Meredell Farm
Monitoring Report
Year 3 of 5 (2010)

Randolph County, North Carolina

USGS HUC: 03030003
Project ID No. 247

Prepared for:

NCDENR-Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, North Carolina 27699-1652

Submitted November 2010
Revised March 2011

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 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. Kimley-Horn and Associates, Inc. (KHA) began the stream and riparian monitoring for Meredell Farms in 2008 and most recently completed Year 3 stream and riparian monitoring during August and October 2010, respectively.

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.

KHA performed stream and riparian monitoring in the fall of 2010 for this Year 3 Monitoring Report. During the monitoring process KHA assessed twelve (12) vegetation quads. Six (6) of the eighteen (18) plots met or exceeded the success criteria of 320 stems/acre (minimum stem count after 5 years). Areas of isolated non-native/invasive species were located along UT1, M1, UT3, and UT4.

A visual assessment and geomorphic survey were completed for the site, and indicated that the majority of the project reaches were performing within established success criteria ranges, as shown below. Morphology monitoring includes ten (10) cross sections and four (4) longitudinal profile segments. Channel stability assessment includes the entire restored length and three (3) permanent photo point locations. Wracklines were present in the floodplain and the crest gauge indicated that a bankfull even occurred during this monitoring period.

Stream Success Criteria (from approved Restoration Plan 2004):

- Cross-Sections
    - There should be little or no change in as-built cross-sections from year to year. If changes do take place, they should be evaluated to determine if they represent a movement toward a more unstable condition (e.g. down-cutting, erosion) or are minor changes that represent an increase in stability (e.g. settling, vegetative changes, deposition along the banks, decrease in width/depth ratio and/or cross-sectional area).

- 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 riffle should remain steep and shallow.

Summary information/data related to performance of various project and monitoring elements can be found in the table and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Reports (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 is available from EEP upon request.

Methodology

- Surveys/topographic data collections was performed using total station, survey grade GPS, or equivalent such that each survey point has three-dimensional coordinates, and is georeferenced (NAD83-State Plane Feet – FIPS3200).
- Longitudinal stationing was developed using the as-built survey thalweg as a baseline.
- The particle size distribution protocol used was the Modified-Wolman pebble count.
- CVS level 2 was used as the vegetation plot methodology.

References

Rosgen, David L. 1996. Applied River Morphology, Second Edition., Wildland Hydrology, Pagosa Springs, Colorado.

Lee, Michael T., Peet, Robert K., Roberts, Steven D., Wentworth, Thomas R. 2006. CVS-EEP Protocol for Recording Vegetation, All Levels of Sampling, Version 4.0.,

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. United States Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. LeGrand, H.E. and S.P. Hall.

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APPENDIX A
PROJECT VICINITY MAP AND BACKGROUND TABLES

Title	Project Setting		
Prepared For: Ecosystem Enhancement Program	**Project**	Meredell Farm Stream Restoration Monitoring Year 3 – 2010 Randolph County, North Carolina	
	Date	**Project Number**	**Figure**
	3/1/11	247	1

Kimley-Horn and Associates, Inc.

Table 1a. Project Components Meredell Farm Stream Restoration Site/247									
Project Component or Reach ID	**Existing Feet/Acres**	**Restoration Level**	**Approach**	**Footage or Acreage**	**Stationing**	**Mitigation Ratio**	**Mitigation Units**	**BMP Elements[1]**	**Comment**
UT1a	1,050	EII		1,100	10+00 - 21+00	2.5:1	440		
UT1b	571	R		780	21+00 - 28+80	1:1	780		
UT2a	800	EI		800	10+00 - 18+00	1.5:1	533		
UT2b	206	R		294	18+00 - 20+94	1:1	294		
M1	2,103	R	I/II	2,254	10+00 - 32+54	1:1	2,254		
UT3a	400	EII		650	10+00 - 16+50	2.5:1	260		
UT3b	836	R		429	16+50 - 20+79	1:1	429		
UT4	913	EII		913	10+00 - 19+13	2.5:1	365		
UT5	1,075	EII		1,075	10+00 - 20+75	2.5:1	430		
M2	1,398	P		1,398	NA	5:1	280		
Sandy Creek 1	1,033	P		1,033	NA	5:1	207		
Sandy Creek 2	801	P		801	NA	5:1	160		
Sandy Creek 3	1,902	P		1,902	NA	5:1	380		

1 = BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond;
FS = Filter Strip; Grassed Swale = S; LS = Level Spreader; NI = Natural Infiltration Area, O = Other
CF = Cattle Fencing; WS = Watering System; CH = Livestock Housing

Table 1b. Component Summations Meredell Farm Stream Restoration Site/247							
Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-Ripar (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	3,757						
Enhancement							
Enhancement I	800						
Enhancement II	3,738						
Creation							
Preservation	5,134						
HQ Preservation							
Totals (Feet/Acres)	**13,429**					**19.8**	
MU Totals	**6,812**					**19.8**	

Non-Applicable

Table 2. Project Activity and Reporting History
Meredell Farm Stream Restoration Site/247

Elapsed Time Since Grading Complete: 3 yrs 11 months
Elapsed Time Since Planting Complete: 3 yrs 10 Months
Number of Reporting Years[1]: 3

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Restoration Plan		Sept-04
Final Design – Construction Plans		Mar-06
Construction	NA	Mar-08
Containerized, bare root and B&B plantings	NA	Apr-08
As-built Mapping	Nov-07	Apr-08
Mitigation Plan (Year 0 Monitoring - basline)*		
Year 1 Monitoring	Nov-03	Jun-09
Year 2 Monitoring	Sep-04	Nov-09
Year 3 Monitoring	Dec-05	Nov-10
Year 4 Monitoring		
Year 5 Monitoring		

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

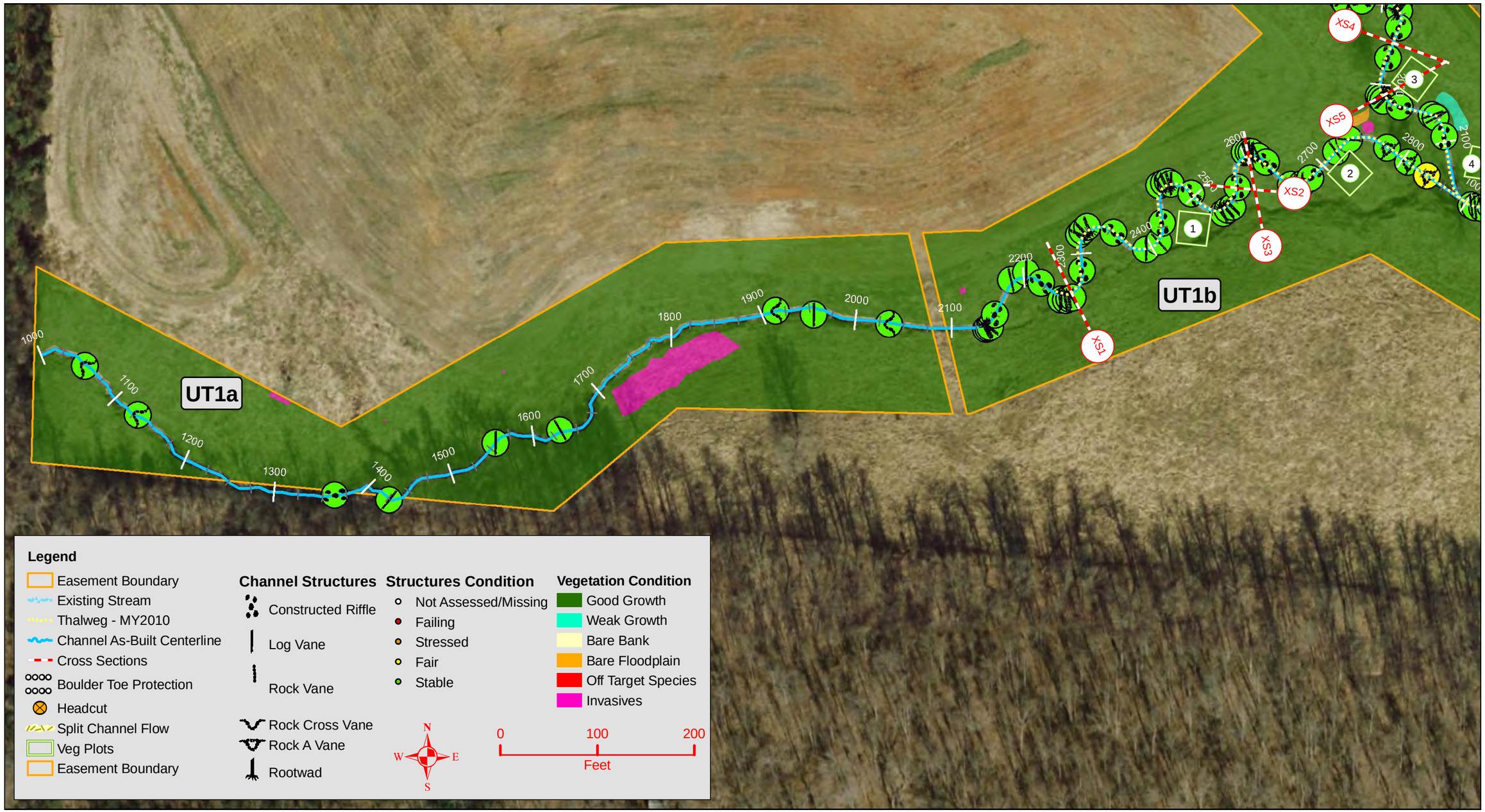
Bolded items are examples of those items that are not standard, but may come up and should be included
Non-bolded items represent events that are standard components over the course of a typical project.
The above are obviously not the extent of potential relevant project activities, but are just provided 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 Primary project design POC	Buck Engineering, PC 8000 Regency Parkway, Suite 200, Cary, NC 27511 Kevin Tweedy, P.E. (919) 463-5488
Construction Contractor Construction contractor POC	RiverWorks, Inc. 8000 Regency Parkway, Suite 200, Cary, NC 27511 (919) 459-9001
Survey Contractor Survey contractor POC	
Planting Contractor Planting contractor POC	
Seeding Contractor Contractor point of contact	
Seed Mix Sources	
Nursery Stock Suppliers	
Monitoring Performers Stream Monitoring POC Vegetation Monitoring POC Wetland Monitoring POC	Kimley-Horn and Associates, Inc. 3001 Westen Parkway, Cary, NC 27513 Daren Pait, P.E., CFM Daren Pait, P.E., CFM Daren Pait, P.E., CFM

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 and UT1b
Prepared For: Ecosystem Enhancement Program	**Project** Meredell Farm Stream Restoration Monitoring Year 3 – 2010 Randolph County, North Carolina

