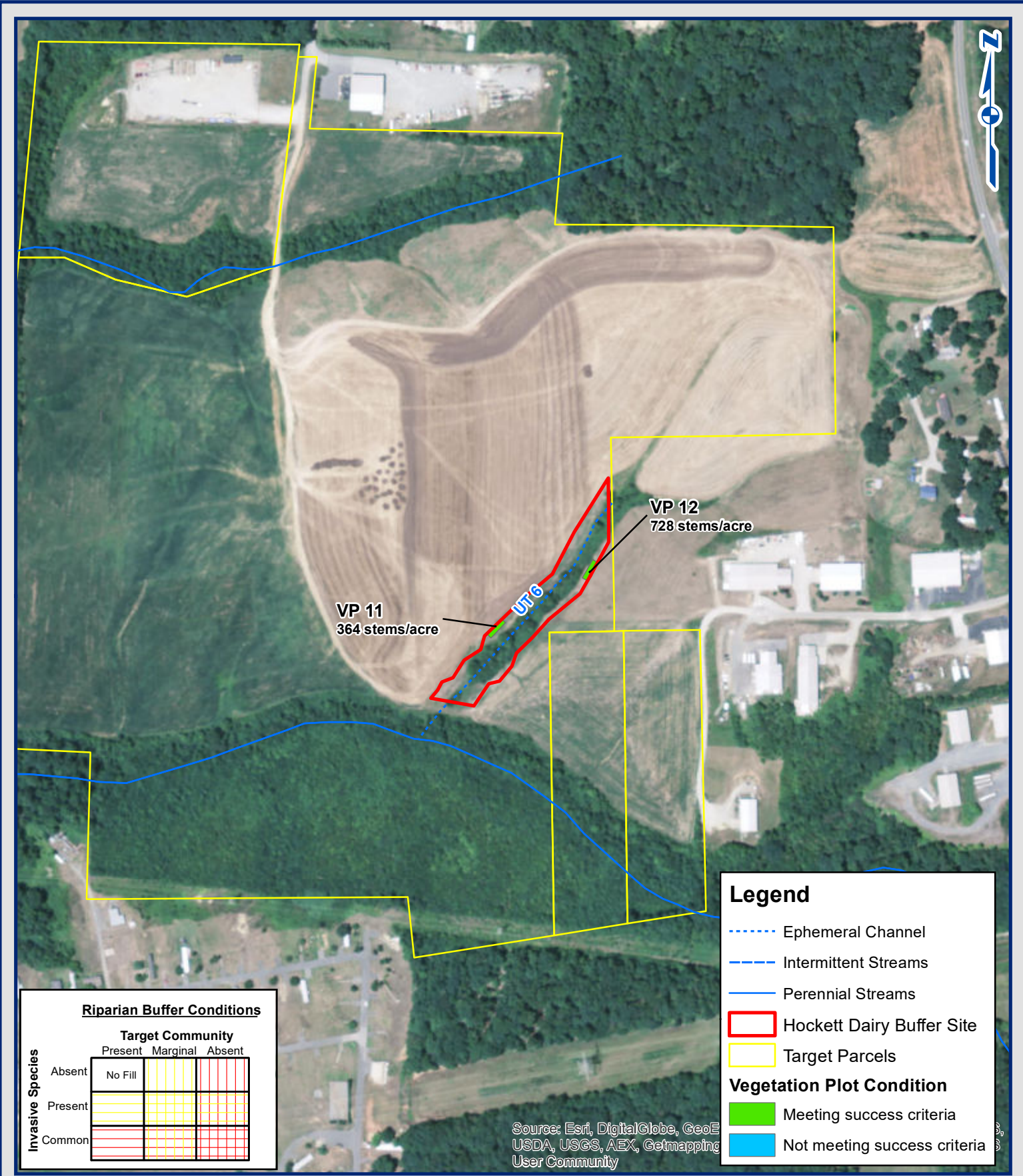
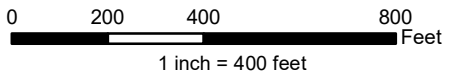


Figure 2b. Current Condition Plan View
 Hockett Dairy Riparian Buffer Restoration Site
 Randolph County, North Carolina
 EEP Project ID# 003993



Date: January 2016

**Table 5. Vegetation Condition Assessment
Hockett Dairy, Randolph County
DMS Project ID Number 003993 DMS Site 95013**

Planted Acreage: 12.99						
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 fill	2	2.09	16%
Total:				2	2.09	16%
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	2.09	16%
Easement Acreage: 12.99						
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 yellow line fill	1	1.05	8%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale)	none	N/A	0	0	0%

