MEREDELL FARM
ANNUAL MONITORING REPORT
YEAR 6 OF 7

EEP Project #247
Randolph County, North Carolina
Completed Construction: 2008
Submitted January 2014

Submitted to:

NCDENR-EEP
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EXECUTIVE SUMMARY

The Meredell Farm Stream Restoration project falls within USGS hydrologic unit 03030003. The project lies within a rural setting that includes agricultural, forested, and low-density residential areas. The project is located on Koopman Dairies (formerly Meredell Farm), a small farm operation that includes dairy and row crop production. Prior to restoration work, the project stream had been historically destabilized through channelization and hoof-shear.

Baker Engineering designed the restoration plans and restoration was completed in 2008. Sepi Engineering & Construction (SEPI) began the stream and riparian monitoring for Meredell Farms in October 2013.

The goal of the project is to restore and improve the stream channel and riparian buffer form and function on-site through the following objectives:

- Restore 3,865 LF of channel dimension, pattern and profile.
- Enhance 4,704 LF of channel dimension, and/or profile.
- Preserve 5,136 LF of stream channel and riparian buffer.
- Improve floodplain functionality by matching floodplain elevation with bankfull stage.
- Establish native stream bank and floodplain vegetation in the permanent conservation easement.
- Improve the water quality in the Upper Cape Fear River watershed by fencing cattle out of the stream and reducing bank erosion.

SEPI performed stream and riparian monitoring in the fall of 2013 for this Year 6 Monitoring Report, which is discussed in greater detail below.

Vegetation Assessment

Vegetation monitoring in Year 6 included visual assessment of the riparian zone and buffer mitigation areas to update the Current Conditions Plan View (CCPV) and Carolina Vegetation Survey (CVS) assessment of 12 vegetation plots. SEPI observed areas of concern that based on visual assessment did not appear to be meeting riparian zone success criteria of 260 stems per acre after 6 years. These observed conditions are reflected in the CCPV figures (**Figures 2-9**) within this report and briefly discussed below.

- The conservation easement area surrounding stream reaches UT1, UT2, M1, and UT5 continue to have large areas that lack significant counts of visible planted woody stems. It was visually observed that the vegetation established within the buffer and outside of the bankfull bench area primarily consists of grasses and herbaceous species. Good vegetation growth was primary observed within the bankfull bench area for each of these reaches.
- The lower M1 area (downstream of the stream crossing) continues to have a significant invasive species population consisting of Chinese privet and cattails.
- UT3 and UT4 also had instances of tree-of-heaven and Chinese privet throughout the reaches.
- UT5 had instances of agricultural squash growing in the buffer.
- The site continues to be free of encroachments to the easement.

Detailed data collected from the CVS assessment of the 12 vegetation plots can be found in **Appendix C** of this report. Ten of the 12 veg plots exceeded the riparian zone success criteria of 260 stems/acre after 6 years, and 5 of the 11 buffer vegetation plots exceeded the buffer mitigation success criteria of 320 stems/acre after 6 years. The total average planted stem density for all twelve veg plots is 435 stems/acre for Year 6 Monitoring.

Invasive species were treated on reaches UT1, UT2, UT3, UT4, and M1 in August 2012. Approximately 22 acres were treated. The target species of concern included *Ailanthus altissima* and *Ligustrum sinense*. Supplemental plantings were performed on reaches UT1, UT2, and M1 in August 2012. A total of 4500 woody stems were planted. Detailed data and maps on supplemental plantings and invasive species control efforts can be found in **Appendix C**.

Stream Assessment

Year 6 stream channel monitoring included a visual assessment of the stream channel and in-stream structures to update the Current Conditions Plan View (CCPV) and collection of geomorphic profile data. Visual observations of the stream channel conditions were conducted to determine if the project is establishing toward the stream success criteria outlined in the approved Restoration Plan (2004). These goals are outlined below:

- Longitudinal Profile:
    - "The longitudinal profile data should show that the bedform features are remaining stable and are not aggrading or degrading. The pools should remain deep with flat water surface slopes and the riffles should remain steep and shallow."

The visual assessment and geomorphic data collection completed for the site indicated that approximately 95% of the project reaches were performing within established success criteria ranges. The remaining 5% were exhibiting impacts such as headcuts and stream structure instabilities. The observed stream channel conditions are reflected in the CCPV figures (**Figures 2-9**) within this report and briefly discussed below.

- Two instream structures (Stations M1: 303+25 and 305+00) had flow going between the sill and arm boulders, but no further instability was observed as a result of the conditions
- One instream structure (Station M1: 303+75) had approximately 15% bank erosion
- Six instances of headcut were observed
- There continues to be a small area of concentrated overland runoff through the buffer on the UT3a near Station 10+50 that is causing erosion to the stream bank
- Two areas of split channel flow were identified along the existing stream at the upstream and downstream section of UT5

Geomorphic monitoring included collection of 4 longitudinal profile segments. Channel profile stability assessment includes the entire restored length of the project. Refer to **Appendix D** contained herein for detailed results of the longitudinal profile data collection.

Site Hydrology

Year 6 hydrologic bankfull indicators were collected during monitoring field visits. These indicators include collection of visually observed wracklines at, or above, the bankfull elevation and recordation of the crest gage height located at Station 30+700 on reach M1.

- Wracklines were noted above the bankfull bench and within the floodplain during the initial site assessment field visit conducted on October 30, 2013. Refer to photograph SP2 within **Appendix B** of this report.
- A crest gage reading of 3.6 feet was recorded during the annual monitoring field visit conducted on October 30, 2013. The baseline bankfull design maximum depth range for reach M1 is 1.0 foot (min) to 1.3 feet (max); therefore, the crest gage reading indicates that a bankfull event had occurred onsite. Refer to photograph SP1 within **Appendix B** of this report.

Summary information/data related to the occurrence of such things 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 EEP's website. All raw data supporting the tables and figures in the appendices are available from EEP upon request.

METHODOLOGY

The following methods were utilized during the Year 6 monitoring for data collection and post-processing:

- Geomorphic topographic data collections were performed in the field using a survey-grade GPS such that each survey point has three-dimensional coordinates, and is georeferenced (NAD83-State Plane Feet – FIPS 3200).
- Longitudinal stationing was developed using the as-built survey thalweg as a baseline.
- The CVS Level 2 methodology was utilized for the vegetation plot data collection.
- Permanent cross-sectional data was not required for this monitoring year.
- Particle size distribution was not required for this monitoring year.

REFERENCES

Buck Engineering, PC. 2004. Meredell Farms Stream Restoration Plan.

North Carolina Ecosystem Enhancement Program. November 2006. Content, Format and Data Requirements for EEP Monitoring Reports.

Rosgen, D.L. 1994. A Classification of Natural Rivers. Catena 22: 166-169.

Kimley-Horn and Associates, Inc. 2009. Meredell Farm Monitoring Report, Year 2 of 5.

Kimley-Horn and Associates, Inc. 2010. Meredell Farm Monitoring Report, Year 3 of 5.

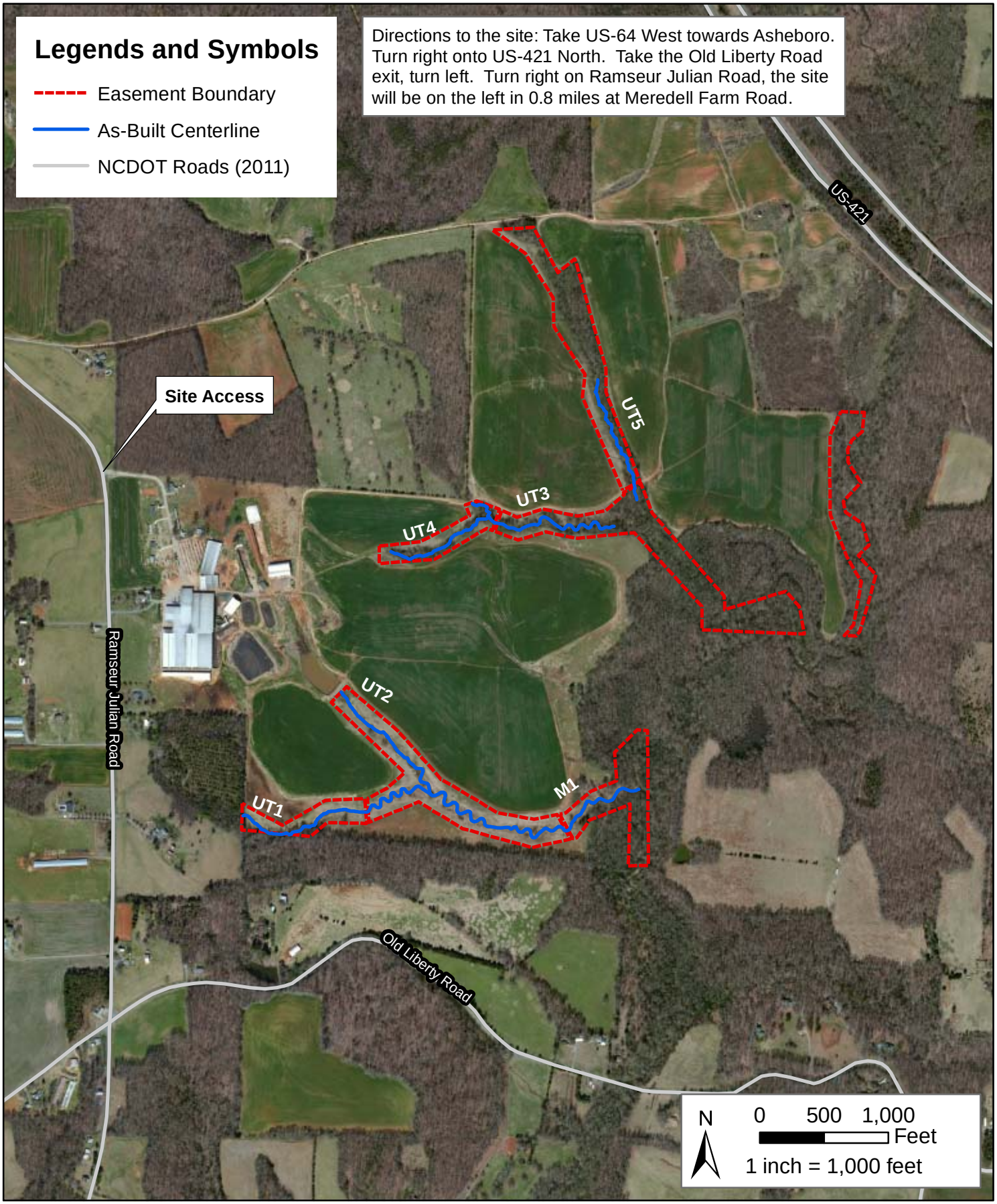
Kimley-Horn and Associates, Inc. 2011. Meredell Farm Monitoring Report, Year 4 of 5.

Kimley-Horn and Associates, Inc. 2012. Meredell Farm Monitoring Report, Year 5 of 5.

U.S. Department of Army, Corps of Engineers. 2003. Stream Mitigation Guidelines. http://www.saw.usace.army.mil/wetlands/Mitigation/stream_mitigation.html

Appendix A

Project Vicinity Map and Background Files



Title	Project Vicinity Map		
Prepared for: Ecosystem Enhancement Program	Project	Meredell Farm Stream Restoration Monitoring Year 6 - 2013 Randolph County, North Carolina	
	Date	Project Number	Figure
	11/27/2013	247	1

Table 1. Project Components and Mitigation Credits
Meredell Farm Stream Restoration Site/247

Mitigation Credits

	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	**5785.5**	**5134**					**570000**		

Project Components

Project Component -or- Reach ID	Stationing/Location	Existing Footage/Acreage	Approach (PI, PII etc.)	Restoration -or- Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio
Ut 1a	**10+00 – 21+00**	**1050**		**EI**	**1100**	**1.5:1**
Ut 1b	**21+00 – 28+80**	**571**		**R**	**780**	**1:1**
Ut 2a	**10+00 – 18+00**	**800**		**EI**	**800**	**1.5:1**
Ut 2b	**18+00 – 20+94**	**206**		**R**	**294**	**1:1**
M1	**10+00 - 32+54**	**2103**	**I/II**	**R**	**2254**	**1:1**
Ut 3a	**10+00 – 16+50**	**400**		**EII**	**650**	**2.5:1**
Ut 3b	**16+50 - 20+79**	**836**		**R**	**429**	**1:1**
Ut 4	**10+00 – 19+13**	**913**		**EII**	**913**	**2.5:1**
Ut 5	**10+00 – 20+75**	**1075**		**EII**	**1075**	**2.5:1**
M2	**NA**	**1398**		**P**	**1398**	**5:1**
Sandy Creek 1	**NA**	**1033**		**P**	**1033**	**5:1**
Sandy Creek 2	**NA**	**801**		**P**	**801**	**5:1**
Sandy Creek 3	**NA**	**1902**		**P**	**1902**	**5:1**

Component Summation

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	3757				373,950	
Enhancement					8,750	
Enhancement I	800					
Enhancement II	3738					
Creation						
Preservation	5134					
High Quality						

BMP Elements

Element	Location	Purpose/Function	Notes

BMP Elements
BR = Bioretention Cell; SF = 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
Meredell Farm Stream Restoration Site/247

Elapsed Time Since Grading Complete: 5 yrs 8 months
Elapsed Time Since Planting Complete: 5 yrs 7 Months
Number of Reporting Years[1]: 6

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Restoration Plan		Sept-04
Final Design – Construction Plans		Jan-07
Construction	NA	Mar-08
Containerized, bare root and B&B plantings	NA	Feb-08
As-built Mapping	Nov-07	Apr-08
Year 1 Monitoring (baseline)*	Nov-08	Jun-09
Year 2 Monitoring	Nov-09	Apr-10
Year 3 Monitoring	Oct-10	Mar-11
Year 4 Monitoring	Oct-11	Jan-12
Year 5 Monitoring	Oct-12	Feb-13
Year 6 Monitoring	Nov-13	Nov-13

*As-built plan view survey performed by Level Cross Surveying, PLLC. (No As-built monitoring data was collected or reported).