Date	Project Number	Figure
3/17/11	247	2

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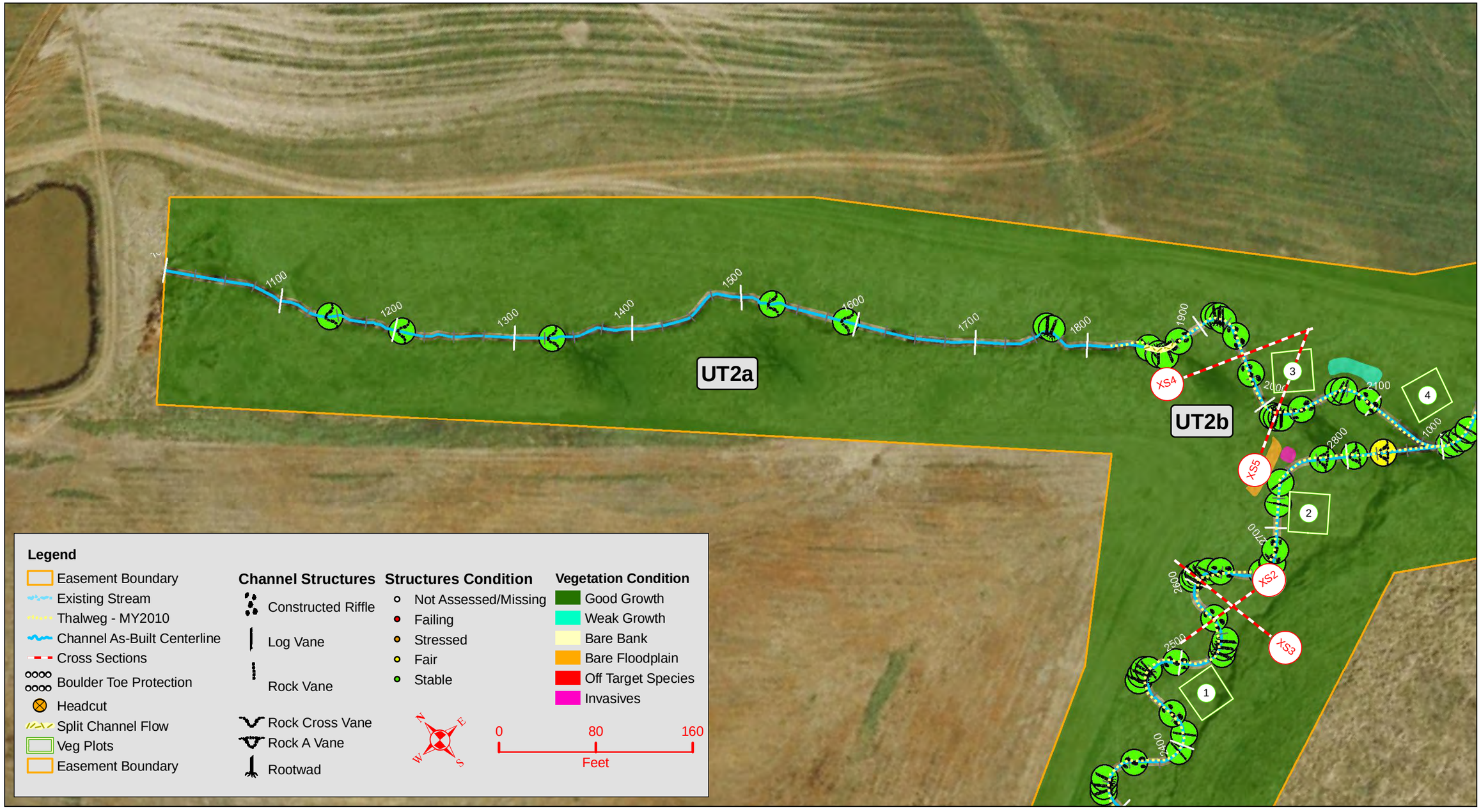
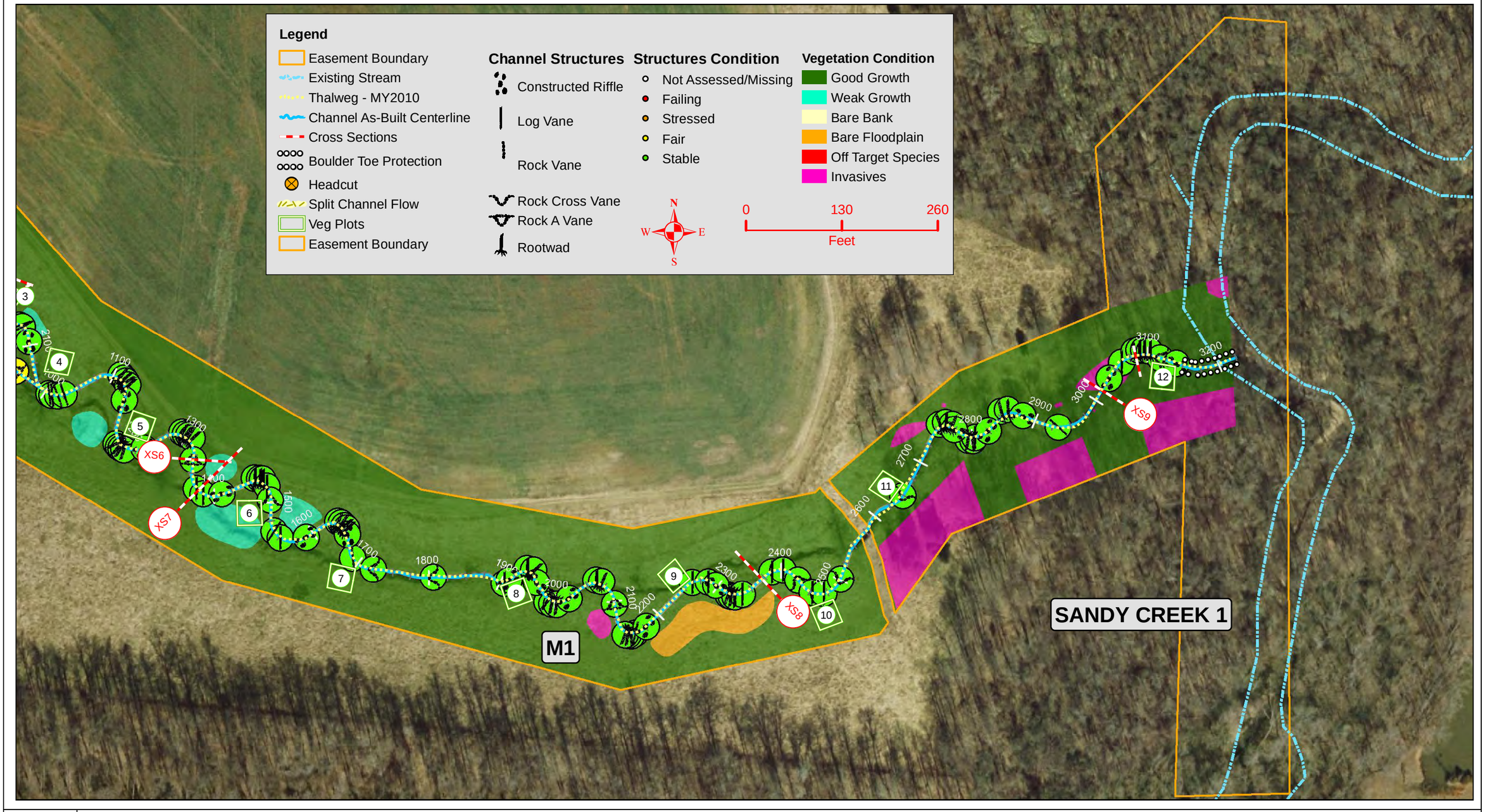


Title	Current Conditions Plan View UT2a and UT2b
Prepared For: Ecosystem Enhancement Program	**Project** Meredell Farm Stream Restoration Monitoring Year 3 – 2010 Randolph County, North Carolina

Date	Project Number	Figure
3/17/11	247	3

Kimley-Horn and Associates, Inc.



Title	Current Conditions Plan View M1 and SC1

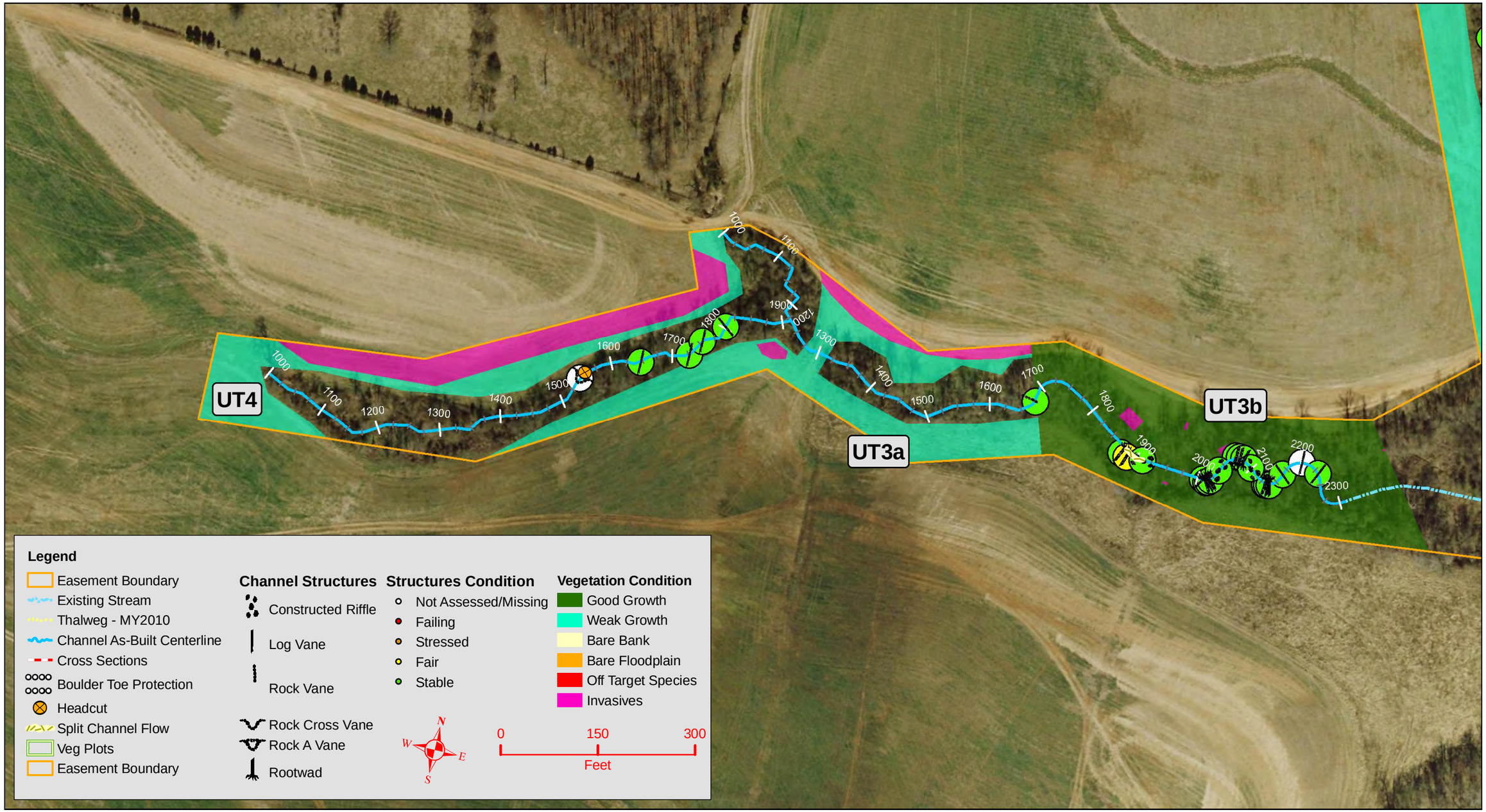
Prepared For:

Ecosystem Enhancement Program

Project	Meredell Farm Stream Restoration Monitoring Year 3 – 2010 Randolph County, North Carolina

Date	**Project Number**	**Figure**
3/17/11	247	4
Date	**Project Number**	**Figure**

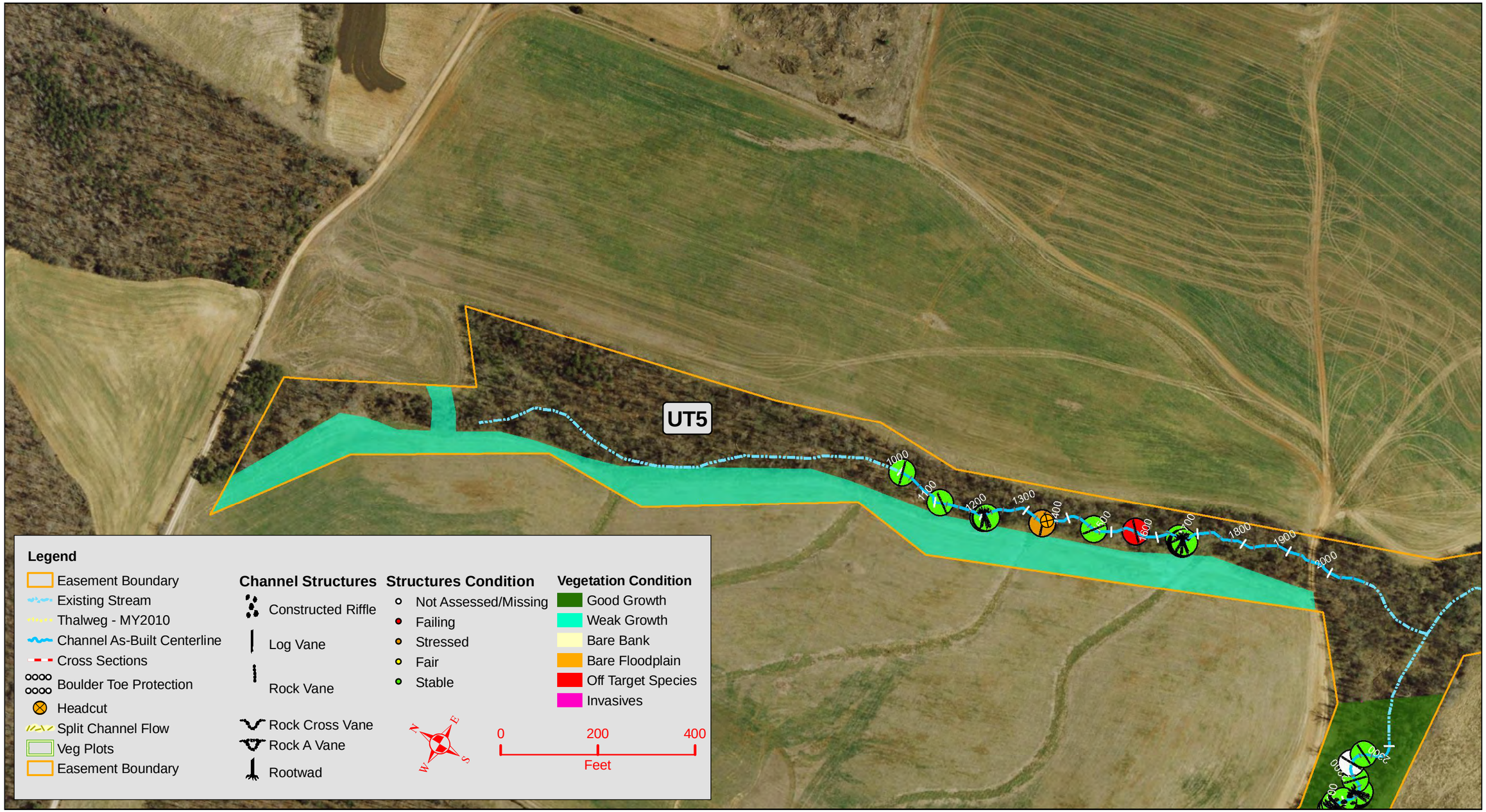
Kimley-Horn and Associates, Inc.