*3 vegetation plots are 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



Vegetation Plot 12

Appendix C

Vegetation Plot Data

Table 6. Riparian Buffer Vegetation Totals Hockett Dairy, Randolph County DMS Project ID Number 003993 DMS Site 95013		
Plot #	Riparian Buffer Stems¹ (per acre)	Success Criteria Met?
1	890	Yes
2	162	No
3	647	Yes
4	688	Yes
5	567	Yes
6	283	No
7	243	No
8	445	Yes
9	445	Yes
10	567	Yes
11	364	Yes
12	728	Yes
Project Avg	502	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
Hockett Dairy, Randolph County
DMS Project ID Number 003993 DMS Site 95013**

Scientific Name	Common Name	Species Type	003993-01-0001			003993-01-0002			003993-01-0003			003993-01-0004			003993-01-0005			003993-01-0006			003993-01-0007			003993-01-0008		
			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
Betula nigra	river birch	Tree	6	6	6				1	1	1				3	3	3									
Cercis canadensis	eastern redbud	Tree				1	1	1							2	2	4	1	1	1				1	1	1
Diospyros virginiana	common persimmon	Tree																								
Fraxinus pennsylvanica	green ash	Tree	3	3	4				2	2	2	3	3	3	3	3	3	1	1	1	1	1	1	1	1	1
Liquidambar styraciflua	sweetgum	Tree																								
Nyssa sylvatica	blackgum	Tree																								
Platanus occidentalis	American sycamore	Tree													5	5	5	1	1	1	1	1	1	1	1	6
Quercus	oak	Tree	2	2	2							3	3	3									1	1	1	
Quercus falcata	southern red oak	Tree	5	5	5	1	1	1	3	3	3	2	2	2	1	1	1									
Quercus michauxii	swamp chestnut oak	Tree	2	2	2	2	2	2	8	8	8	5	5	5	1	1	1	5	5	5						
Quercus nigra	water oak	Tree																								
Quercus phellos	willow oak	Tree	4	4	5				2	2	2	2	2	2								2	2	2	5	5
Quercus rubra	northern red oak	Tree																								
Robinia pseudoacacia	black locust	Tree			3																					
Unknown		Shrub or Tree						1																		
Stem count			22	22	27	4	4	5	16	16	16	17	17	19	14	14	14	7	7	7	6	6	6	11	11	11
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			6	6	7	3	3	4	5	5	5	6	6	6	6	6	6	3	3	3	5	5	5	2	2	2
Stems per ACRE			890.30841	890.31	1092.65	161.87426	161.87	202.34	647.497	647.5	647.5	687.96559	687.97	768.9	566.559899	566.56	566.56	283.279949	283.28	283.28	242.8114	242.81	242.81	445.154206	445.15	445.15

Scientific Name	Common Name	Species Type	003993-01-0009			003993-01-0010			003993-01-0011			003993-01-0012			MY3 (2016)			MY2 (2014)			MY1 (2013)			MY0 (2013)		
			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
Betula nigra	river birch	Tree				1	1	1	2	2	2	1	1	1	14	14	14	15	15	15	27	27	27	58	58	58
Cercis canadensis	eastern redbud	Tree				1	1	1							6	6	8	8	8	8	2	2	2			
Diospyros virginiana	common persimmon	Tree																								
Fraxinus pennsylvanica	green ash	Tree	2	2	2	5	5	5	4	4	4	2	2	2	26	26	27	26	26	27	30	30	30	28	28	28
Liquidambar styraciflua	sweetgum	Tree												1												
Nyssa sylvatica	blackgum	Tree																								
Platanus occidentalis	American sycamore	Tree				6	6	6							19	19	19	20	20	21	20	20	20	45	45	45
Quercus	oak	Tree	4	4	4							1	1	2	11	11	12	15	15	15	61	61	61	133	133	133
Quercus falcata	southern red oak	Tree	3	3	3				1	1	1				16	16	16	12	12	12	1	1	1			
Quercus michauxii	swamp chestnut oak	Tree	2	2	2				2	2	2	5	5	5	32	32	32	31	31	31	15	15	15			
Quercus nigra	water oak	Tree										1	1	1	1	1	1	3	3	3	4	4	4			
Quercus phellos	willow oak	Tree				1	1	1				5	5	5	21	21	22	21	21	21	15	15	15			
Quercus rubra	northern red oak	Tree										3	3	3	3	3	3	3	3	3	2	2	2			
Robinia pseudoacacia	black locust	Tree																								
Unknown		Shrub or Tree																								
Stem count			11	11	11	14	14	14	9	9	9	18	18	20	149	149	159	154	154	159	177	177	177	264	264	264
size (ares)			1			1			1			1			12			12			12			12		
size (ACRES)			0.02			0.02			0.02			0.02			0.30			0.30			0.30			0.30		
Species count			4	4	4	5	5	5	4	4	4	7	7	8	10	10	13	10	10	12	10	10	10	4	4	4
Stems per ACRE			445.15421	445.15	445.154	566.5599	566.56	566.56	364.2171	364.22	364.22	728.43416	728.43	809.37	502.484672	502.48	536.21	519.346574	519.35	536.21	596.9113	596.91	596.91	890.308412	890.31	890.31

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%