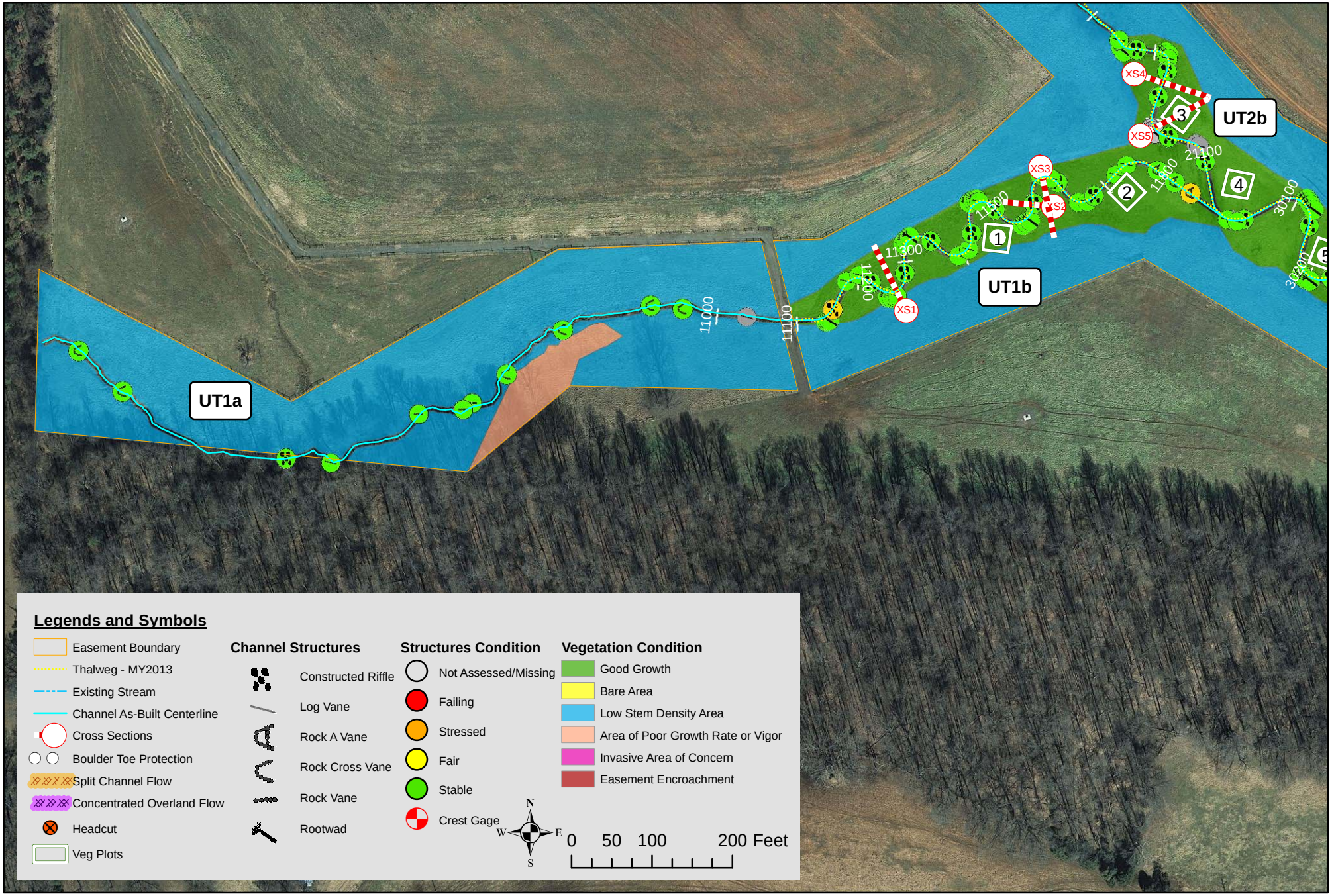
Bolded items are examples of those items that are not standard, but may come up and should be included
Non-bolded items represent events that are standard components over the course of a typical project.
The above are obviously not the extent of potential relevant project activities, but are just provided as example as part of this exhibit.
If planting and morphology are on split monitoring schedules that should be made clear in the table
1 = Equals the number of reports or data points produced excluding the baseline

Table 3. Project Contacts Table Meredell Farm Stream Restoration Site/247	
Designer	Buck Engineering, PC
	8000 Regency Parkway, Suite 200, Cary, NC 27511
Primary project design POC	Kevin Tweedy, P.E. (919) 463-5488
Construction Contractor	RiverWorks, Inc.
	8000 Regency Parkway, Suite 200, Cary, NC 27511
Construction contractor POC	(919) 459-9001
Survey Contractor	Level Cross Survey, PLLC
	668 Marsh Country Lane, Randleman, NC 27317
Survey contractor POC	(336) 495-1713
Planting Contractor	
Planting contractor POC	
Seeding Contractor	
Contractor point of contact	
Seed Mix Sources	
Nursery Stock Suppliers	
Monitoring Performers	SEPI Engineering & Construction, Inc.
	1025 Wade Avenue, Raleigh, NC 27605
Stream Monitoring POC	Philip Beach, PWS
Vegetation Monitoring POC	Kim Hamlin, Project Scientist
Wetland Monitoring POC	

Table 4. Project Attribute Table Meredell Farm Stream Restoration Site/247							
Project County	Randolph						
Physiographic Region	Piedmont						
Ecoregion	Carolina Slate Belt						
Project River Basin	Cape Fear						
USGS HUC for Project (14 digit)	03030003020010						
NCDWQ Sub-basin for Project	03-06-09						
Within extent of EEP Watershed Plan?	no						
WRC Hab Class (Warm, Cool, Cold)	warm						
% of project easement fenced or demarcated	100						
Beaver activity observed during design phase?	No						
Restoration Component Attribute Table							
	M1	M2	UT1	UT2	UT3	UT4	UT5
Drainage area (acres)	168	265	64	67	148	56	59
Stream order	2	2	1	1	1	1	1
Restored length (feet)	2254	1398	1880	1095	1351	913	1075
Perennial or Intermittent	P	P	P	P	P	P	P
Watershed type (Rural, Urban, Developing etc.)	R	R	R	R	R	R	R
Watershed LULC Distribution (e.g.)							
Residential	U	U	U	U	U	U	U
Ag-Row Crop	U	U	U	U	U	U	U
Ag-Livestock	U	U	U	U	U	U	U
Forested	U	U	U	U	U	U	U
Etc.	U	U	U	U	U	U	U
Watershed impervious cover (%)	U	U	U	U	U	U	U
NCDWQ AU/Index number							
NCDWQ classification	WS-III	WS-III	WS-III	WS-III	WS-III	WS-III	WS-III
303d listed?	No	No	No	No	No	No	No
Upstream of a 303d listed segment?	No	No	No	No	No	No	No
Reasons for 303d listing or stressor	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total acreage of easement	49.8						
Total vegetated acreage within the easement	49.8						
Total planted acreage as part of the restoration	8.3	0	6.2	3	2.2	0	0
Rosgen classification of pre-existing	G4c	U	G4	B5-1/E5-1	B4c	G5	E5
Rosgen classification of As-built	U	U	U	U	U	U	U
Valley type	U	U	U	U	U	U	U
Valley slope	U	U	U	U	U	U	U
Valley side slope range (e.g. 2-3.%)	U	U	U	U	U	U	U
Valley toe slope range (e.g. 2-3.%)	U	U	U	U	U	U	U
Cowardin classification	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Trout waters designation	No	No	No	No	No	No	No
Species of concern, endangered etc.? (Y/N)	Y	Y	Y	Y	Y	Y	Y
Dominant soil series and characteristics							
Series	U	U	U	U	U	U	U
Depth	U	U	U	U	U	U	U
Clay%	U	U	U	U	U	U	U
K	U	U	U	U	U	U	U
T	U	U	U	U	U	U	U

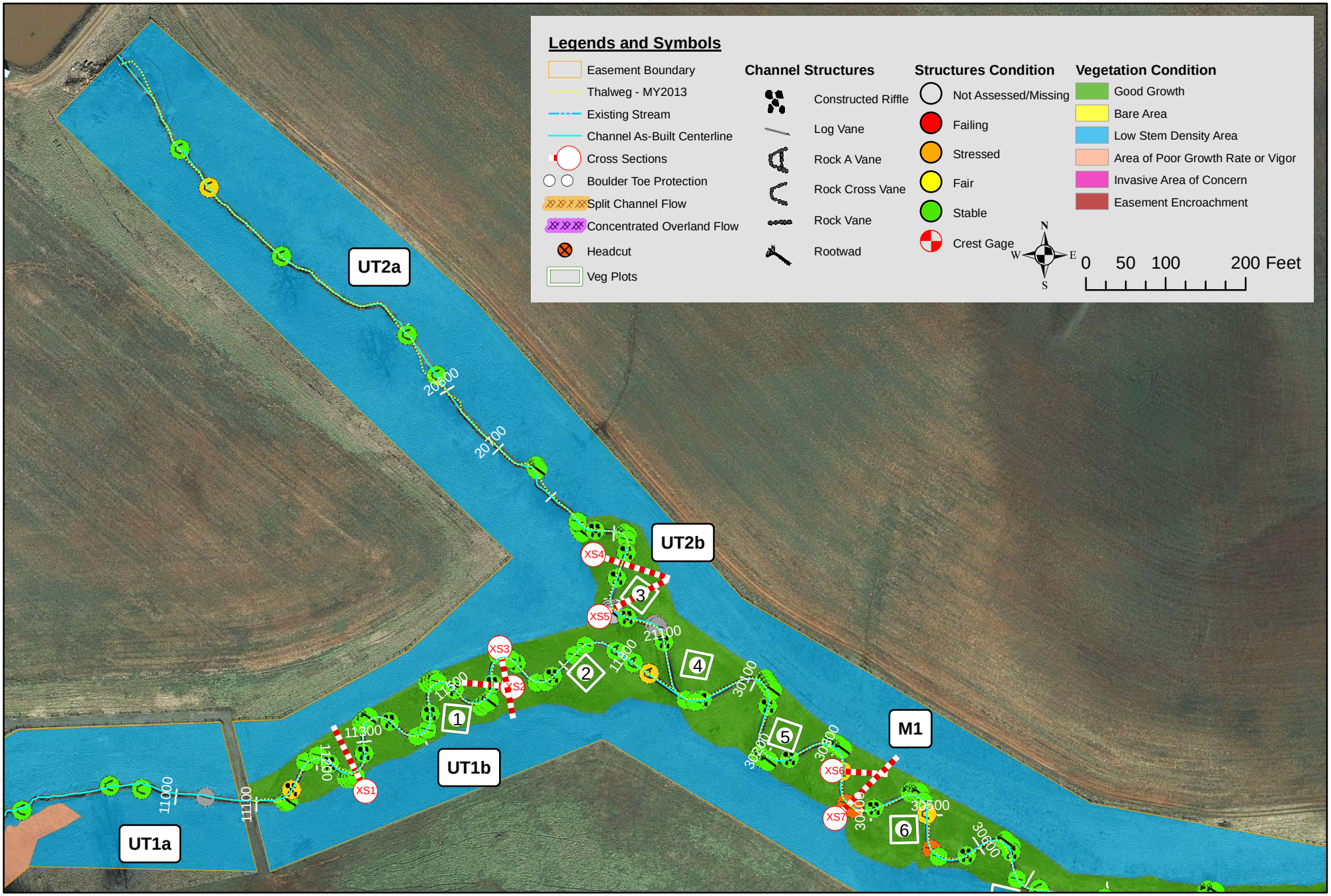
Use N/A for items that may not apply. Use "-" for items that are unavailable and "U" for items that are unknown