Title	Current Conditions Plan View UT3a, UT3b, and UT4
Prepared For: Ecosystem Enhancement Program	**Project** Meredell Farm Stream Restoration Monitoring Year 3 – 2010 Randolph County, North Carolina

Date	Project Number	Figure
3/17/11	247	5

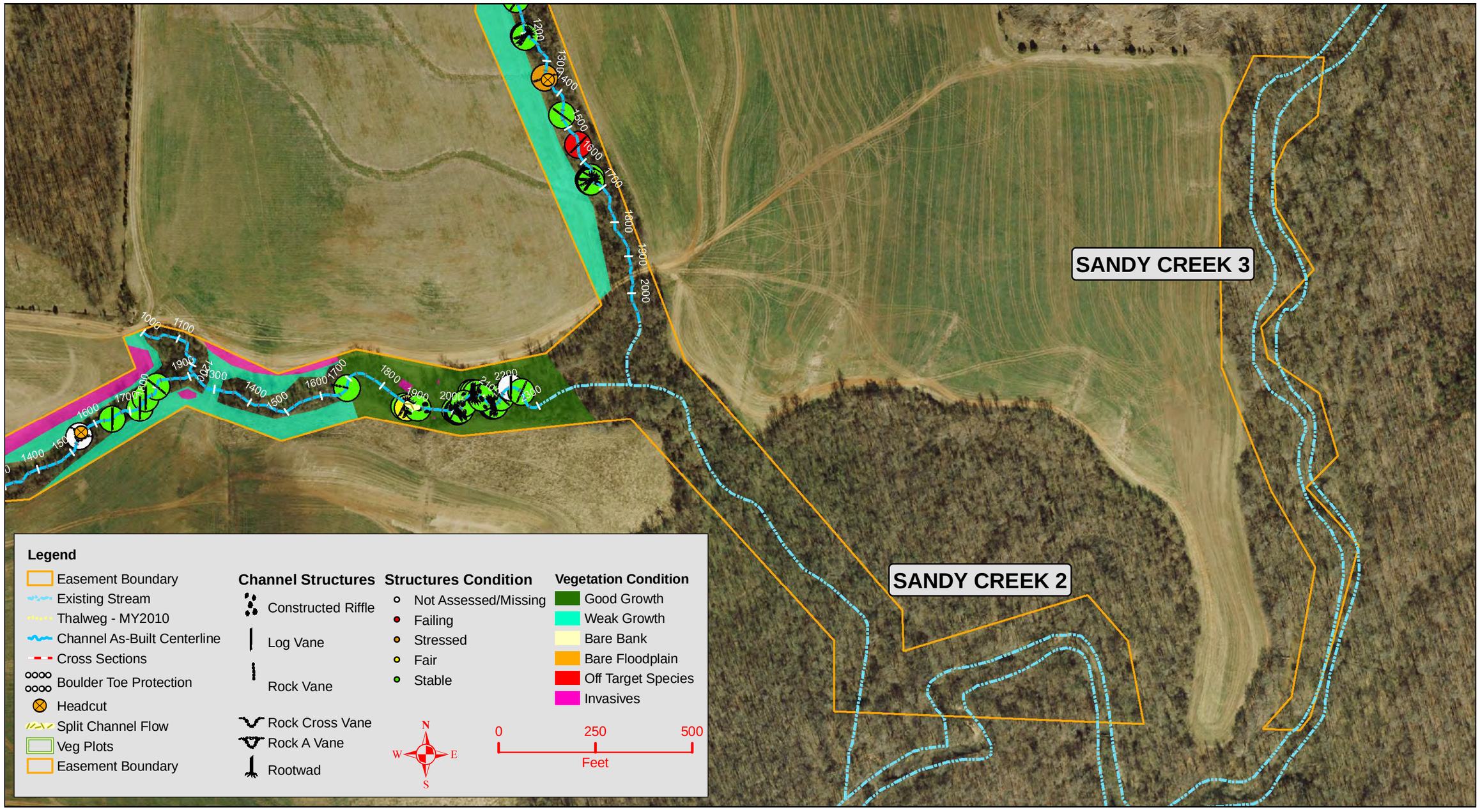
Kimley-Horn and Associates, Inc.



Title	Current Conditions Plan View UT5
Prepared For: Ecosystem Enhancement Program	**Project** Meredell Farm Stream Restoration Monitoring Year 3 – 2010 Randolph County, North Carolina

Date	Project Number	Figure
3/17/11	247	6

Kimley-Horn and Associates, Inc.



Title	Current Conditions Plan View SC2 and SC3

Prepared For:

Ecosystem Enhancement Program

Project	Meredell Farm Stream Restoration Monitoring Year 3 – 2010 Randolph County, North Carolina	
Date	**Project Number**	**Figure**
3/17/11	247	7

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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.	24	25			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)	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)			1	23	93%			
		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%			

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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.	48	48			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)	48	48			100%			
	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] **26**

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	2	0.20	0.8%
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	2	0.10	0.4%
			Total	4	0.30	1.2%
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	8	5.60	21.5%
			Cumulative Total	12	5.90	22.7%

Easement Acreage[2] **49.8**

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	31	1.75	3.5%
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.

SP1: Crest Gage
Taken: 8-4-2010

SP2: Vegetation growing in Channel
Taken: 8-4-2010

SP3: Compromised log sill structure on UT5
Taken: 8-4-2010

VQ1: Vegetation Quad 1
Taken: 10-11-2010

VQ2: Vegetation Quad 2
Taken: 10-11-2010

VQ3: Vegetation Quad 3
Taken: 10-11-2010

VQ4: Vegetation Quad 4
Taken: 10-11-2010

VQ5: Vegetation Quad 5
Taken: 10-11-2010

VQ6: Vegetation Quad 6
Taken: 10-11-2010

VQ7: Vegetation Quad 7
Taken: 10-11-2010

VQ8: Vegetation Quad 8
Taken: 10-11-2010

VQ9: Vegetation Quad 9
Taken: 10-11-2010

VQ10: Vegetation Quad 10
Taken: 10-11-2010

VQ11: Vegetation Quad 11
Taken: 10-11-2010

VQ12: Vegetation Quad 12
Taken: 10-11-2010

VP1: M1 Weak Growth
Taken: 8-4-2010

VP2: M1 Weak Growth (Bare Bench)
Taken: 8-4-2010

VP3: UT1 Invasives (Tree of Heaven)
Taken: 8-4-2010

VP4: M1 Invasives (Tree of Heaven)
Taken: 8-4-2010

VP5: M1 Invasives (Privet)
Taken: 8-4-2010

APPENDIX C
VEGETATION PLOT DATA

Table 7. Veg Plot Criteria Attainment		
Meredell Farm Stream Restoration Site/247		
Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
247-01-0001	Y	50%
247-01-0002	N	
247-01-0003	Y	50%
247-01-0004	Y	
247-01-0005	N	
247-01-0006	N	
247-01-0007	N	
247-01-0008	Y	
247-01-0009	N	
247-01-0010	N	
247-01-0011	Y	
247-01-0012	Y	

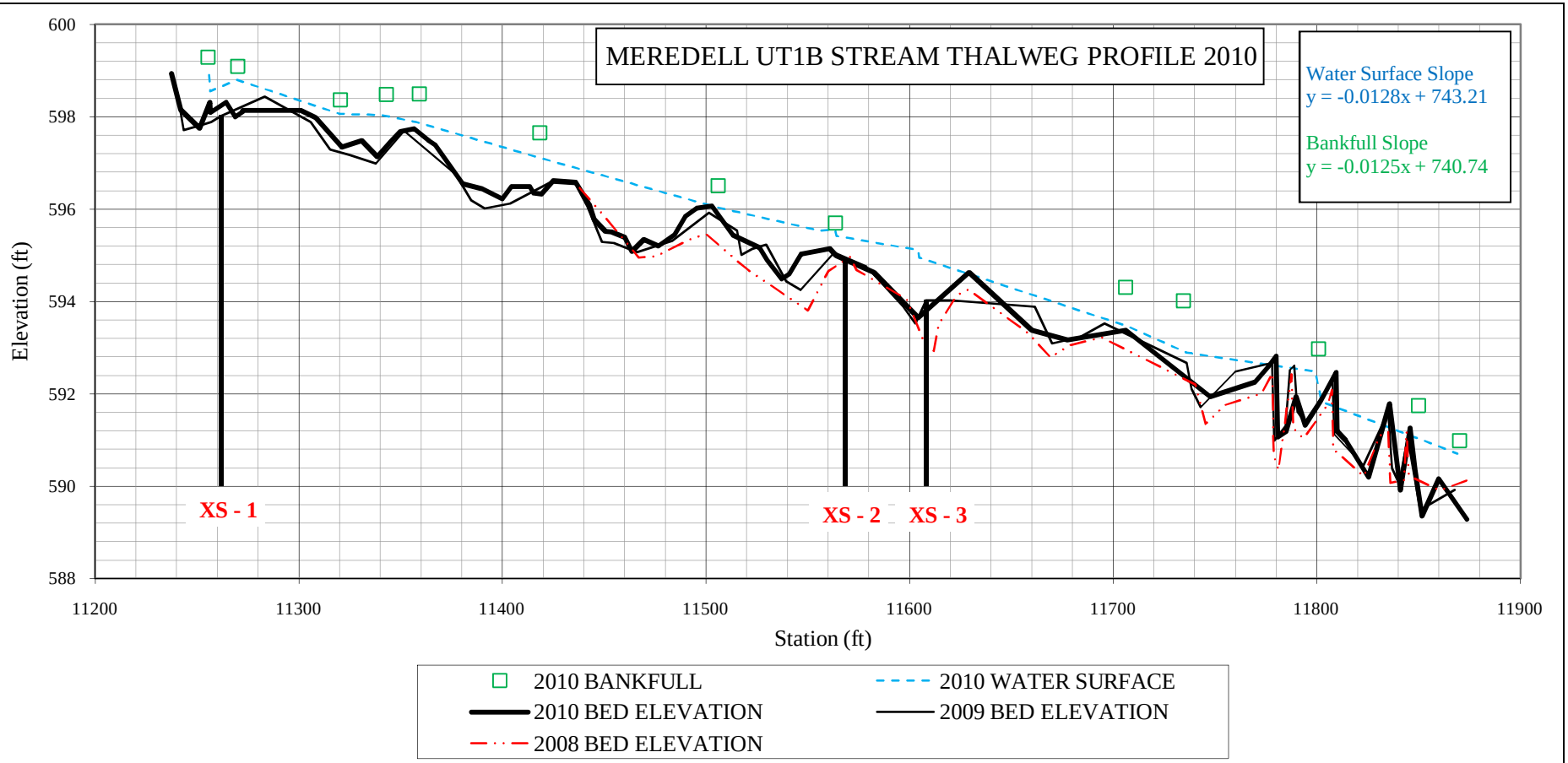
Table 8. CVS Vegetation Plot Metadata Meredell Farm Stream Restoration Site/247	
Report Prepared By	Josh Allen
Date Prepared	11/5/2010 11:27
database name	cvs-eep-entrytool-v2.2.6.mdb
database location	K:\RAL_Environmental\011795 Meredell Farm Monitoring MDELL\MDELL VEGETATION
computer name	DD83075
file size	57192448
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 Stream Restoration
Description	stream restoation, enhancement, and preservation
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

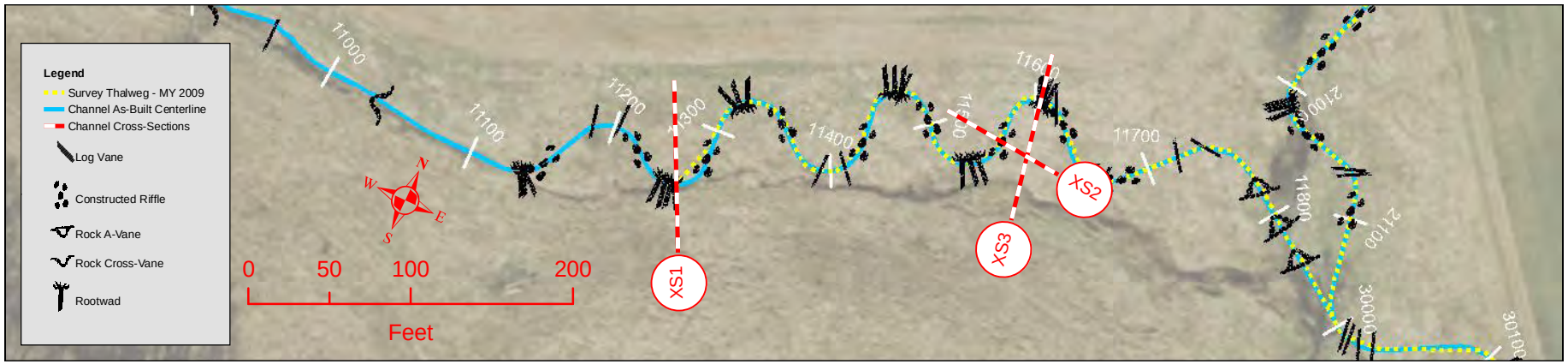
Table 9 Planted and Total Stem Counts (Species by Plot with Annual Means)

			Current Plot Data (MY3 2010)																																					Annual Means								
			247-01-0001			247-01-0002			247-01-0003			247-01-0004			247-01-0005			247-01-0006			247-01-0007			247-01-0008			247-01-0009			247-01-0010			247-01-0011			247-01-0012			MY3 (2010)			MY2 (2009)			MY1 (2009)		
Scientific Name	Common Name	Species Type	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T
Acer rubrum	red maple	Tree																	1	1														4	4		6	6		10	10		11	11			
Asimina triloba	pawpaw	Shrub Tree																																						1	1					1	1
Betula nigra	river birch	Tree								3	3		1	1		2	2								4	4													12	12		10	10		12	12
Carya	hickory	Tree																	1	1																				1	1		2	2			
Cornus amomum	silky dogwood	Shrub																																			1	1	1	1	1	1	2	2	2	2	2	2
Corylus americana	American hazelnut	Shrub											5	5																										5	5		10	10		11	11
Diospyros virginiana	common persimmon	Tree		1	1											2	2					2	2																6	6		12	12		15	15
Fraxinus	ash	Shrub Tree																																											1	1
Hamamelis virginiana	American witchhazel	Shrub Tree		1	1																																			1	1		3	3		3	3
Juglans nigra	black walnut	Tree																				2	2					1	3	3									1	5	5		6	6		2	2
Lindera benzoin	northern spicebush	Shrub Tree														1	1								1	1														2	2		5	5		9	9
Liriodendron tulipifera	tuliptree	Tree																																						2	2		8	8		8	8
Platanus occidentalis	American sycamore	Tree		3	3		2	2											1	1		2	2		2	2						1	1						2	2		13	13		14	14		12	12
Populus deltoides	eastern cottonwood	Tree																									1	1														1	1		1	1		3	3
Quercus alba	white oak	Tree																																										1	1			
Quercus michauxii	swamp chestnut oak	Tree					1	1					1	1					1	1														2	2					5	5		8	8		7	7
Quercus pagoda	cherrybark oak	Tree											1	1																										1	1		3	3		4	4
Quercus phellos	willow oak	Tree					3	3																																3	3		4	4		4	4
Salix sericea	silky willow	Shrub Tree	9	14	14					10	10											1	2	2	1	1	1				2	4	4							13	31	31	30	49	49	32	33	33
Sambucus canadensis	Common Elderberry	Shrub Tree																										1	2	2										1	2	2	2	2	2	2	2	2
Ulmus	elm	Tree																																				1	1		1	1		3	3		3	3
		Stem count	9	19	19	0	6	6	0	13	13	0	8	8	0	5	5	0	4	4	0	6	6	1	9	9	1	2	2	2	6	6	2	13	13	1	20	20	16	111	111	34	154	154	36	132	132
		size (ares)	1			1			1			1			1			1			1			1			1			1			1			1			12			12			12		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.30			0.30			0.30		
		Species count	1	4	4	0	3	3	0	2	2	0	4	4	0	3	3	0	4	4	0	3	3	1	4	4	1	2	2	2	3	3	1	5	5	1	6	6	4	19	19	3	19	19	3	18	18
		Stems per ACRE	364.22	768.9	768.9	0	242.81	242.81	0	526.09	526.09	0	323.75	323.75	0	202.34	202.34	0	161.87	161.87	0	242.81	242.81	40.469	364.22	364.22	40.469	80.937	80.937	80.937	242.81	242.81	80.937	526.09	526.09	40.469	809.37	809.37	53.958	374.33	374.33	114.66	519.35	519.35	121.41	445.15	445.15

Type = Tree, Shrub, Livestake
P = Planted
T = Total

APPENDIX D
STREAM SURVEY DATA





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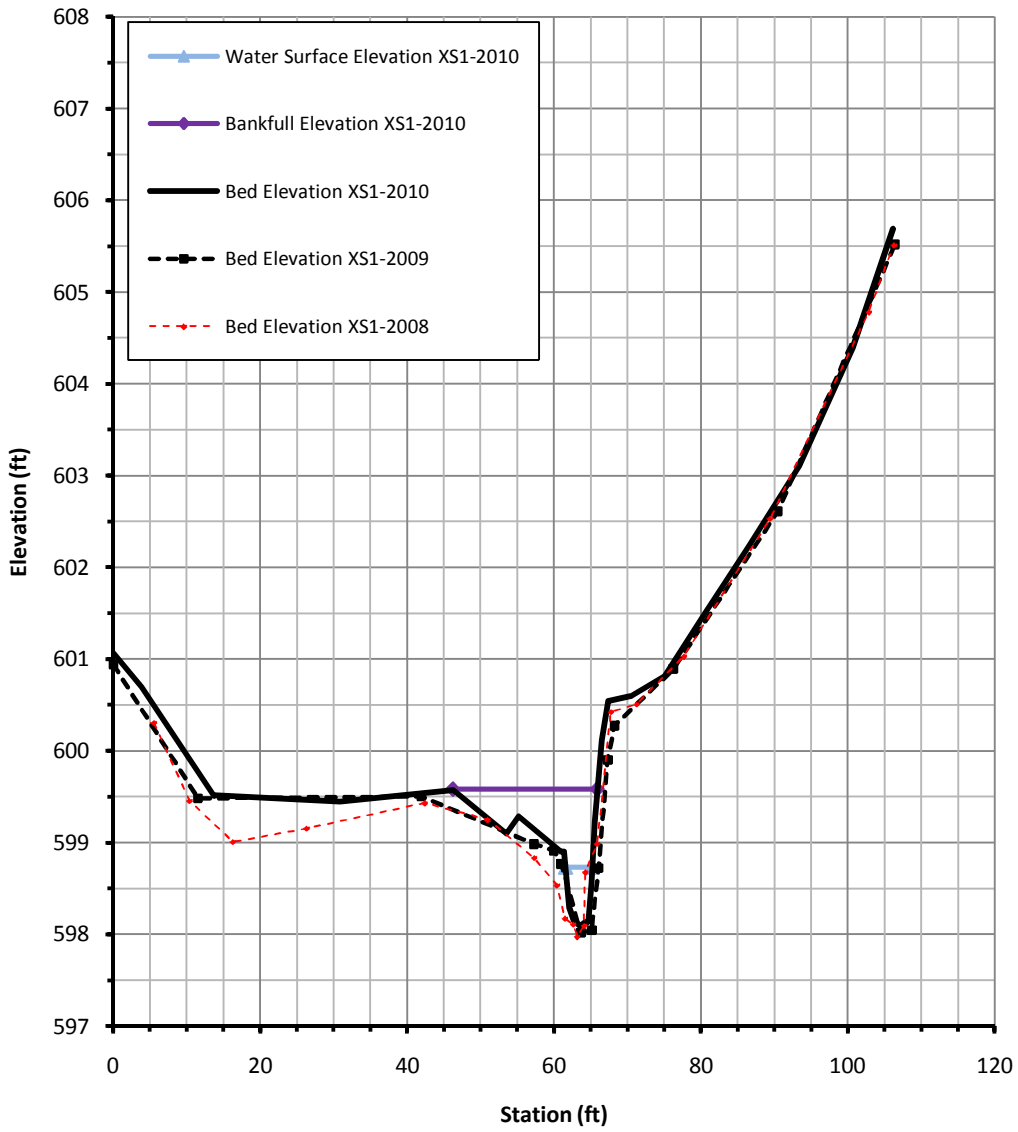
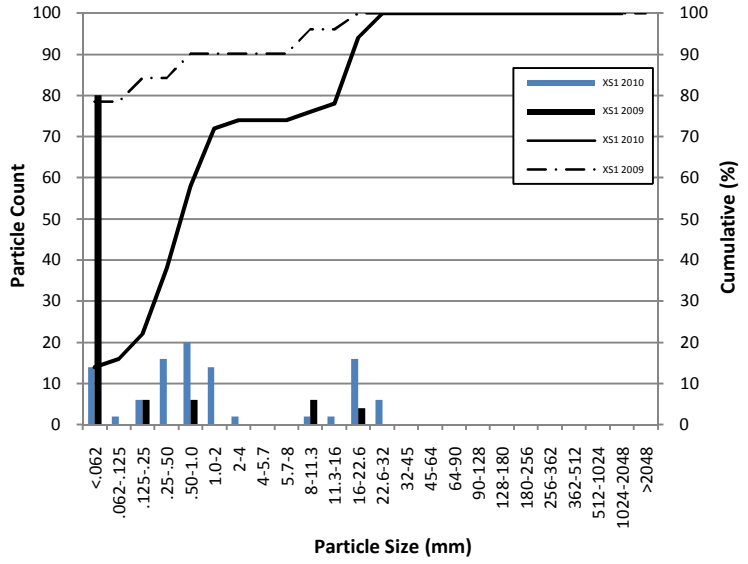
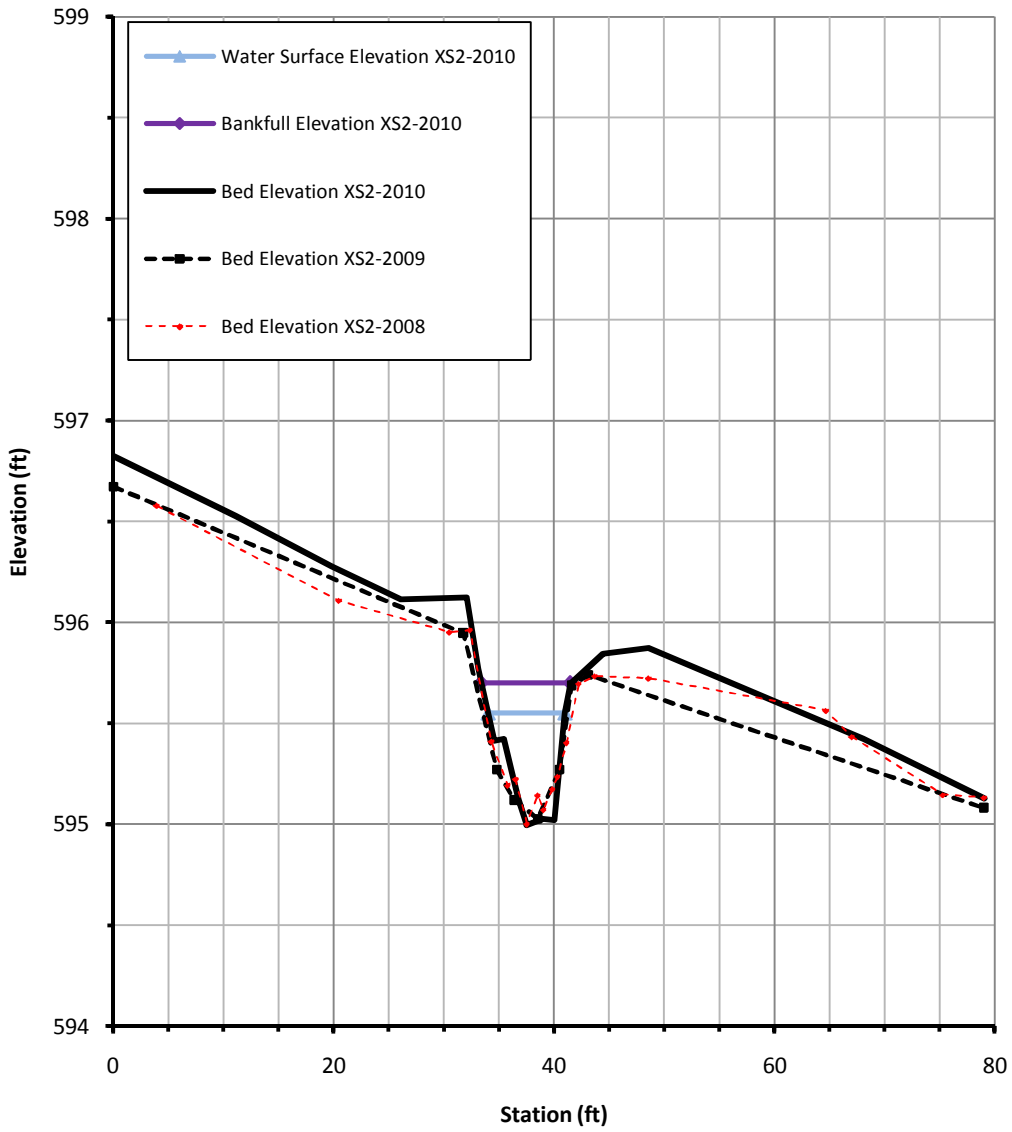
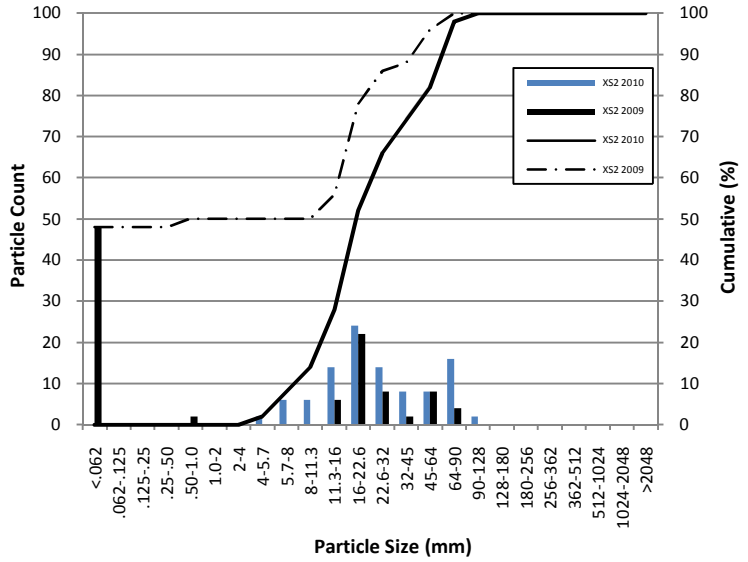