Appendix B
Visual Assessment Data



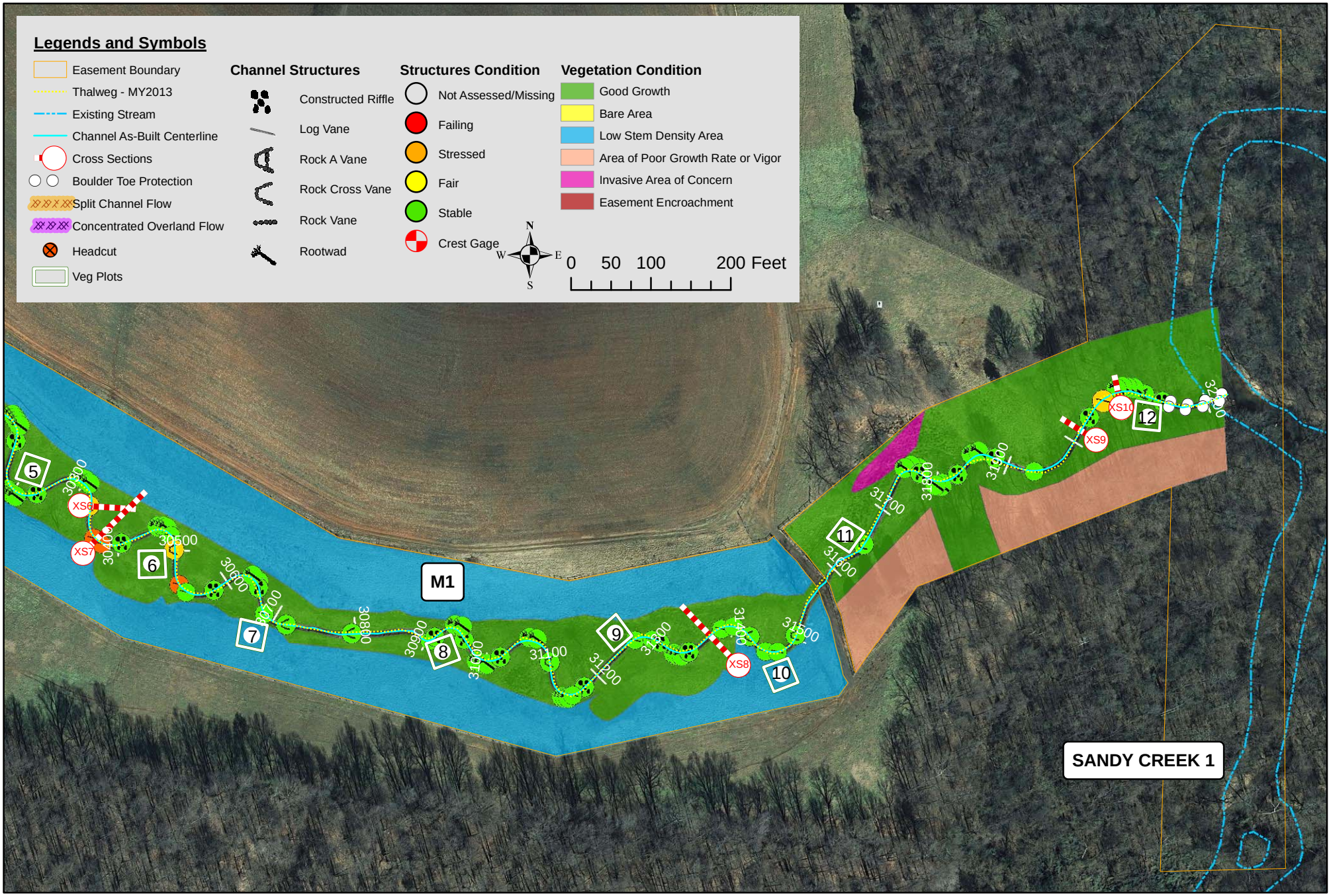
Title	Current Conditions Plan View UT1a, UT1b, and UT2b
Project	Meredell Farm Stream Restoration Monitoring year 6 -- 2013 Randolph County, North Carolina

Date	Project Number	Figure
11/27/2013	247	2



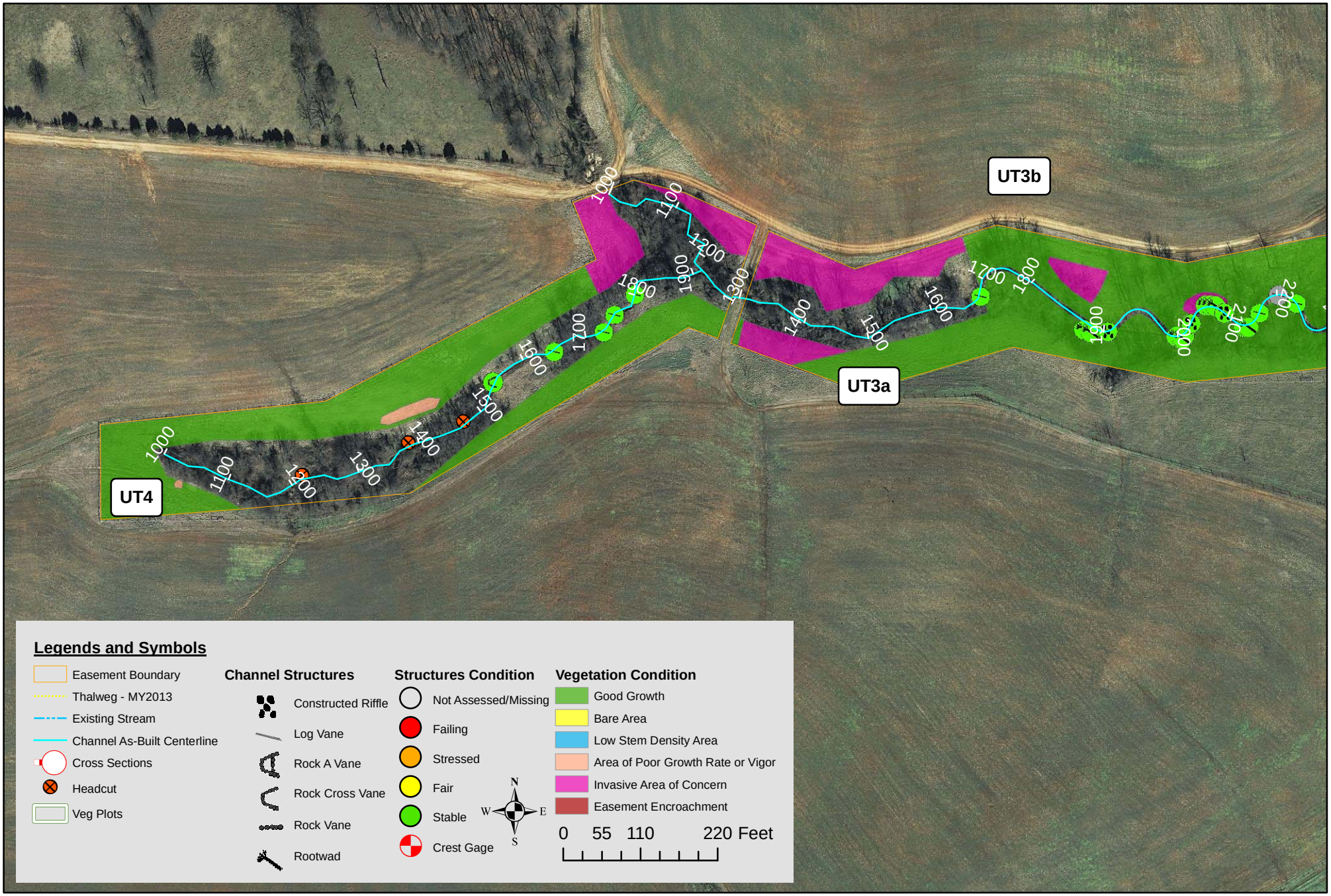
Title	Current Conditions Plan View UT1a, UT1b, UT2a, UT2b, M1
Project	Meredell Farm Stream Restoration Monitoring year 6 -- 2013 Randolph County, North Carolina

Date	Project Number	Figure
11/27/2013	247	3

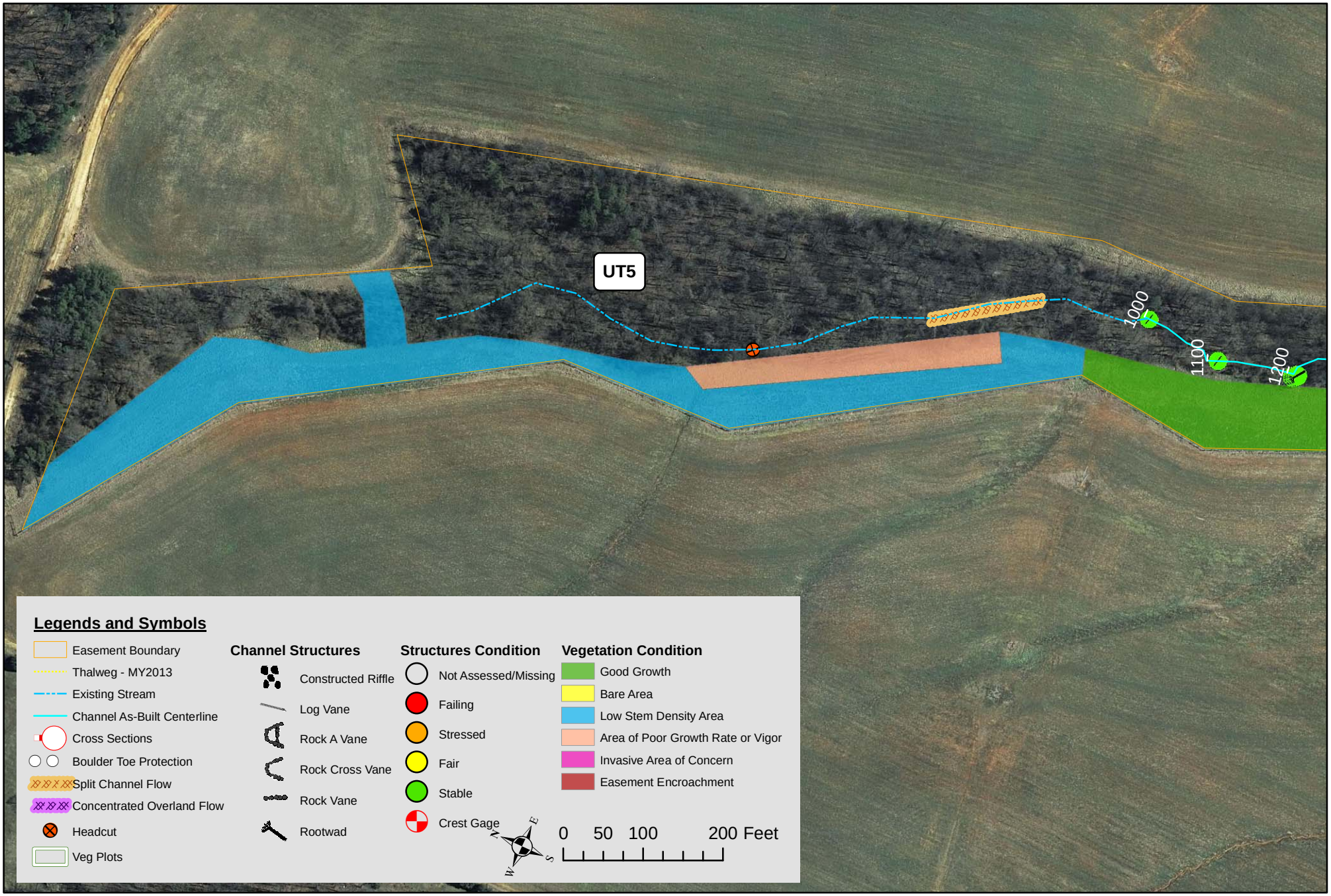


Title	Current Conditions Plan View M1 and SC1
Project	Meredell Farm Stream Restoration Monitoring year 6 -- 2013 Randolph County, North Carolina

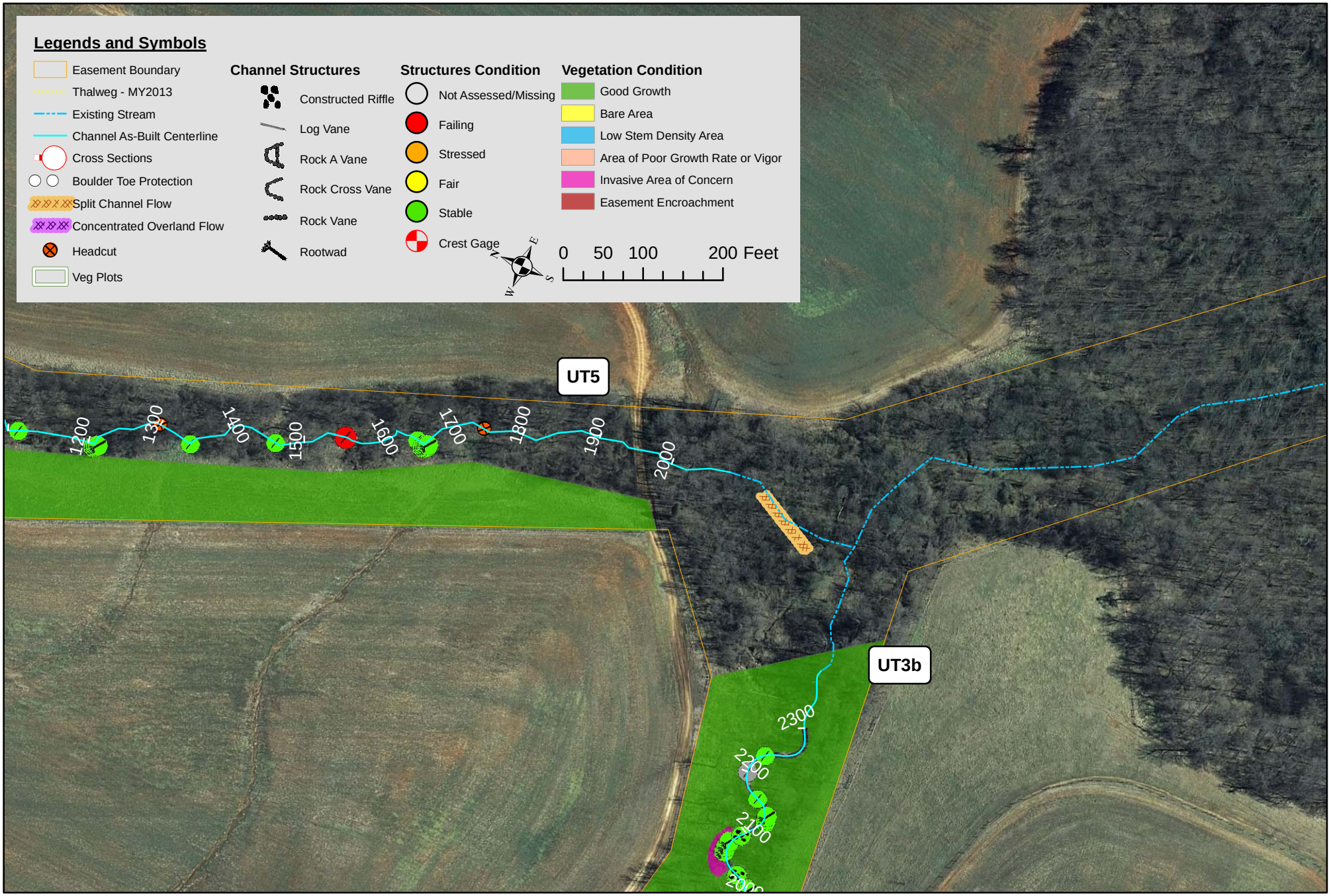
Date	Project Number	Figure
11/27/2013	247	4



Title	Current Conditions Plan View UT3a, UT3b, and UT4		
Ecosystem Enhancement Program	**Project**	Meredell Farm Stream Restoration Monitoring year 6 -- 2013 Randolph County, North Carolina	
	Date	**Project Number**	**Figure**
	11/27/2013	247	5

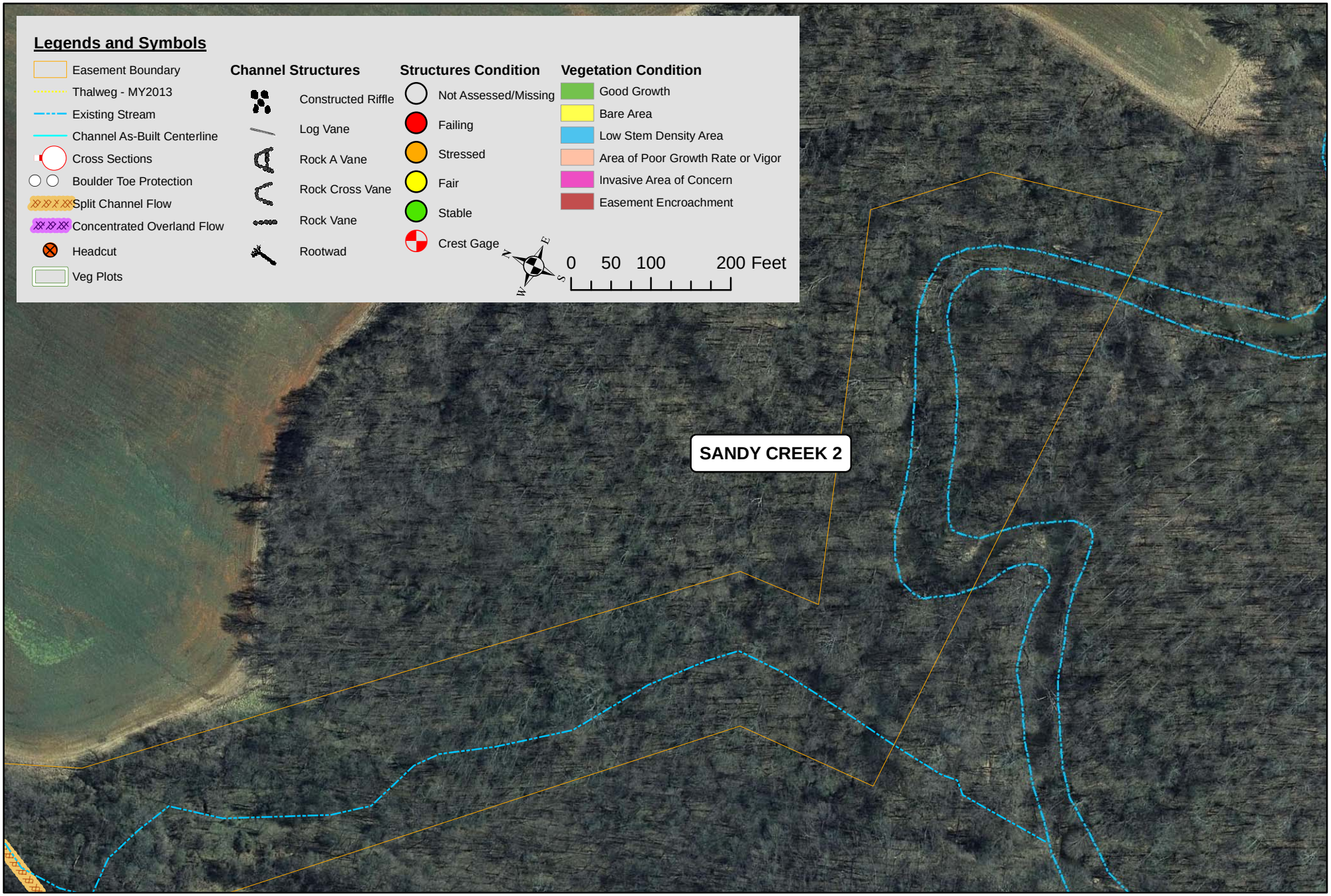


Title	Current Conditions Plan View UT5		
Ecosystem Enhancement Program	**Project**	Meredell Farm Stream Restoration Monitoring year 6 -- 2013 Randolph County, North Carolina	
	Date	**Project Number**	**Figure**
	11/27/2013	247	6



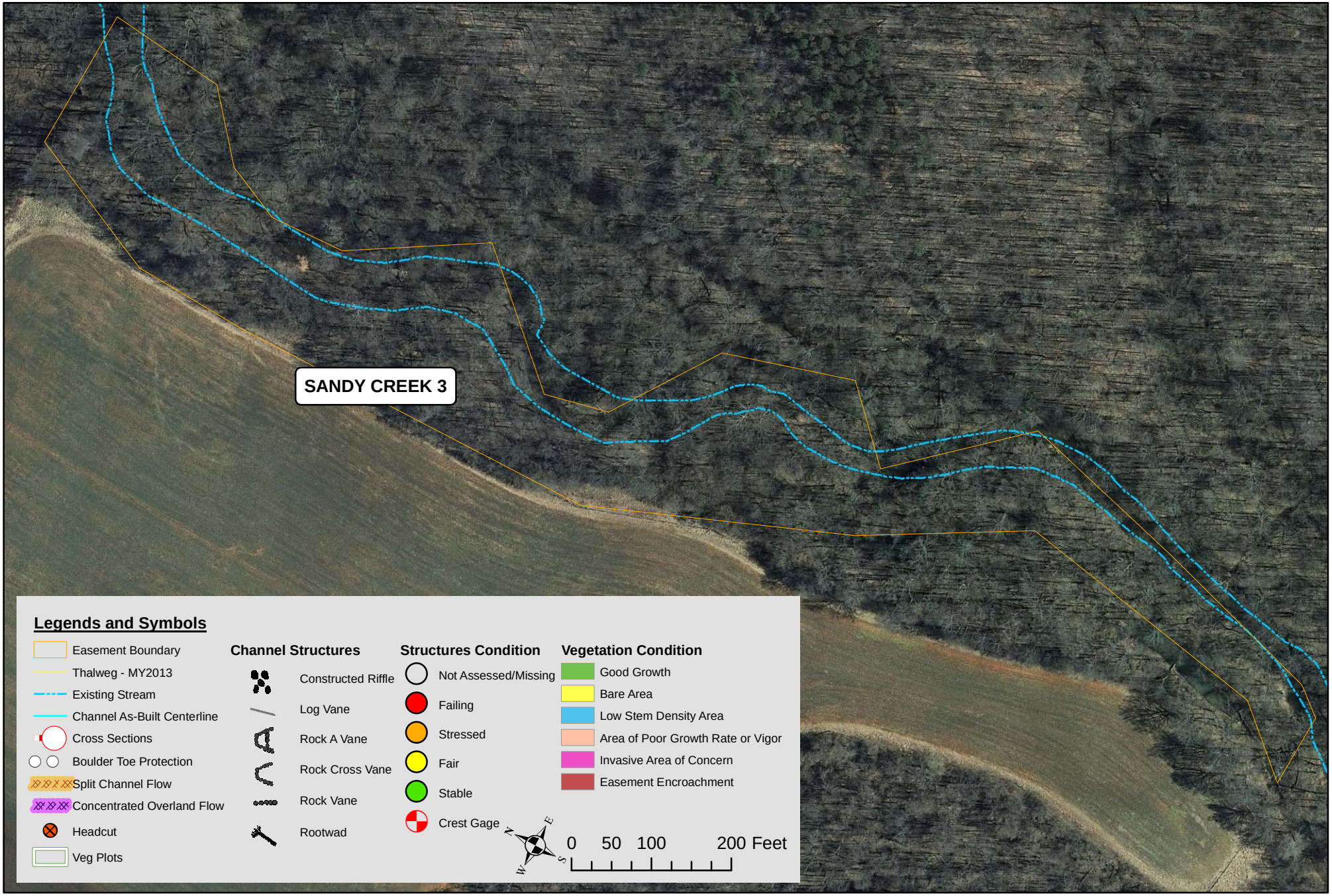
Title	Current Conditions Plan View UT3b and UT5
Project	Meredell Farm Stream Restoration Monitoring year 6 -- 2013 Randolph County, North Carolina

Date	Project Number	Figure
11/27/2013	247	7



Title	Current Conditions Plan View SC2
Project	Meredell Farm Stream Restoration Monitoring year 6 -- 2013 Randolph County, North Carolina

Date	Project Number	Figure
11/27/2013	247	8



Title	Current Conditions Plan View SC3
Project	Meredell Farm Stream Restoration Monitoring year 6 -- 2013 Randolph County, North Carolina

Date	Project Number	Figure
11/27/2013	247	9

Table 5.1 **Visual Stream Morphology Stability Assessment**
Reach ID **UT1**
Assessed Length **640**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	5	5			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	5	5			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	5	5			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	5	5			100%			
		2. Thalweg centering at downstream of meander (Glide)	5	5			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	25	25			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	25	25			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	25	25			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	25	25			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	25	25			100%			

Table 5.2 **Visual Stream Morphology Stability Assessment**
Reach ID **UT2**
Assessed Length **350**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	5	5			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	4	4			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	4	4			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	3	3			100%			
		2. Thalweg centering at downstream of meander (Glide)	3	3			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	15	15			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	15	15			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	15	15			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	15	15			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	15	15			100%			

Table 5.3 **Visual Stream Morphology Stability Assessment**
Reach ID **M1**
Assessed Length **3200**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	25	25			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	23	23			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	23	23			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	26	26			100%			
		2. Thalweg centering at downstream of meander (Glide)	26	26			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	48	48			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	48	48			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	46	48			96%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	47	48			98%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	48	48			100%			

Table 6 Vegetation Condition Assessment

Planted Acreage[1] **33.7**

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 herbaceous material.	0.1 acres	Pattern and Color	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	Pattern and Color	7	13.52	40.1%
			Total	7	13.52	40.1%
3. 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	Pattern and Color	6	1.26	3.7%
			Cumulative Total	13	14.78	43.9%

Easement Acreage[2] **55.6**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	Areas or points (if too small to render as polygons at map scale).	1000 SF	Pattern and Color	7	0.87	1.6%
5. Easement Encroachment Areas[3]	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0.00	0.0%

1 = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

2 = The acreage within the easement boundaries.

3 = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1,2 or 3) as well as a parallel tally in item 5.