ID	YEAR	PHASE	FACET TYPE	Wbkf	Abkf	Dbkf
XS1	2008	CD	POOL	12.0	11.5	1.0
XS1	2008	MY1	POOL	10.9	4.5	0.5
XS1	2009	MY2	POOL	25.0	12.3	0.5
XS1	2010	MY3	POOL	19.6	10.9	0.6

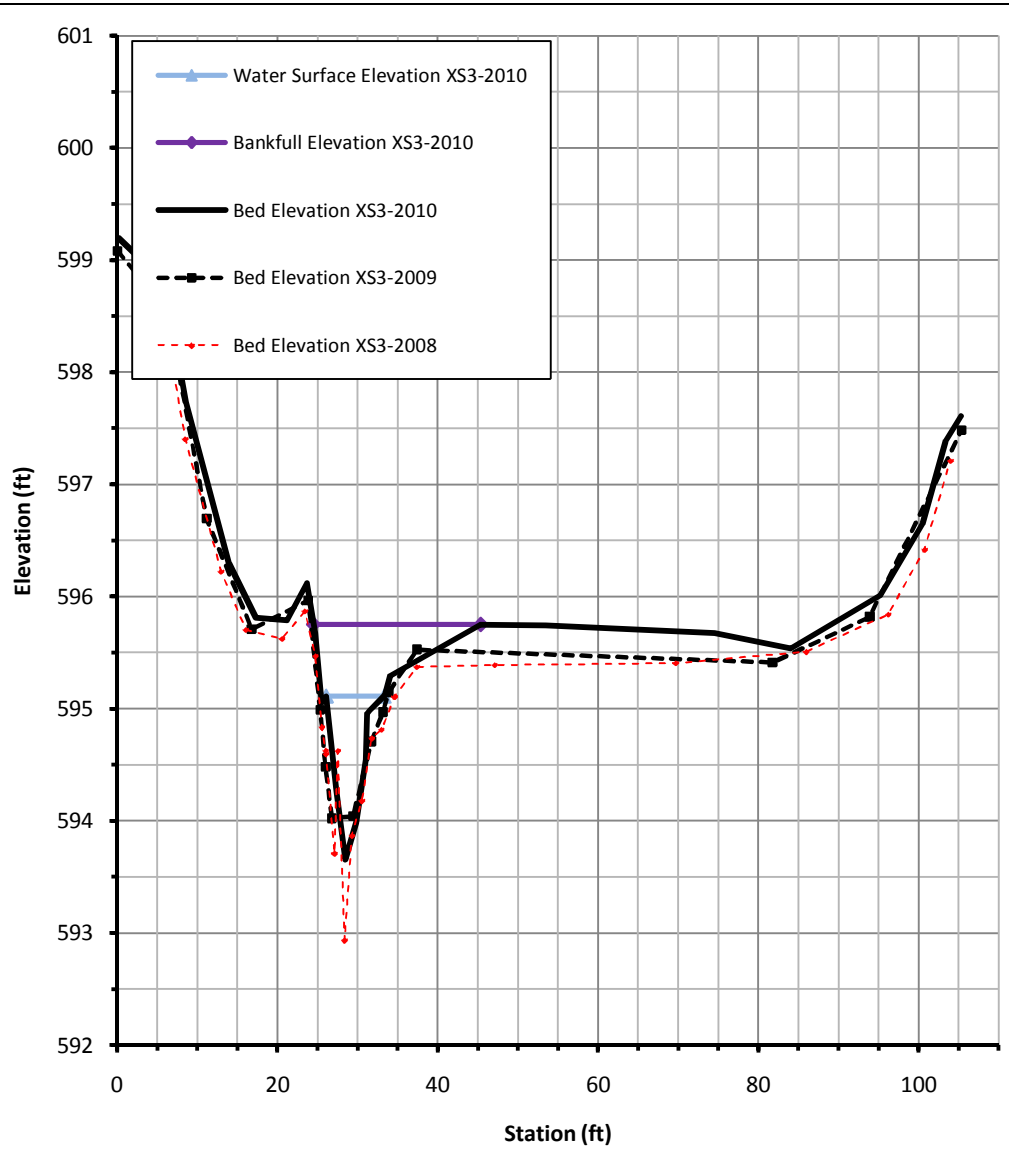
ID	YEAR	PHASE	d50 (mm)	d84 (mm)
XS1	2009	MY2	<0.062	0.25
XS1	2010	MY3	0.8	18.5

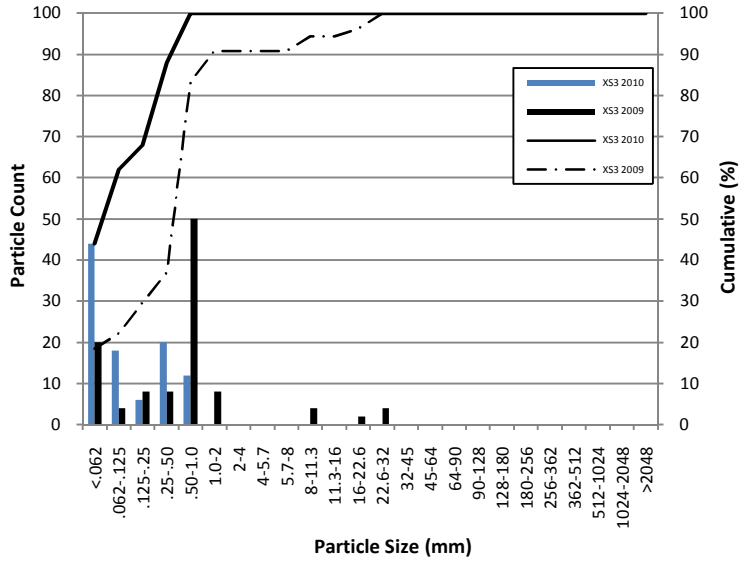




ID	YEAR	PHASE	FACET TYPE	Wbkf	Abkf	Dbkf
XS2	2008	CD	RIFFLE	7.3	4.5	0.6
XS2	2008	MY1	RIFFLE	8.9	3.8	0.4
XS2	2009	MY2	RIFFLE	8.7	3.8	0.4
XS2	2010	MY3	RIFFLE	8.1	3.6	0.5

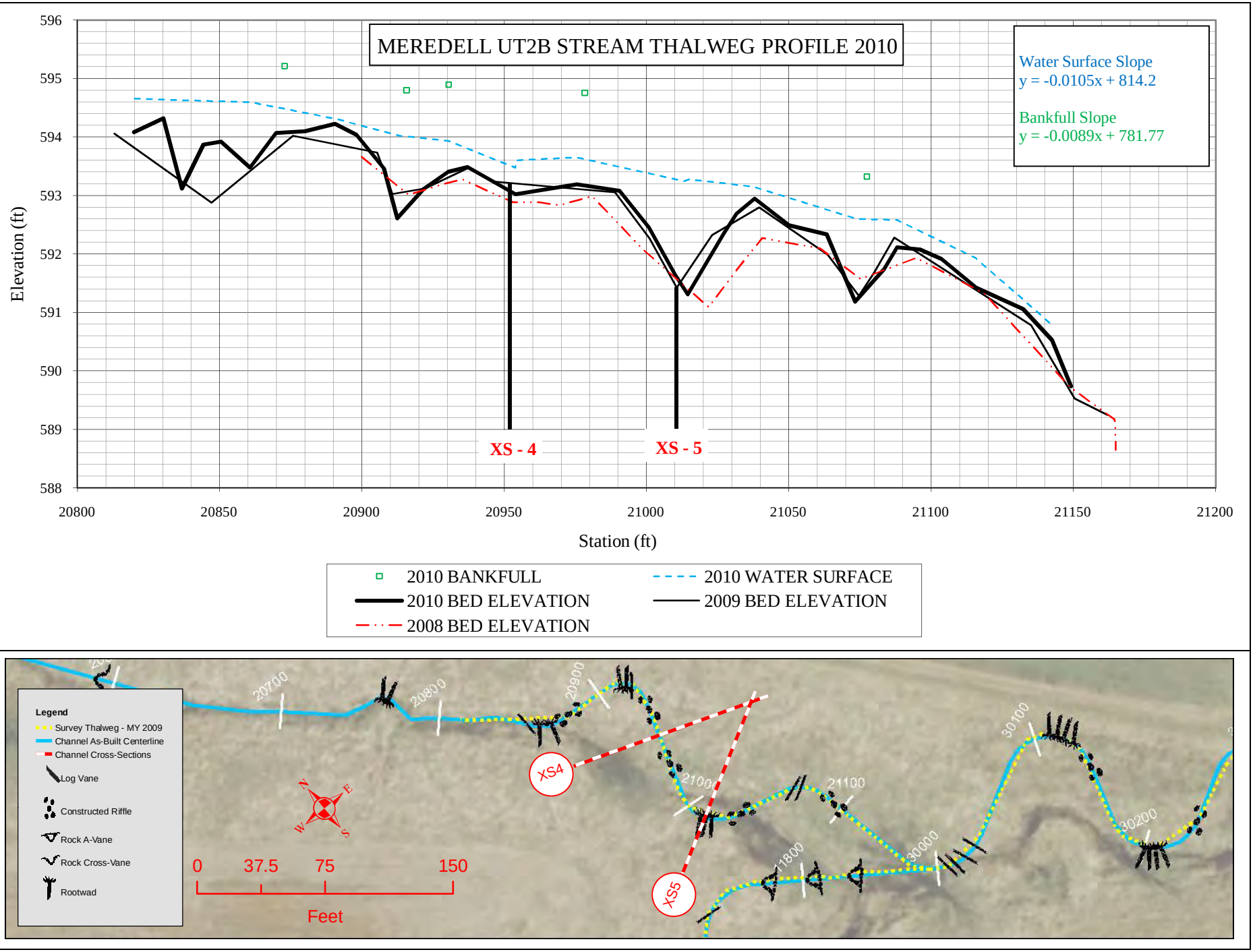
ID	YEAR	PHASE	d50 (mm)	d84 (mm)
XS2	2009	MY2	8	22.6
XS2	2010	MY3	22.1	67.3