4 = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern spcies are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by EEP such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likley trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly ealry in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolzing invasives polygons, particulalry for situations where the conditon for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

Appendix C
Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment

Vegetation Plot ID	MY1		MY2		MY3		MY4		MY5				MY6			
	Vegetation Survival Threshold Met?	Reach Mean	Vegetation Survival Threshold Met?	Reach Mean	Vegetation Survival Threshold Met?	Reach Mean	Vegetation Survival Threshold Met?	Reach Mean	Stream Riparian Zone Vegetation Survival Threshold (260 stems/acre) Met?	Reach Mean	Buffer Mitigation Vegetation Survival Threshold (320 stems/acre) Met?	Reach Mean	Stream Riparian Zone Vegetation Survival Threshold (260 stems/acre) Met?	Reach Mean	Buffer Mitigation Vegetation Survival Threshold (320 stems/acre) Met?	Reach Mean
247-01-0001	Y	100%	Y	50%	Y	50%	Y	100%	N	50%	N	0%	Y	100%	N	50%
247-01-0002	Y		N		N		Y		Y		N		Y		Y	
247-01-0003	Y	100%	Y	100%	Y	100%	Y	100%	N	50%	N	50%	Y	100%	N	0%
247-01-0004	Y		Y		Y		Y		Y		Y		Y		N	
247-01-0005	Y	50%	Y	50%	Y	38%	N	38%	N	13%	N	0%	Y	75%	Y	57%
247-01-0006	N		N		N		N		N		N		Y		Y	
247-01-0007	N		N		N		N		N		N		Y		Y	
247-01-0008	Y		Y		Y		Y		N		N		Y		N	
247-01-0009	N		N		N		N		N		N		N		N	
247-01-0010	N		N		N		N		N		N		N		N	
247-01-0011	Y		Y		Y		Y		N		N		Y		Y	
247-01-0012	Y		Y		Y		Y		Y		N/A		Y		N/A	

Table 8. CVS Vegetation Plot Metadata Meredell Farm Stream Restoration Site/ 247	
Report Prepared By	Kim Hamlin
Date Prepared	11/20/2013 10:54
database name	cvs-eep-entrytool-v2.3.1.mdb
database location	G:\Environmental\NCEEP Meredell Farms SMS\MY06\CVS
computer name	W93
file size	61476864
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	247
project Name	Meredell Farm
Description	Riparian Buffer Restoration
River Basin	Cape Fear
length(ft)	9601
stream-to-edge width (ft)	100
area (sq m)	201,533
Required Plots (calculated)	12
Sampled Plots	12

EEP Project Code 247. Project Name: Meredell Farm

Table 9 Planted and Total Stem Counts (Species by Plot with Annual Means)

Current Plot Data (MY6 2013)

Scientific Name	Common Name	Species Type	E247-01-0001			E247-01-0002			E247-01-0003			E247-01-0004			E247-01-0005			E247-01-0006		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree																		
Acer rubrum	red maple	Tree																		
Asimina triloba	pawpaw	Tree																2	2	2
Betula nigra	river birch	Tree				1	1	1	4	4	4	1	1	1	1	1	2			
Carya	hickory	Tree																		
Chamaecyparis thyoides	Atlantic white cedar	Tree													3	3	3	3	3	3
Cornus amomum	silky dogwood	Shrub													1	1	4	1	1	1
Corylus americana	American hazelnut	Shrub										4	4	4						
Diospyros virginiana	common persimmon	Tree	1	1	2										2	2	4			1
Fraxinus	ash	Tree																		
Fraxinus pennsylvanica	green ash	Tree																		
Hamamelis virginiana	American witchhazel	Tree	2	2	2				1	1	1	3	3	3						
Juglans nigra	black walnut	Tree															1			
Juniperus virginiana	eastern redcedar	Tree			5			5			2						2			19
Ligustrum sinense	Chinese privet	Exotic																		
Lindera benzoin	northern spicebush	Shrub																		
Liquidambar styraciflua	sweetgum	Tree															1	1	1	3
Liriodendron tulipifera	tuliptree	Tree													2	2	4	1	1	2
Oxydendrum arboreum	sourwood	Tree							1	1	1									
Pinus	pine	Tree																		
Pinus taeda	loblolly pine	Tree				1	1	2												
Platanus occidentalis	American sycamore	Tree	3	3	3	3	3	3										1	1	1
Populus deltoides	eastern cottonwood	Tree																		
Quercus alba	white oak	Tree																		
Quercus michauxii	swamp chestnut oak	Tree				1	1	1				2	2	2				1	1	1
Quercus pagoda	cherrybark oak	Tree			1							1	1	1						
Quercus phellos	willow oak	Tree			1	3	3	3												
Salix nigra	black willow	Tree		1	2															
Salix sericea	silky willow	Shrub	6	16	16				8	8	9									
Sambucus canadensis	Common Elderberry	Shrub			2															1
Ulmus	elm	Tree																		
Ulmus rubra	slippery elm	Tree																		
		Stem count	12	23	34	9	9	15	14	14	17	11	11	11	9	9	21	10	10	34
		size (ares)	1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	4	5	9	5	5	6	4	4	5	5	5	5	5	5	8	7	7	10
		Stems per ACRE	485.6	930.8	1376	364.2	364.2	607	566.6	566.6	688	445.2	445.2	445.2	364.2	364.2	849.8	404.7	404.7	1376

Scientific Name	E247-01-0007			E247-01-0008			E247-01-0009			E247-01-0010			E247-01-0011			E247-01-0012		
	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo																1	1	1
Acer rubrum						3							6	6	9	4	4	25
Asimina triloba																		
Betula nigra				4	4	4										2	2	2
Carya																		
Chamaecyparis thyoides																		
Cornus amomum																	1	1
Corylus americana																		
Diospyros virginiana	3	3	3										1	1	1			
Fraxinus																		
Fraxinus pennsylvanica																		
Hamamelis virginiana																		
Juglans nigra	2	2	2							3	3	3	2	2	2			
Juniperus virginiana	2	2	3			4												5
Ligustrum sinense																		10
Lindera benzoin				1	1	1										2	2	2
Liquidambar styraciflua				1	1	1												
Liriodendron tulipifera	1	1	2										2	2	2	10	10	10
Oxydendrum arboreum																		
Pinus																		
Pinus taeda	1	1	1															
Platanus occidentalis	2	2	2	2	2	2	1	1	1	1	1	1				3	3	4
Populus deltoides																		
Quercus alba																		
Quercus michauxii													2	2	2			
Quercus pagoda	1	1	1															
Quercus phellos																		
Salix nigra																		
Salix sericea				2	3	3		1	1				2	4	4			
Sambucus canadensis												15						
Ulmus																		
Ulmus rubra																		2
Stem count	12	12	14	10	11	18	1	2	2	4	4	19	15	17	20	22	23	62
size (ares)	1			1			1			1			1			1		
size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02		
Species count	7	7	7	5	5	7	1	2	2	2	2	3	6	6	6	6	7	10
Stems per ACRE	485.6	485.6	566.6	404.7	445.2	728.4	40.47	80.94	80.94	161.9	161.9	768.9	607	688	809.4	890.3	930.8	2509

Annual Means

Scientific Name	MY6 (2013)			MY5 (2012)			MY4 (2011)			MY3 (2010)			MY2 (2009)			MY1 (2009)		
	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	1	1	1															
Acer rubrum	10	10	37	12	12	12	12	12	12	10	10	10	11	11	11			
Asimina triloba	2	2	2	2	2	2	1	1	1	1	1	1				1	1	1
Betula nigra	13	13	14	14	14	14	13	13	13	12	12	12	10	10	10	12	12	12
Carya										1	1	1	2	2	2			
Chamaecyparis thyoides	6	6	6	9	9	9												
Cornus amomum	2	3	6	4	5	5		1	1		1	1		2	2		2	2
Corylus americana	4	4	4	4	4	4	5	5	5	5	5	5	10	10	10	11	11	11
Diospyros virginiana	7	7	11	6	6	6	5	5	5	6	6	6	12	12	12	15	15	15
Fraxinus																1	1	1
Fraxinus pennsylvanica				1	1	1												
Hamamelis virginiana	6	6	6	6	6	6	1	1	1	1	1	1	3	3	3	3	3	3
Juglans nigra	7	7	8	10	10	10	5	5	5	4	5	5	6	6	6	2	2	2
Juniperus virginiana	2	2	45	2	2	2												
Ligustrum sinense			10															
Lindera benzoin	3	3	3	3	3	3	3	3	3	2	2	2	5	5	5	9	9	9
Liquidambar styraciflua	2	2	5	3	3	3	1	1	1									
Liriodendron tulipifera	16	16	20	16	16	16	13	13	13	10	10	10	8	8	8	8	8	8
Oxydendrum arboreum	1	1	1	1	1	1												
Pinus				1	1	1												
Pinus taeda	2	2	3															
Platanus occidentalis	16	16	17	17	17	17	14	14	14	13	13	13	14	14	14	12	12	12
Populus deltoides										1	1	1	1	1	1	3	3	3
Quercus alba													1	1	1			
Quercus michauxii	6	6	6	6	6	6	6	6	6	5	5	5	8	8	8	7	7	7
Quercus pagoda	2	2	3	4	4	4	2	2	2	1	1	1	3	3	3	4	4	4
Quercus phellos	3	3	4	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4
Salix nigra		1	2		1	1												
Salix sericea	18	32	33	23	39	39	18	33	33	18	31	31	19	49	49	1	33	33
Sambucus canadensis			18					2	2	1	2	2		2	2		2	2
Ulmus										1	1	1	3	3	3	3	3	3
Ulmus rubra			2															
Stem count	129	145	267	147	165	165	102	120	120	95	111	111	120	154	154	96	132	132
size (ares)	12			12			12			12			12			12		
size (ACRES)	0.30			0.30			0.30			0.30			0.30			0.30		
Species count	21	22	25	21	22	22	15	17	17	18	19	19	17	19	19	16	18	18
Stems per ACRE	435	489	900.4	495.7	556.4	556.4	344	404.7	404.7	320.4	374.3	374.3	404.7	519.3	519.3	323.7	445.2	445.2

Meredell Farm (#247)
Year 6 (22-Oct-2013 to 12-Nov-2013)
Vegetation Plot Summary Information

Plot #	Riparian Buffer Stems[1]	Stream/ Wetland Stems[2]	Live Stakes	Invasives	Volunteers [3]	Total[4]	Unknown Growth Form
0001	6	12	11	0	11	**34**	0
0002	8	9	0	0	6	**15**	0
0003	6	14	0	0	3	**17**	0
0004	7	11	0	0	0	**11**	0
0005	8	9	0	0	12	**21**	0
0006	9	10	0	0	24	**34**	0
0007	11	12	0	0	2	**14**	0
0008	7	10	1	0	7	**18**	0
0009	1	1	1	0	0	**2**	0
0010	4	4	0	0	15	**19**	0
0011	13	15	2	0	3	**20**	0
0012	n/a	22	1	10	39	**52**	0

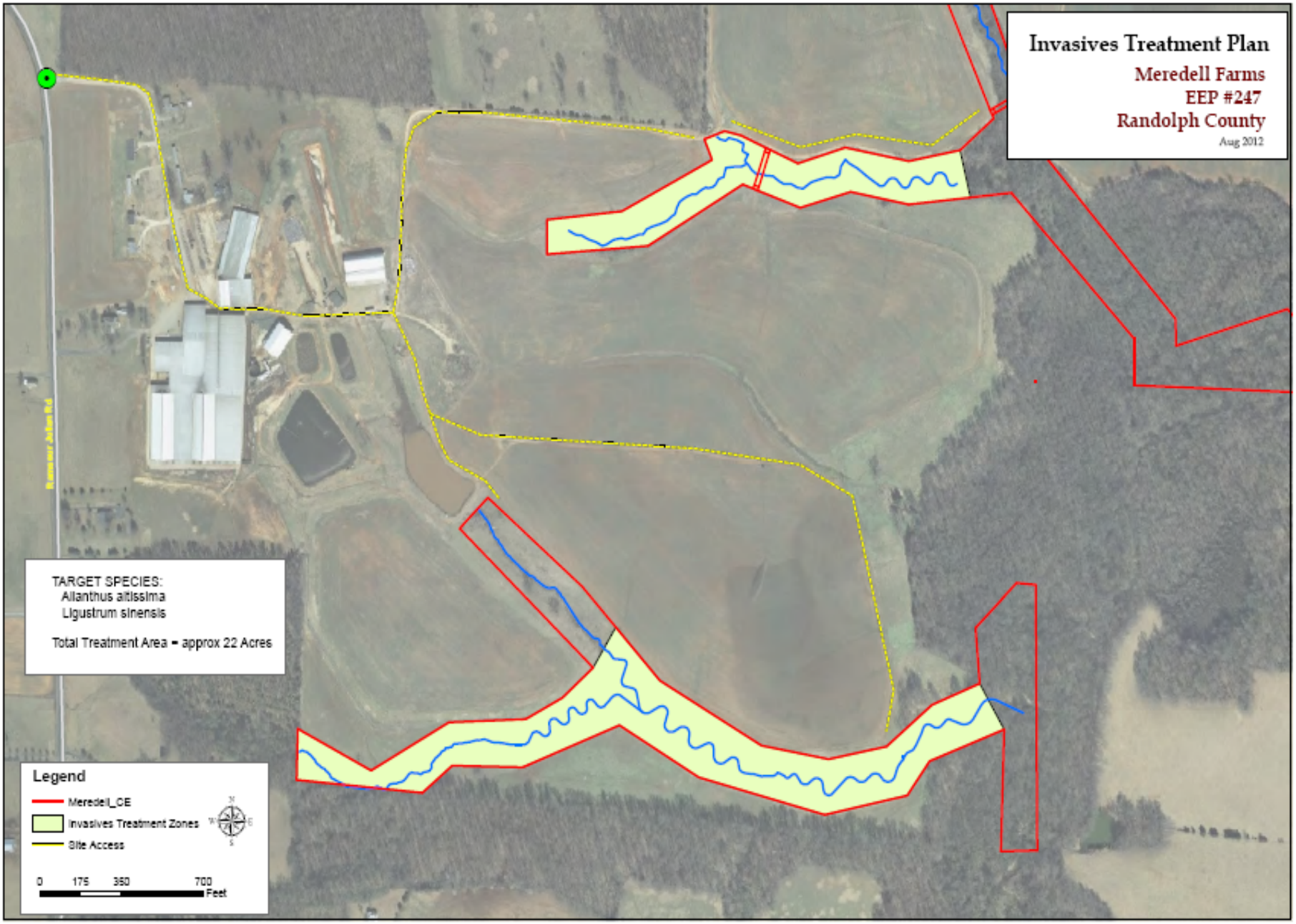
Wetland/Stream Vegetation Totals
(per acre)