ID	YEAR	PHASE	FACET TYPE	Wbkf	Abkf	Dbkf
XS3	2008	CD	POOL	12.0	11.5	1.0
XS3	2008	MY1	POOL	12.4	10.1	0.8
XS3	2009	MY2	POOL	12.9	10.3	0.8
XS3	2010	MY3	POOL	20.8	13.1	0.6

ID	YEAR	PHASE	d50 (mm)	d84 (mm)
XS3	2009	MY2	0.5	1.0
XS3	2010	MY3	0.08	0.45



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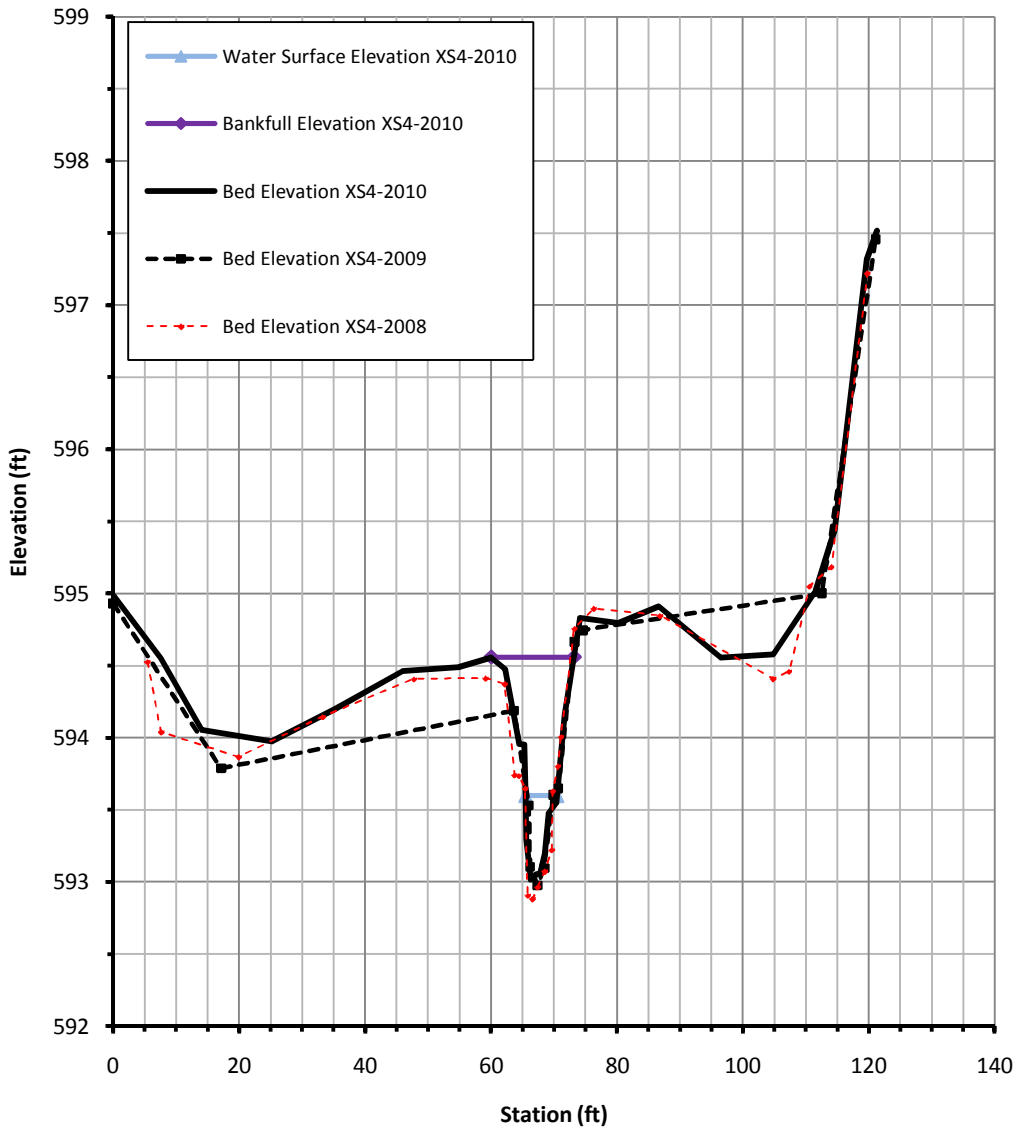
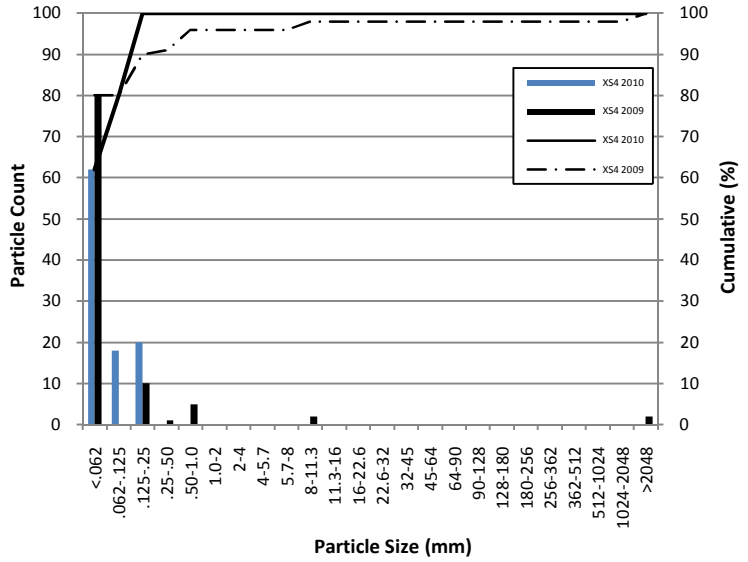
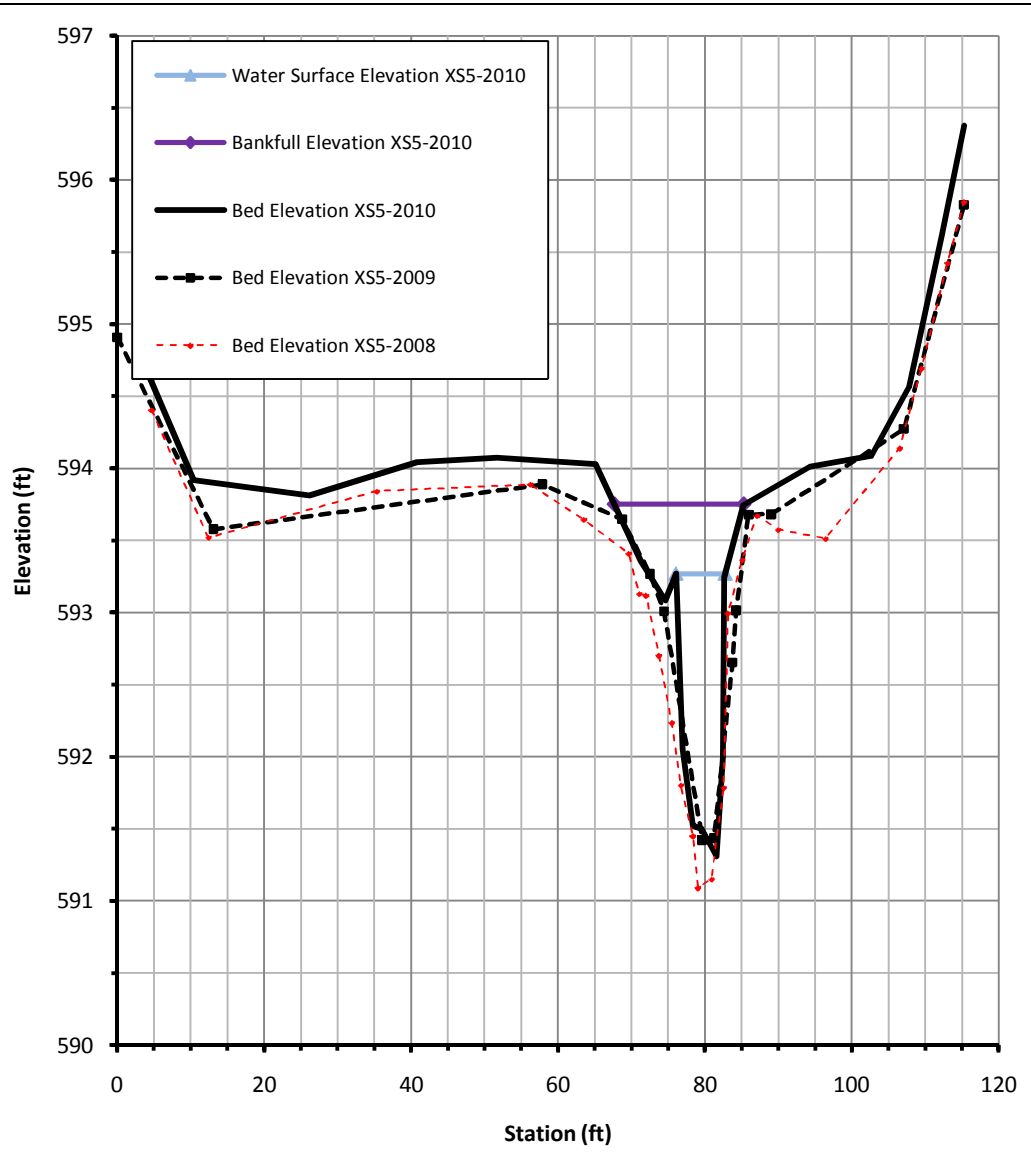
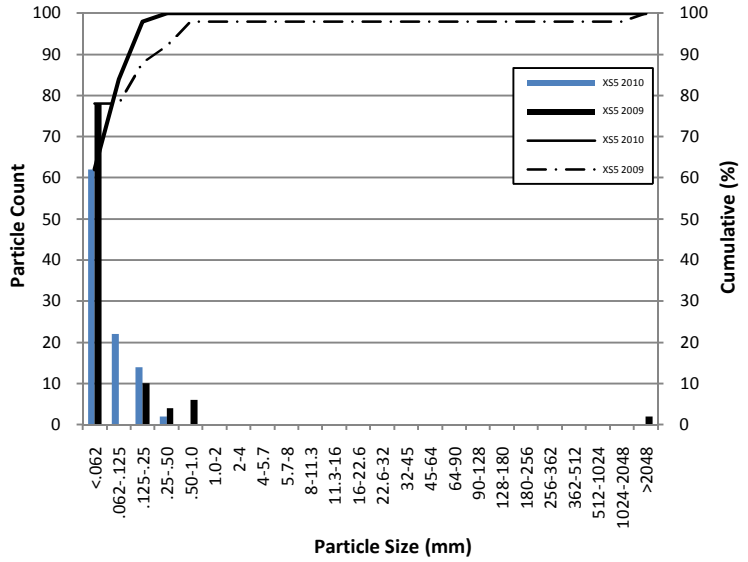




ID	YEAR	PHASE	FACET TYPE	Wbkf	Abkf	Dbkf
XS4	2008	CD	RIFFLE	7.3	4.5	0.6
XS4	2008	MY1	RIFFLE	10.0	8.2	0.8
XS4	2009	MY2	RIFFLE	8.4	5.2	0.6
XS4	2010	MY3	RIFFLE	13.1	9.2	0.7

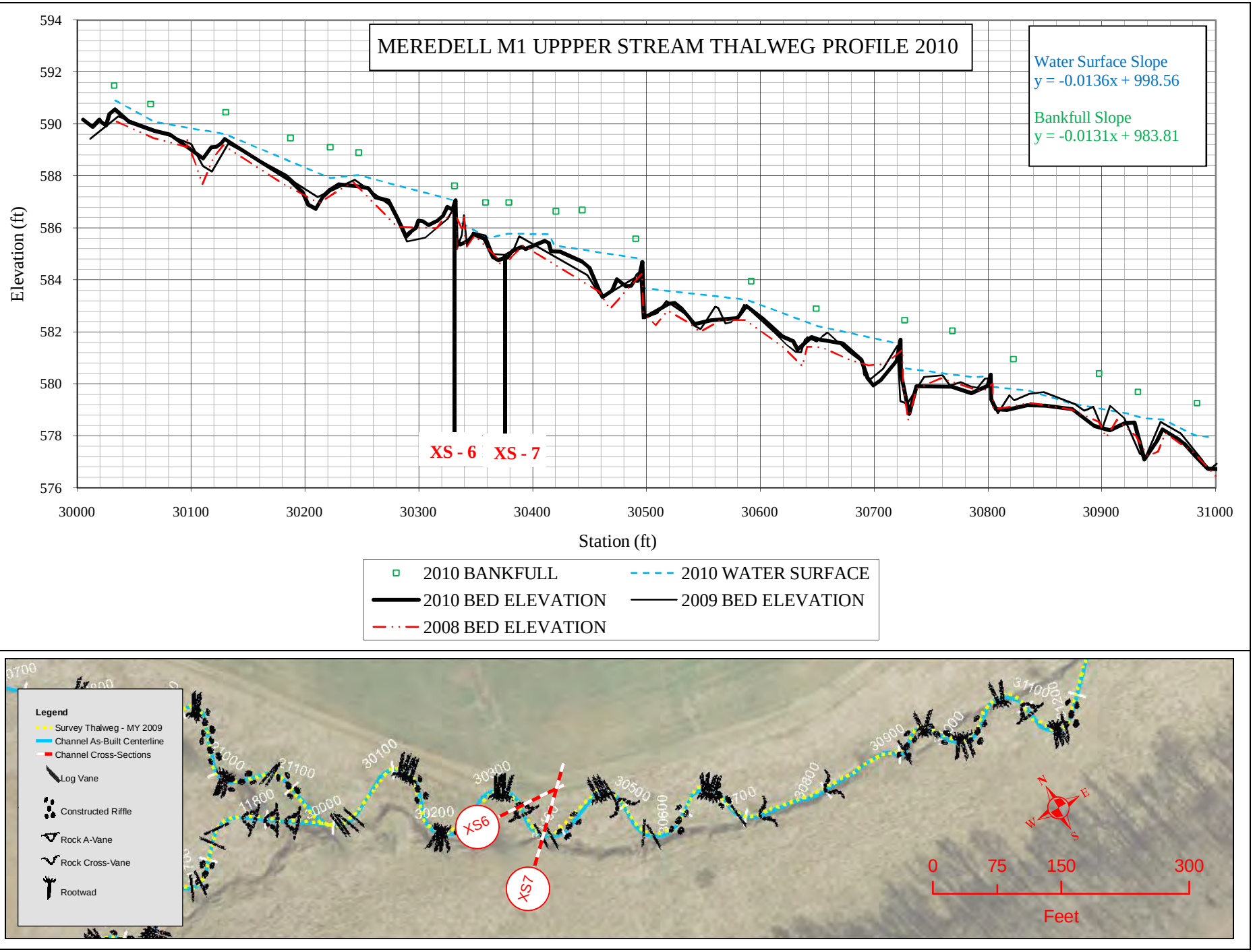
ID	YEAR	PHASE	d50 (mm)	d84 (mm)
XS4	2009	MY2	<0.062	0.125
XS4	2010	MY3	<0.062	0.15





ID	YEAR	PHASE	FACET TYPE	Wbkf	Abkf	Dbkf
XS5	2008	CD	POOL	12.0	11.5	1.0
XS5	2008	MY1	POOL	23.4	21.9	0.9
XS5	2009	MY2	POOL	17.2	17.1	1.0
XS5	2010	MY3	POOL	17.5	17.0	1.0

ID	YEAR	PHASE	d50 (mm)	d84 (mm)
XS5	2009	MY2	<0.062	0.125
XS5	2010	MY3	<0.062	0.125



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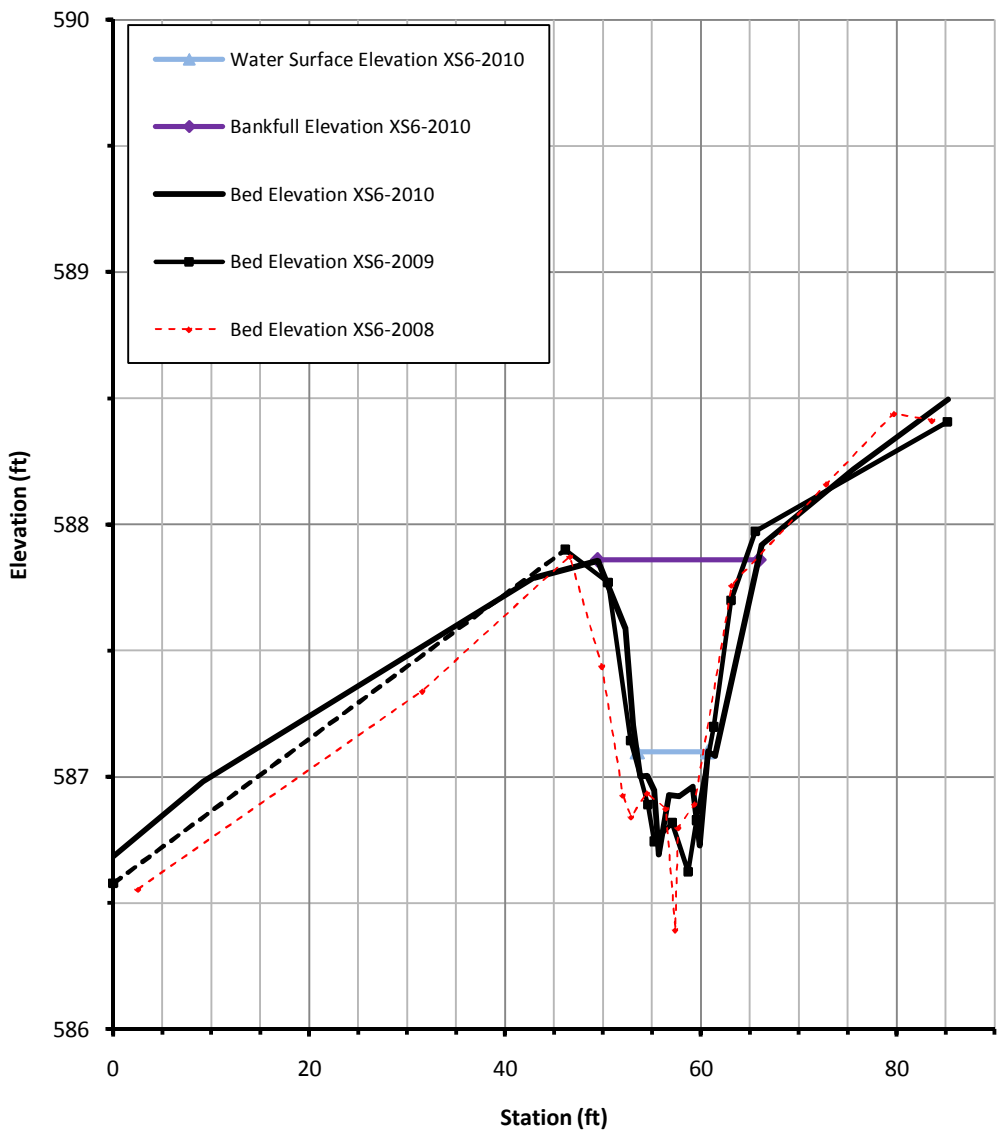
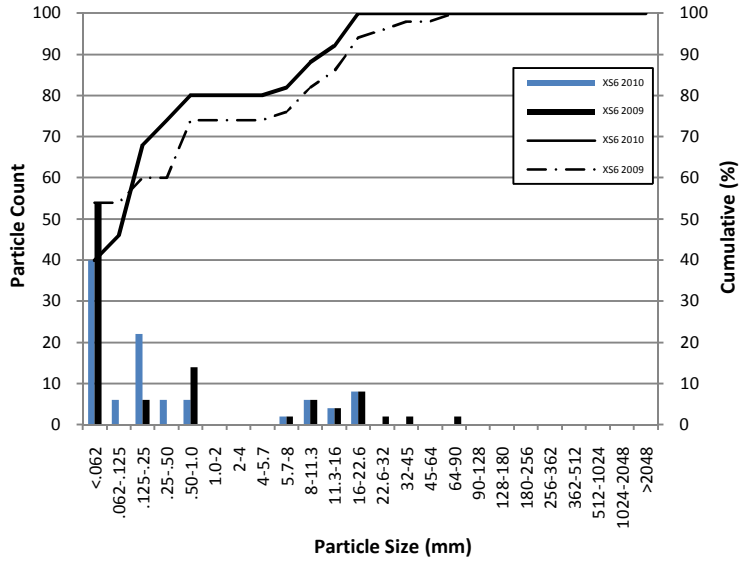
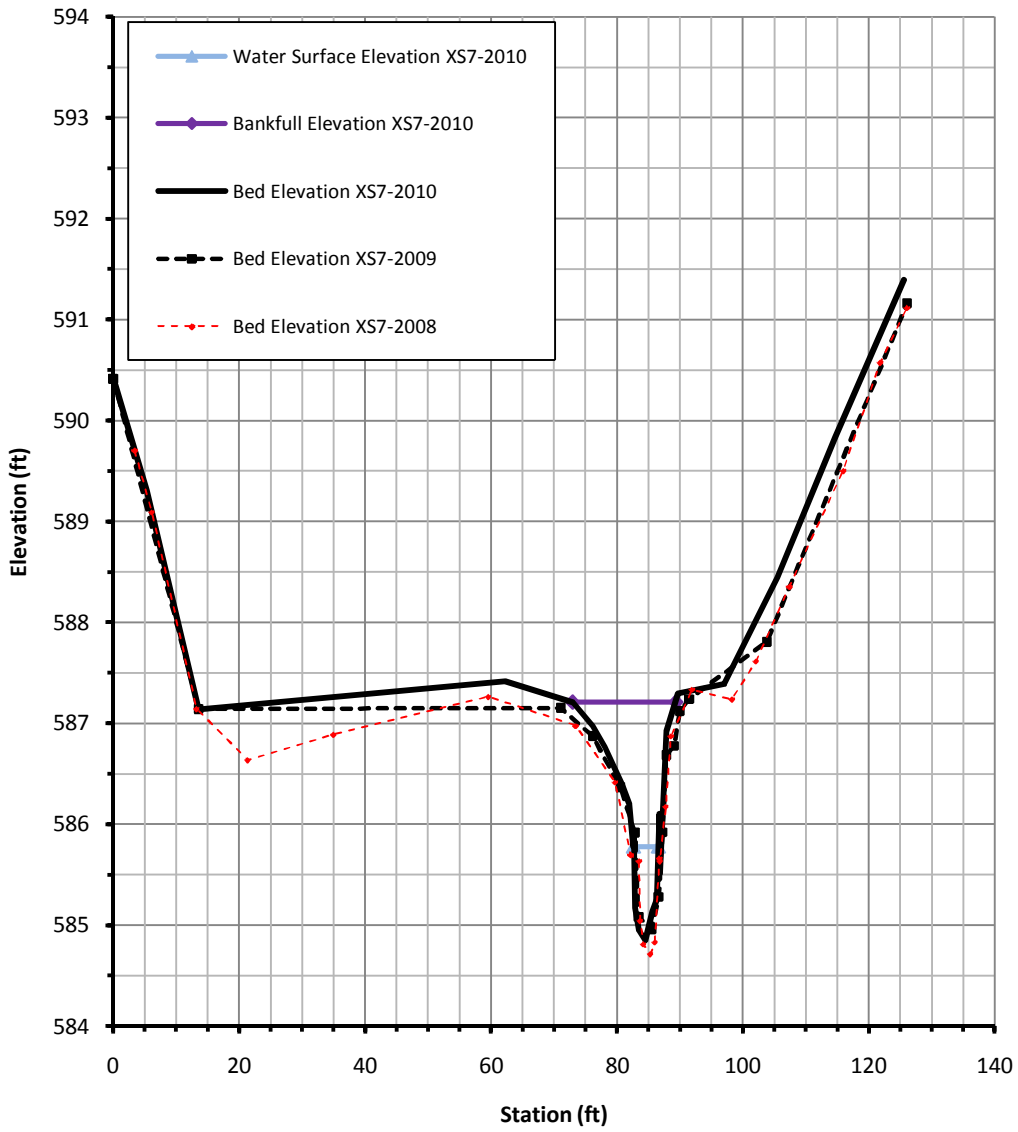
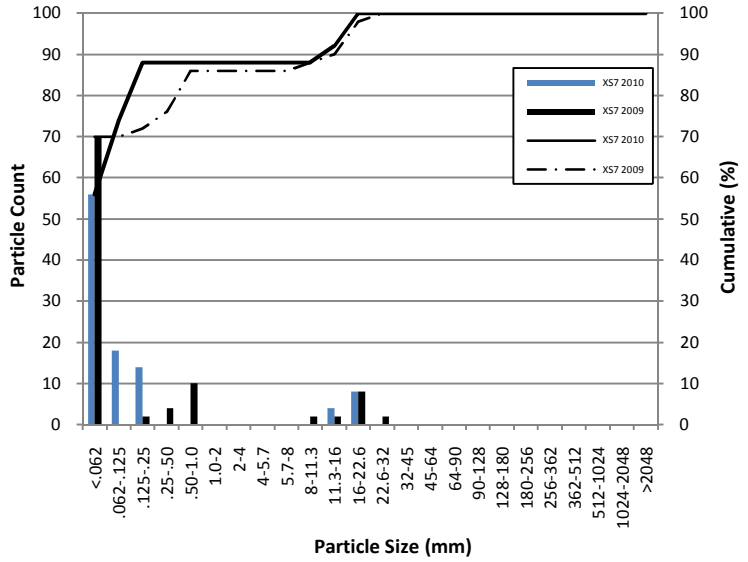