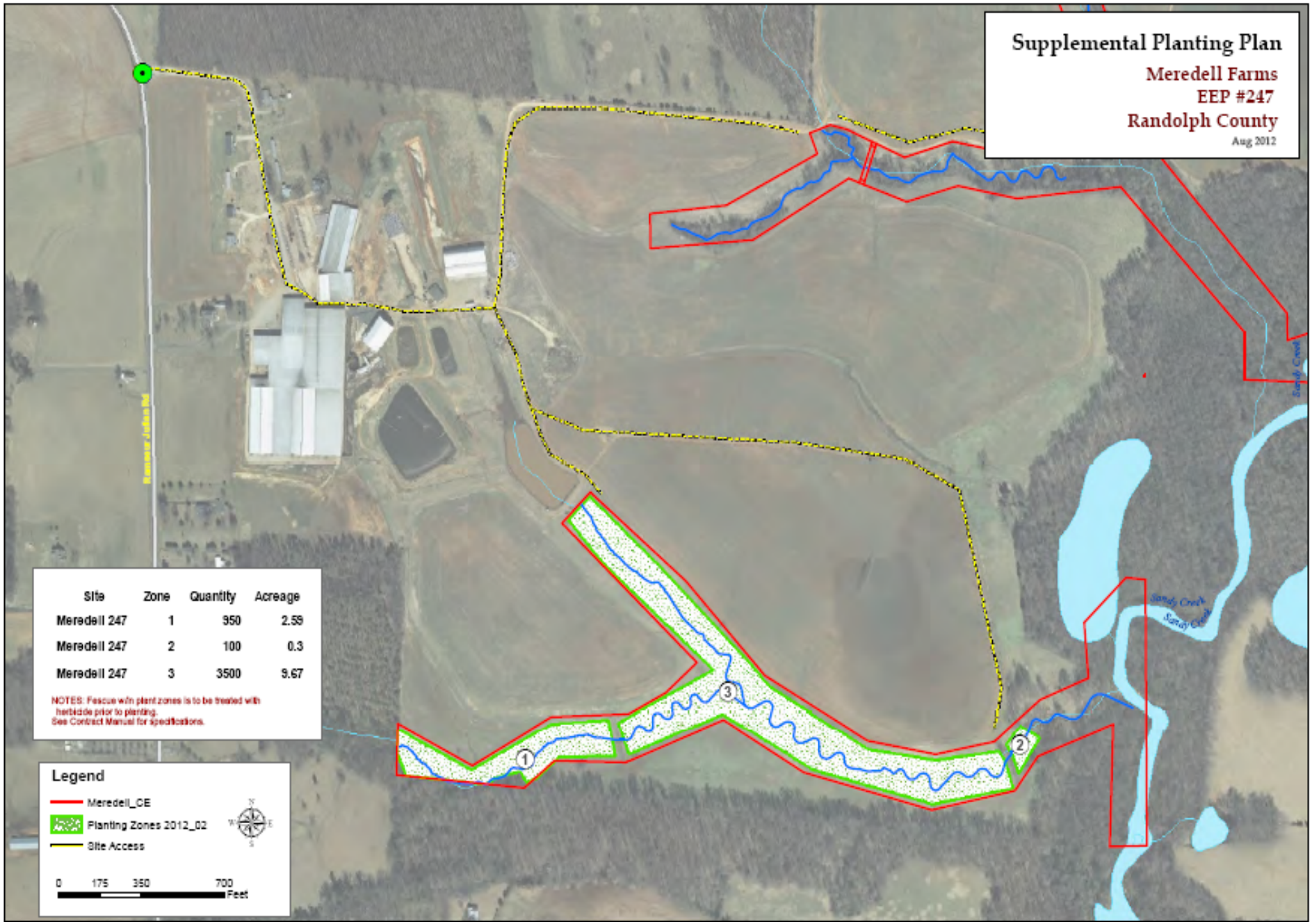
Plot #	Stream/ Wetland Stems[2]	Volunteers [3]	Total[4]	Success Criteria Met?
0001	486	445	1376	Yes
0002	364	243	607	Yes
0003	567	121	688	Yes
0004	445	0	445	Yes
0005	364	486	850	Yes
0006	405	971	1376	Yes
0007	486	81	567	Yes
0008	405	283	728	Yes
0009	40	0	81	No
0010	162	607	769	No
0011	607	121	809	Yes
0012	890	1578	2104	Yes
Project Avg	**435**	**411**	**867**	

Riparian Buffer Vegetation Totals
(per acre)

Plot #	Riparian Buffer Stems[1]	Success Criteria Met?
0001	243	No
0002	324	Yes
0003	243	No
0004	283	No
0005	324	Yes
0006	364	Yes
0007	445	Yes
0008	283	No
0009	40	No
0010	162	No
0011	526	Yes
0012	n/a	n/a
Project Avg	**294**	

Stem Class	Characteristics
[1]Buffer Stems	Native planted hardwood trees. Does NOT include shrubs. No pines. No vines.
[2]Stream/ Wetland Stems	Native planted woody stems. Includes shrubs, does NOT include live stakes. No vines
[3]Volunteers	Native woody stems. Not planted. No vines.
[4]Total	Planted + volunteer native woody stems. Includes live stakes. Excl. exotics. Excl. vines.


Invasives Treatment Plan
Meredell Farms
EEP #247
Randolph County
Aug 2012
TARGET SPECIES:
Ailanthus altissima
Ligustrum sinensis
Total Treatment Area = approx 22 Acres
Legend
Meredell_CE
Invasives Treatment Zones
Site Access
0 175 350 700
Feet

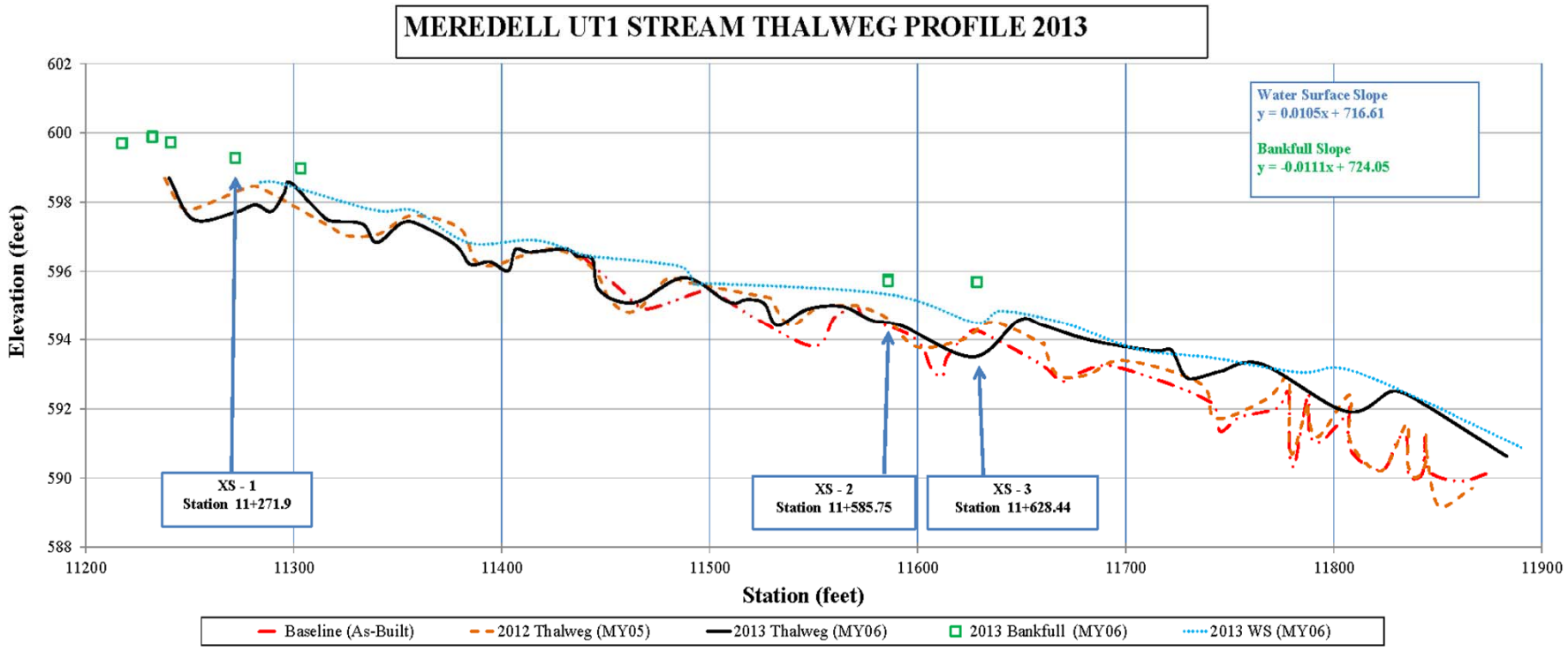

Supplemental Planting Plan
Meredell Farms
EEP #247
Randolph County
Aug 2012
Site Zone Quantity Acreage
Meredell 247 1 950 2.59
Meredell 247 2 100 0.3
Meredell 247 3 3500 9.67
NOTES: Fescue w/in plant zones is to be treated with herbicide prior to planting.
See Contract Manual for specifications.
Legend
Meredell_CE
Planting Zones 2012_02
Site Access
0 175 350 700
Feet
Sandy Creek
Sandy Creek
1
2
3

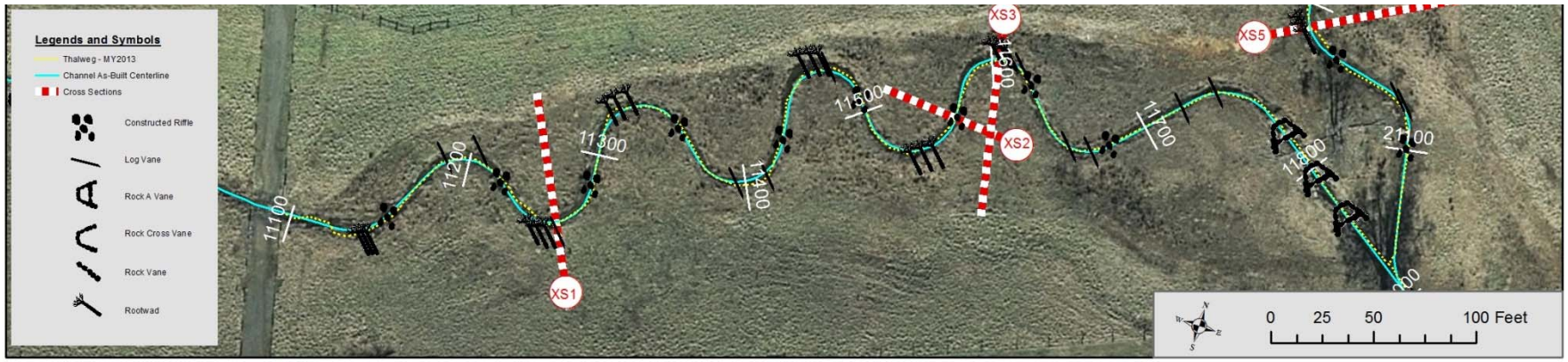
HARP
HABITAT AND RESTORATION PLANTS

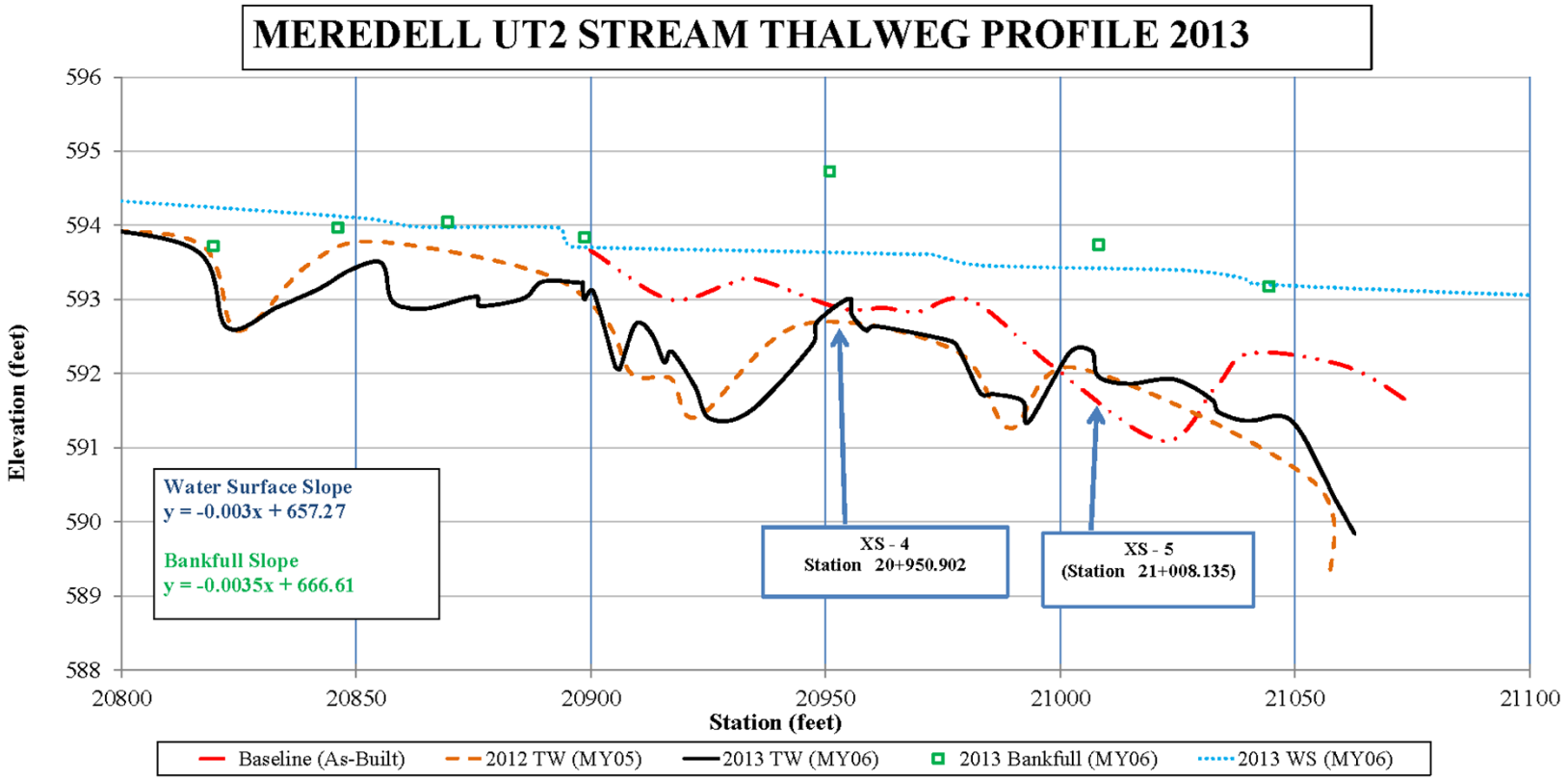
Scientific name	Common name	Size	EEP Merredell max 900
Acer barbatum	Southern Sugar Maple	1 gallon	70
Betula nigra	River Birch	1 gallon	449
Celtis laevigata	Sugar berry	1 gallon	385
Diospyros virginiana	Persimmon	1 gallon	422
Fraxinus pennsylvanica	Green ash	1 gallon	400
Liriodendron tulipifera	Tulip poplar	1 gallon	261
Nyssa biflora	Swamp Blackgum	1 gallon	370
Nyssa sylvatica	Black Gum	1 gallon	248
Platanus occidentalis	Sycamore	1 gallon	81
Populus deltoities	Cottonwood	1 gallon	4
Quercus michauxii	Swamp Chestnut Oak	1 gallon	200
Quercus nigra	Water Oak	1 gallon	175
Quercus pagoda	Cherrybark Oak	1 gallon	217
Quercus palustris	Pin Oak	1 gallon	343
Quercus phellos	Willow Oak	1 gallon	490
Quercus rubra	Northern Red Oak	1 gallon	262
Quercus shumardii	Shumard Oak	1 gallon	123
			4500
			4500

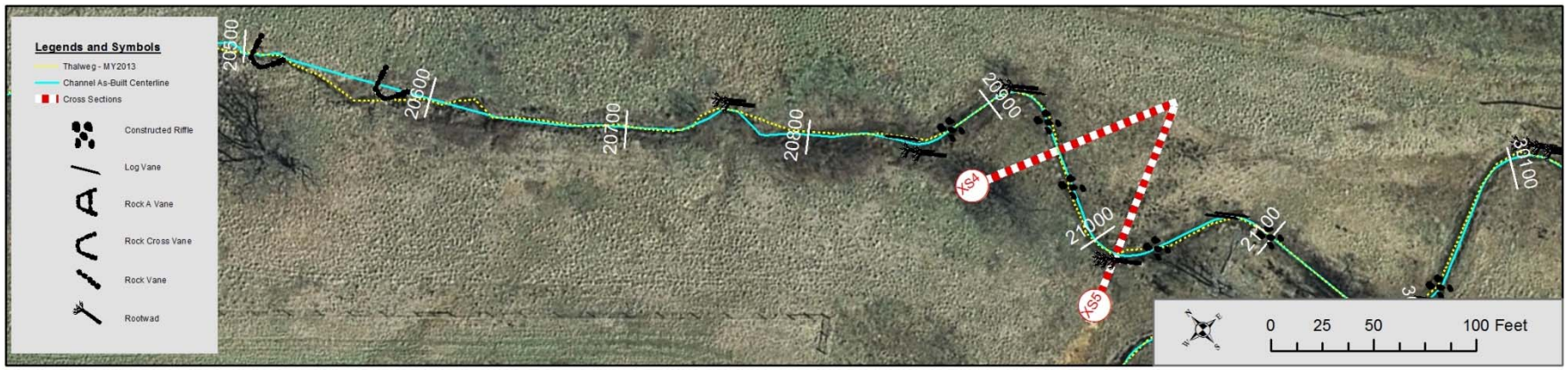
Appendix D
Stream Survey Data

NOTE: No areas of significant stream instability were observed during the field survey. Survey monuments were not present in the field. Due to this and differences in surveying methodologies between monitoring year 5 and monitoring year 6, the longitudinal profile data may differ in some areas.

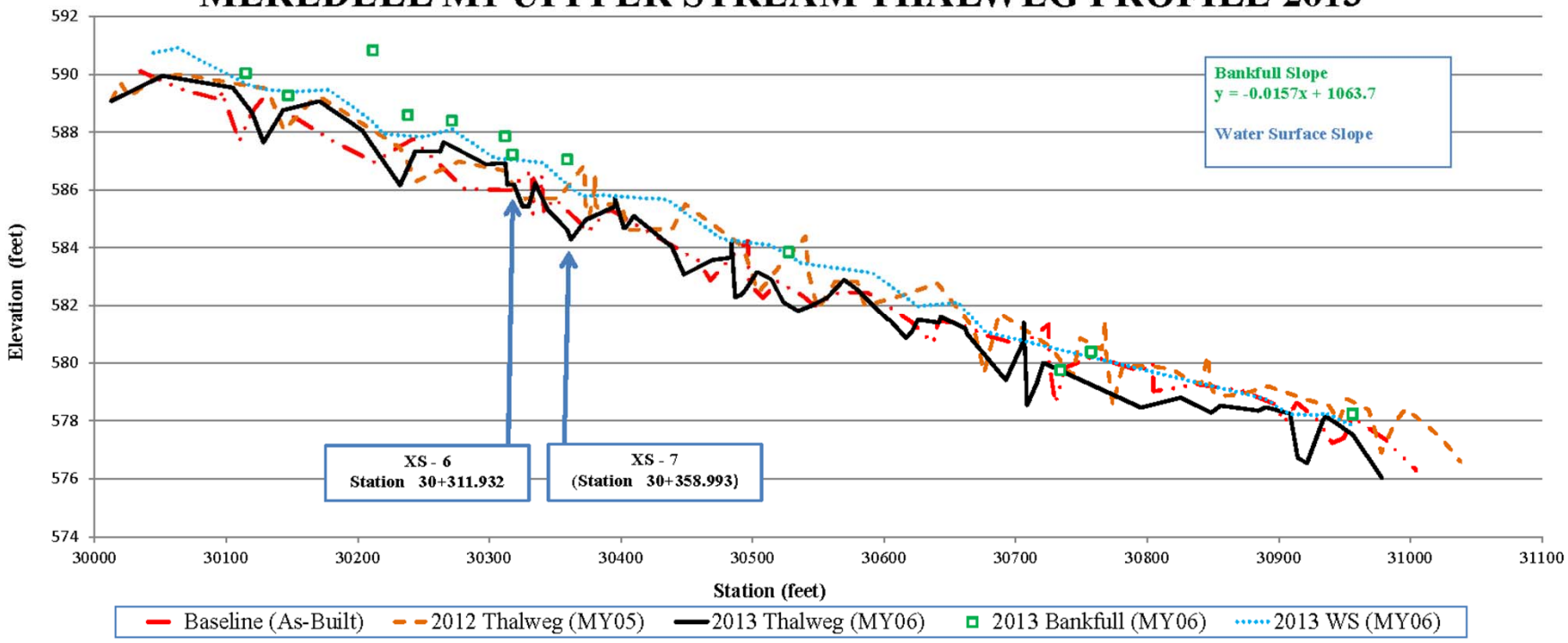

MEREDELL UT1 STREAM THALWEG PROFILE 2013
Water Surface Slope
y = 0.0105x + 716.61
Bankfull Slope
y = -0.0111x + 724.05
XS - 1
Station 11+271.9
XS - 2
Station 11+585.75
XS - 3
Station 11+628.44
Elevation (feet)
Station (feet)
602
600
598
596
594
592
590
588
11200
11300
11400
11500
11600
11700
11800
11900
Baseline (As-Built)
2012 Thalwag (MY05)
2013 Thalweg (MY06)
2013 Bankfull (MY06)
2013 WS (MY06)

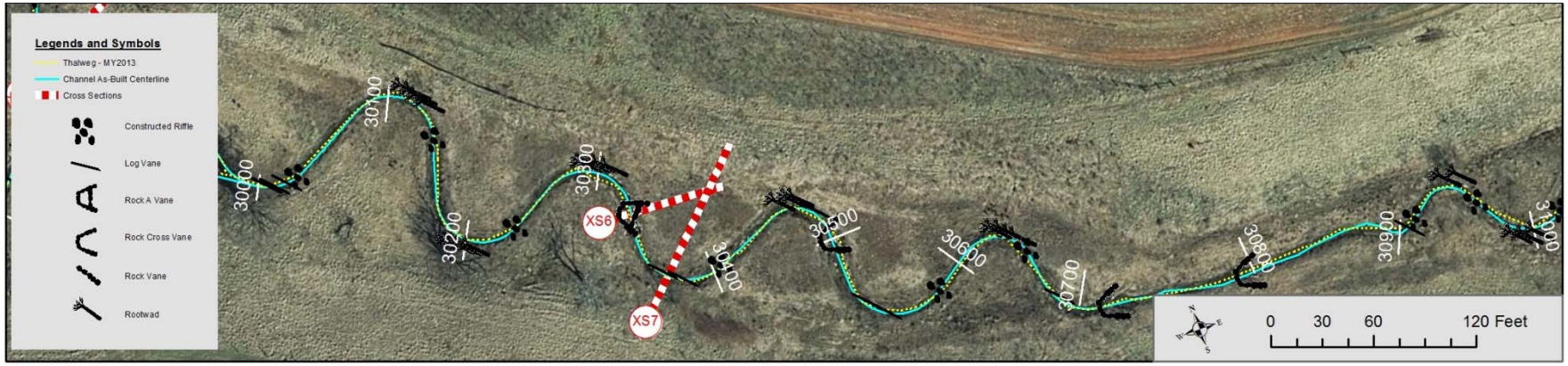

Legends and Symbols
Thalweg - MY2013
Channel As-Built Centerline
Cross Sections
Constructed Riffle
Log Vane
Rock A Vane
Rock Cross Vane
Rock Vane
Rootwad
XS1
XS2
XS3
XS5
11100
11200
11300
11400
11500
11600
11700
11800
21100
0
25
50
100 Feet


MEREDELL UT2 STREAM THALWEG PROFILE 2013
Elevation (feet)
596
595
594
593
592
591
590
589
588
20800
20850
20900
20950
21000
21050
21100
Station (feet)
Water Surface Slope
y = -0.003x + 657.27
Bankfull Slope
y = -0.0035x + 666.61
XS - 4
Station 20+950.902
XS - 5
(Station 21+008.135)
Baseline (As-Built)
2012 TW (MY05)
2013 TW (MY06)
2013 Bankfull (MY06)
2013 WS (MY06)


Legends and Symbols
Thalweg - MY2013
Channel As-Built Centerline
Cross Sections
Constructed Riffle
Log Vane
Rock A Vane
Rock Cross Vane
Rock Vane
Rootwad
XS4
XS5
0
25
50
100 Feet

MEREDELL M1 UPPPER STREAM THALWEG PROFILE 2013





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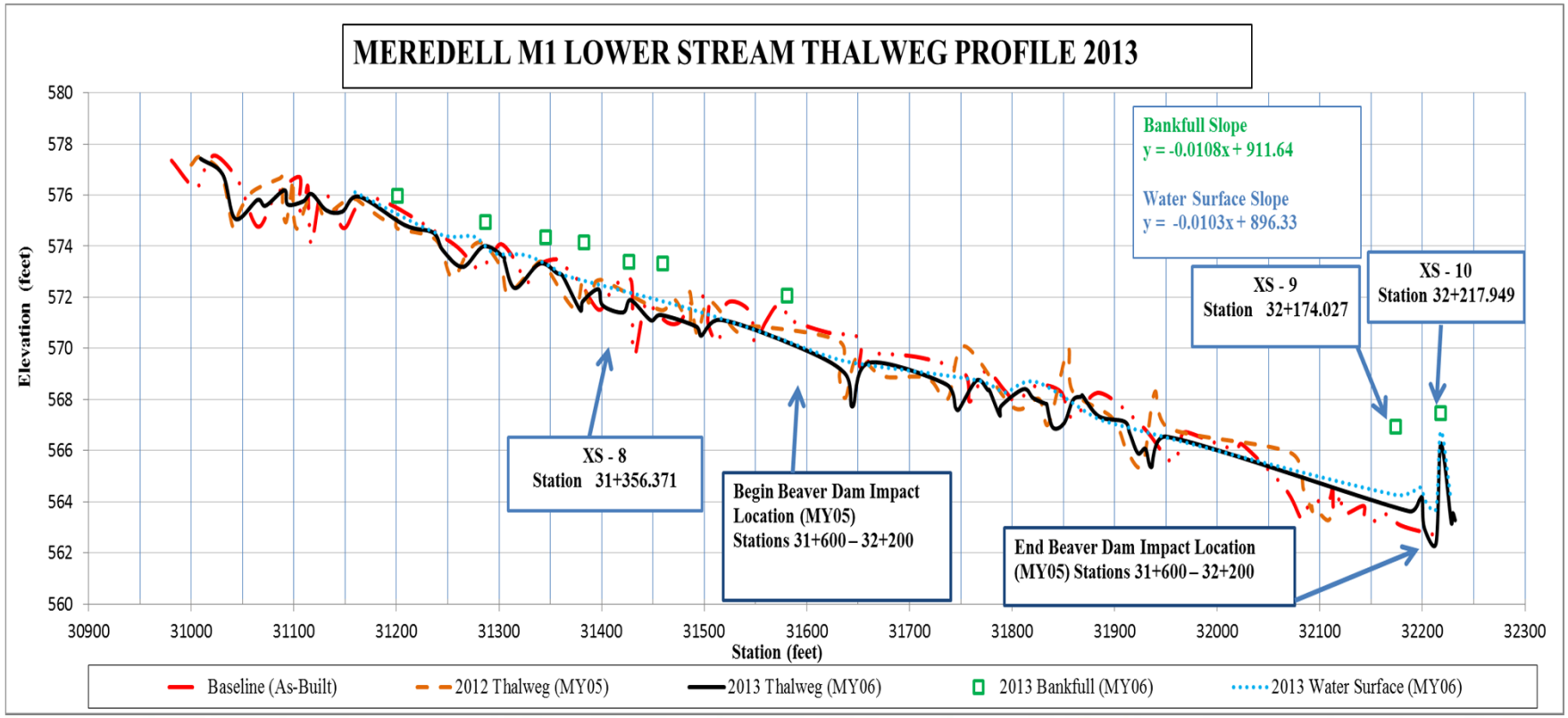
MEREDELL M1 LOWER STREAM THALWEG PROFILE 2013
Elevation (feet)
580
578
576
574
572
570
568
566
564
562
560
30900
31000
31100
31200
31300
31400
31500
31600
31700
31800
31900
32000
32100
32200
32300
Station (feet)
Bankfull Slope
y = -0.0108x + 911.64
Water Surface Slope
y = -0.0103x + 896.33
XS - 9
Station 32+174.027
XS - 10
Station 32+217.949
XS - 8
Station 31+356.371
Begin Beaver Dam Impact Location (MY05)
Stations 31+600 – 32+200
End Beaver Dam Impact Location (MY05) Stations 31+600 – 32+200
Baseline (As-Built)
2012 Thalweg (MY05)
2013 Thalweg (MY06)
2013 Bankfull (MY06)
2013 Water Surface (MY06)


Legends and Symbols
Thalweg - MY2013
Channel As-Built Centerline
Cross Sections
Constructed Riffle
Log Vane
Rock A Vane
Rock Cross Vane
Rock Vane
Rootwad
XS8
XS9
XS10
0
50
100
200 Feet

Table 10a.1 Baseline Stream Data Summary
Meredell Farm Stream Restoration Site/247 - Reach: UT1b (780 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					4.1	8.0	6.4	14.7	4.0	6								7.3							
Floodprone Width (ft)					6.0	25.5	17.0	59.0	20.0	6															
Bankfull Mean Depth (ft)					0.5	0.6	0.6	0.7	0.1	6								0.6							
[1]Bankfull Max Depth (ft)					0.8	0.9	0.9	1.1	0.1	6							0.7	0.8	0.9						
Bankfull Cross Sectional Area (ft^2)					2.6	4.6	3.8	8.3	2.2	6								4.5							
Width/Depth Ratio					5.7	14.0	11.8	26.2	7.4	6								12							
Entrenchment Ratio					1.3	3.3	2.5	6.9	2.3	6															
[1]Bank Height Ratio					1.1	3.0	3.4	4.6	1.5	6								**1**							
Profile																									
Riffle Length (ft)																									
Riffle Slope (ft/ft)					0.093			0.022									0.013	0.018	0.022						
Pool Length (ft)																									
Pool Max depth (ft)						2.4											1.2	1.5	1.8						
Pool Spacing (ft)					18			171									14.7	25.7	36.7						
Pattern																									
Channel Beltwidth (ft)					10			140									26	42.5	59						
Radius of Curvature (ft)					13			45									15	18.5	22						
Rc:Bankfull width (ft/ft)					**1.6**			**5.6**									**2**	2.5	**3**						
Meander Wavelength (ft)					80			400									51	66	81						
Meander Width Ratio					10			50.2									7	9	11						
Transport parameters																									
Reach Shear Stress (competency) lb/f^2								0.81										0.26							
Max part size (mm) mobilized at bankfull								50										50							
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification								G4, F4b, E4b C4b										C4							
Bankfull Velocity (fps)																									
Bankfull Discharge (cfs)																									
Valley length (ft)																									
Channel Thalweg length (ft)																									
Sinuosity (ft)								1.2										1.4							
Water Surface Slope (Channel) (ft/ft)								0.0258										0.011							
BF slope (ft/ft)																		**0.0159**							
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing survey data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10a.2 Baseline Stream Data Summary
Meredell Farm Stream Restoration Site/247 - Reach: UT2b (294 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					4.9	6.6	6.8	8.1	1.3	4								7.3							
Floodprone Width (ft)					10.0	12.3	11.0	17.0	3.2	4															
Bankfull Mean Depth (ft)					0.4	0.6	0.5	0.8	0.2	4								0.6							
[1]Bankfull Max Depth (ft)					0.8	1.0	1.0	1.2	0.2	4							0.7	0.8	0.9						
Bankfull Cross Sectional Area (ft^2)					2.4	3.7	3.1	6.2	1.8	4								4.5							
Width/Depth Ratio					9.8	12.8	11.6	18.4	3.9	4								12							
Entrenchment Ratio					1.6	1.9	1.9	2.3	0.3	4															
[1]Bank Height Ratio					2.2	2.6	2.3	3.7	0.7	4								**1**							
Profile																									
Riffle Length (ft)																									
Riffle Slope (ft/ft)					0.009			0.225									0.016	0.021	0.027						
Pool Length (ft)																									
Pool Max depth (ft)						1											1.2	1.5	1.8						
Pool Spacing (ft)					30			67									14.7	25.7	36.7						
Pattern																									
Channel Beltwidth (ft)						15											26	42.5	59						
Radius of Curvature (ft)					3			13									15	18.5	22						
Rc:Bankfull width (ft/ft)					**0.4**			**1.9**									**2**	2.5	**3**						
Meander Wavelength (ft)					60			95									51	66	81						
Meander Width Ratio					8.8			13.9									7	9	11						
Transport parameters																									
Reach Shear Stress (competency) lb/f^2								0.565										0.439							
Max part size (mm) mobilized at bankfull								sand										sand							
Stream Power (transport capacity) W/m^2								31.1										20.9							
Additional Reach Parameters																									
Rosgen Classification								B5, E5										C4							
Bankfull Velocity (fps)								2.9										3.1							
Bankfull Discharge (cfs)								13																	
Valley length (ft)																									
Channel Thalweg length (ft)																									
Sinuosity (ft)								1.12										1.2							
Water Surface Slope (Channel) (ft/ft)								0.0321										0.0134							
BF slope (ft/ft)																		**0.0166**							
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing survey data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10a.3 Baseline Stream Data Summary
Meredell Farm Stream Restoration Site/247 - Reach: M1 (3200 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					4.6	6.4	6.7	7.6	1.3	4								10.2							
Floodprone Width (ft)					6.0	10.0	10.5	13.0	2.9	4															
Bankfull Mean Depth (ft)					0.8	1.0	1.0	1.1	0.1	4								0.8							
[1]Bankfull Max Depth (ft)					1.2	1.3	1.4	1.4	0.1	4							1	1.15	1.3						
Bankfull Cross Sectional Area (ft^2)					3.7	7.0	7.4	9.4	2.5	4								8.6							
Width/Depth Ratio					5.8	6.8	6.7	7.9	0.9	4								12							
Entrenchment Ratio					1.2	1.5	1.5	1.9	0.3	4															
[1]Bank Height Ratio					2.8	3.0	2.9	3.4	0.3	4								**1**							
Profile																									
Riffle Length (ft)																									
Riffle Slope (ft/ft)																	0.016	0.021	0.026						
Pool Length (ft)																									
Pool Max depth (ft)																	1.7	2.1	2.5						
Pool Spacing (ft)																	20.3	35.55	50.8						
Pattern																									
Channel Beltwidth (ft)					20			30									36	58.5	81						
Radius of Curvature (ft)					16			25									20	25	30						
Rc:Bankfull width (ft/ft)					**2.5**			**3.9**									**2**	2.5	**3**						
Meander Wavelength (ft)					70			170									71	91.5	112						
Meander Width Ratio					11			26.6									7	9	11						
Transport parameters																									
Reach Shear Stress (competency) lb/ft^2								0.61										0.54							
Max part size (mm) mobilized at bankfull								52										52							
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification								G4c																	
Bankfull Velocity (fps)																									
Bankfull Discharge (cfs)																									
Valley length (ft)																									
Channel Thalweg length (ft)																									
Sinuosity (ft)								1.08																	
Water Surface Slope (Channel) (ft/ft)								0.013																	
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing survey data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10b.1 Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Meredell Farm Stream Restoration Site/247 - Reach: UT1b (780 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																												
[1]SC% / Sa% / G% / C% / B% / Be%																												
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)		0.8	11.2	38.4	63.2		50																					
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																												
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																												

Shaded cells indicate that these will typically not be filled in.

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design survey), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtions distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section surveys and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 10b.2 Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Meredell Farm Stream Restoration Site/247 - Reach: UT2b (294 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																													
[1]SC% / Sa% / G% / C% / B% / Be%																													
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)		0.035	0.05	0.13	0.22		0.5																					
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																													
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																													

Shaded cells indicate that these will typically not be filled in.

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design survey), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtution distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section surveys and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 10b.3 Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Meredell Farm Stream Restoration Site/247 - Reach: M1 (3200 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																												
[1]SC% / Sa% / G% / C% / B% / Be%																												
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)		0.3	16.5	60.4	128		52																					
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																												
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																												

Shaded cells indicate that these will typically not be filled in.

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design survey), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtions distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section surveys and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Appendix E
Hydrologic Data

Table 11. Verification of Bankfull Events Meredell Farm Stream Restoration Site/247			
Date of Data Collection	Date of Occurrence	Method	Photo # (if available)
8/24/2010	N/A	*Crest Gage Reading: 1.96'	
10/20/2011	N/A	Crest Gage indicates BKF event	
3/26/2012	N/A	Wracklines indicate BKF event on UT1b	SP2 (MY5 report)
10/18/2012	N/A	*Crest Gage Reading: 1.17'	SP1 (MY5 report)
10/30/2013	N/A	*Crest Gage Reading: 3.6'	SP1
10/30/2013	N/A	Wracklines indicate BKF event on M1	SP2

*Design bankfull depth range for reach M1 is 1.0' to 1.3'. Crest gage readings occuring at, above, or within this range are recorded as bankfull indicators

SP1: Crest gage reading = 3.6’
Taken: 10-30-2013

SP2: Bankfull indicator on M1 (STA 307+00)
Taken: 10-30-2013