ID	YEAR	PHASE	FACET TYPE	Wbkf	Abkf	Dbkf
XS6	2008	CD	RIFFLE	10.2	8.0	0.8
XS6	2008	MY1	RIFFLE	19.3	11.3	0.6
XS6	2009	MY2	RIFFLE	13.2	9.0	0.7
XS6	2010	MY3	RIFFLE	16.4	10.2	0.6

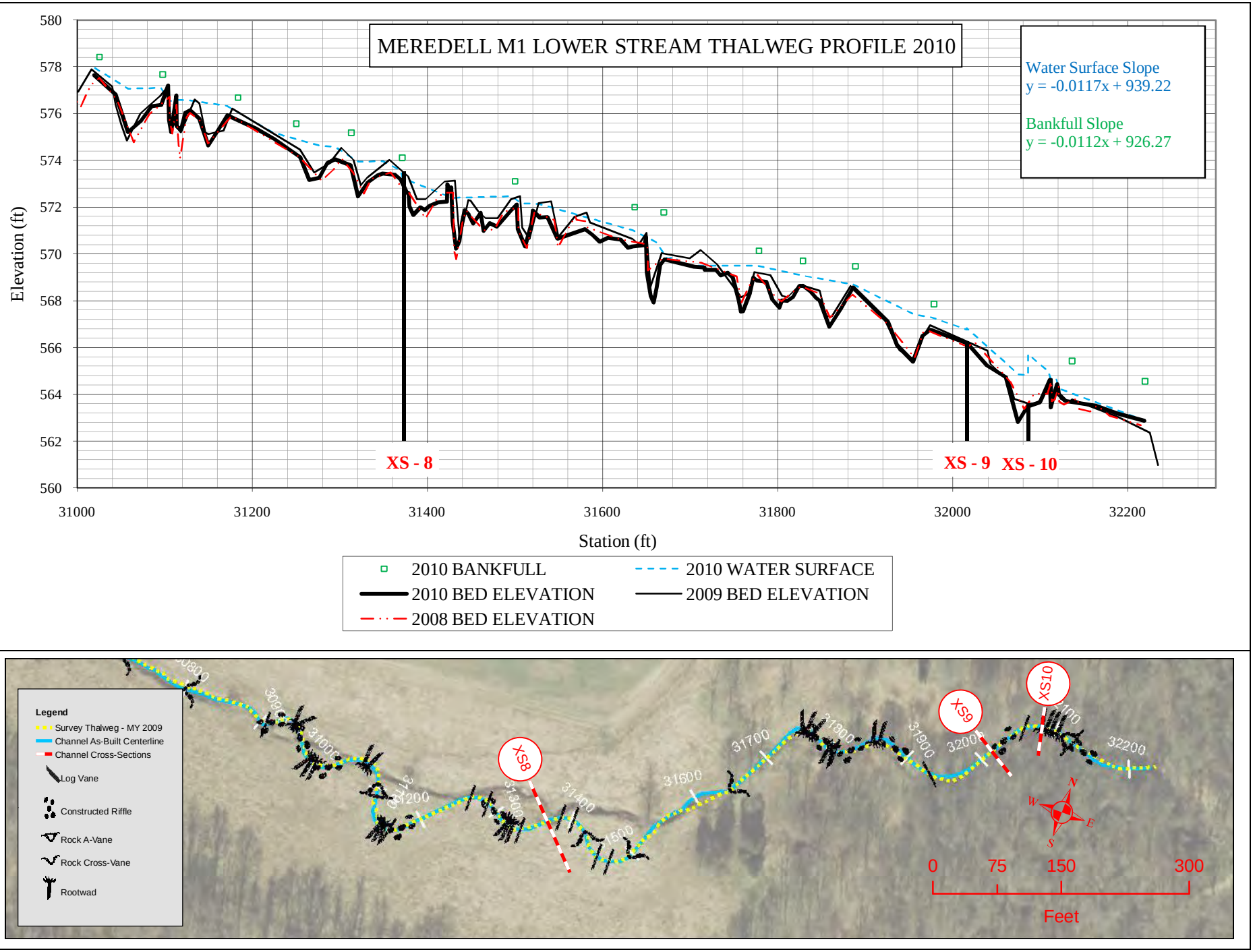
ID	YEAR	PHASE	d50 (mm)	d84 (mm)
XS6	2009	MY2	<0.062	11.3
XS6	2010	MY3	0.15	9.1





ID	YEAR	PHASE	FACET TYPE	Wbkf	Abkf	Dbkf
XS7	2008	CD	POOL	15.0	18.5	1.2
XS7	2008	MY1	POOL	15.9	13.8	0.9
XS7	2009	MY2	POOL	18.3	14.6	0.8
XS7	2010	MY3	POOL	16.3	14.7	0.9

ID	YEAR	PHASE	d50 (mm)	d84 (mm)
XS7	2009	MY2	<0.062	0.5
XS7	2010	MY3	<0.062	0.2143



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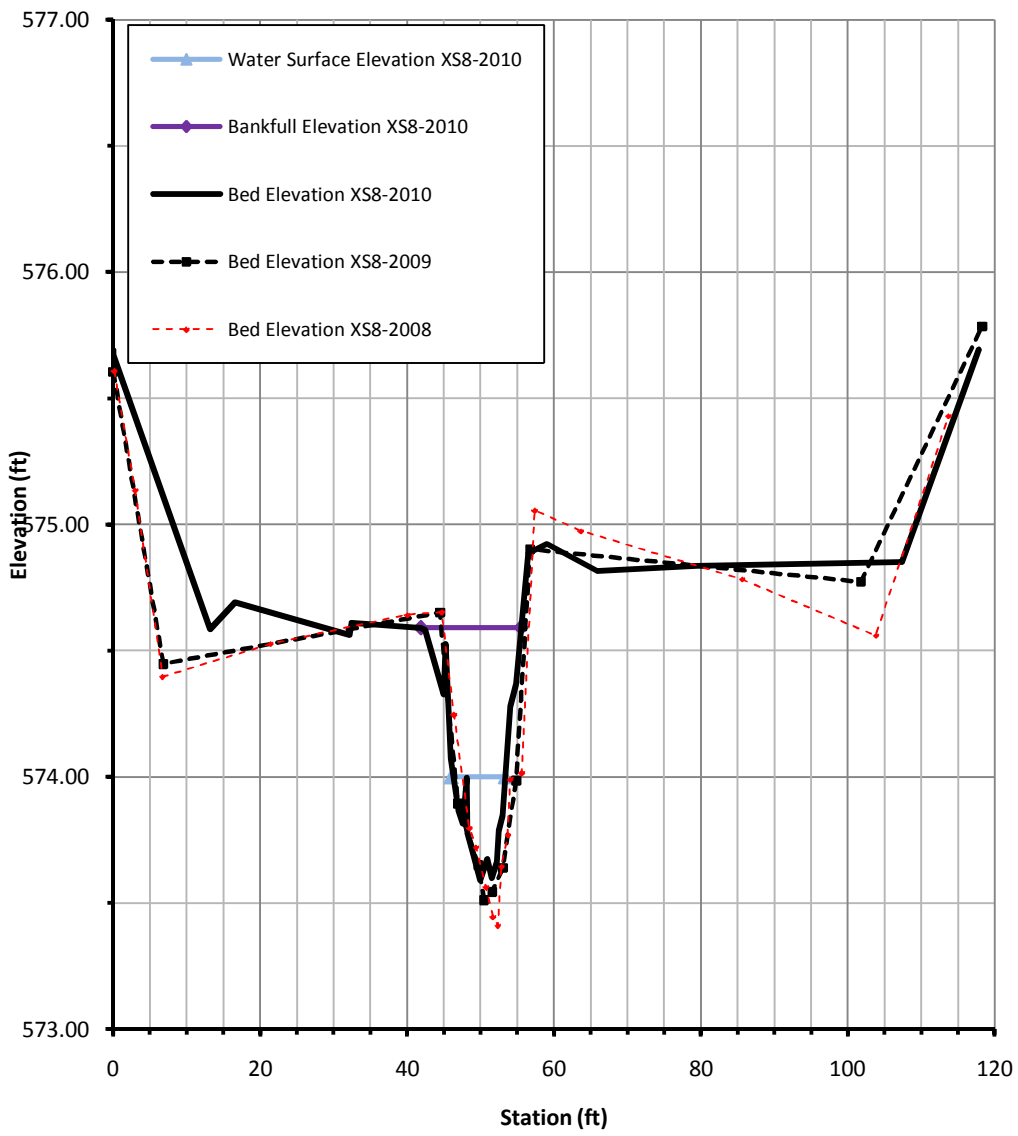
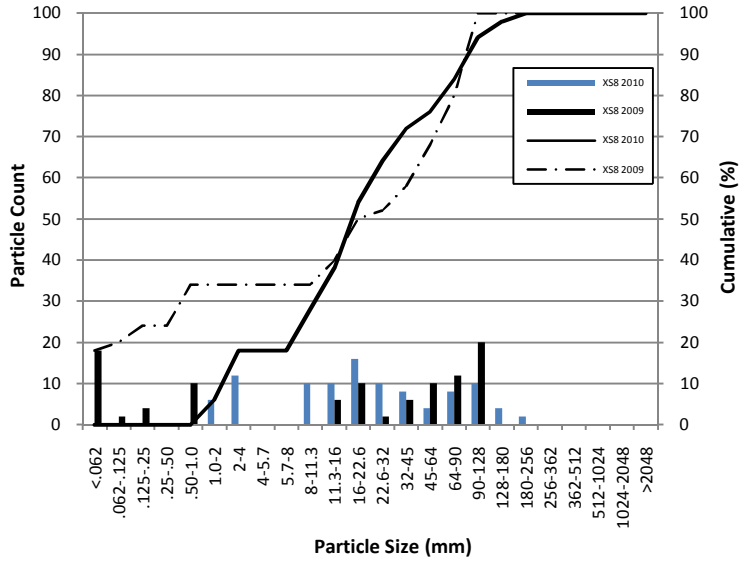
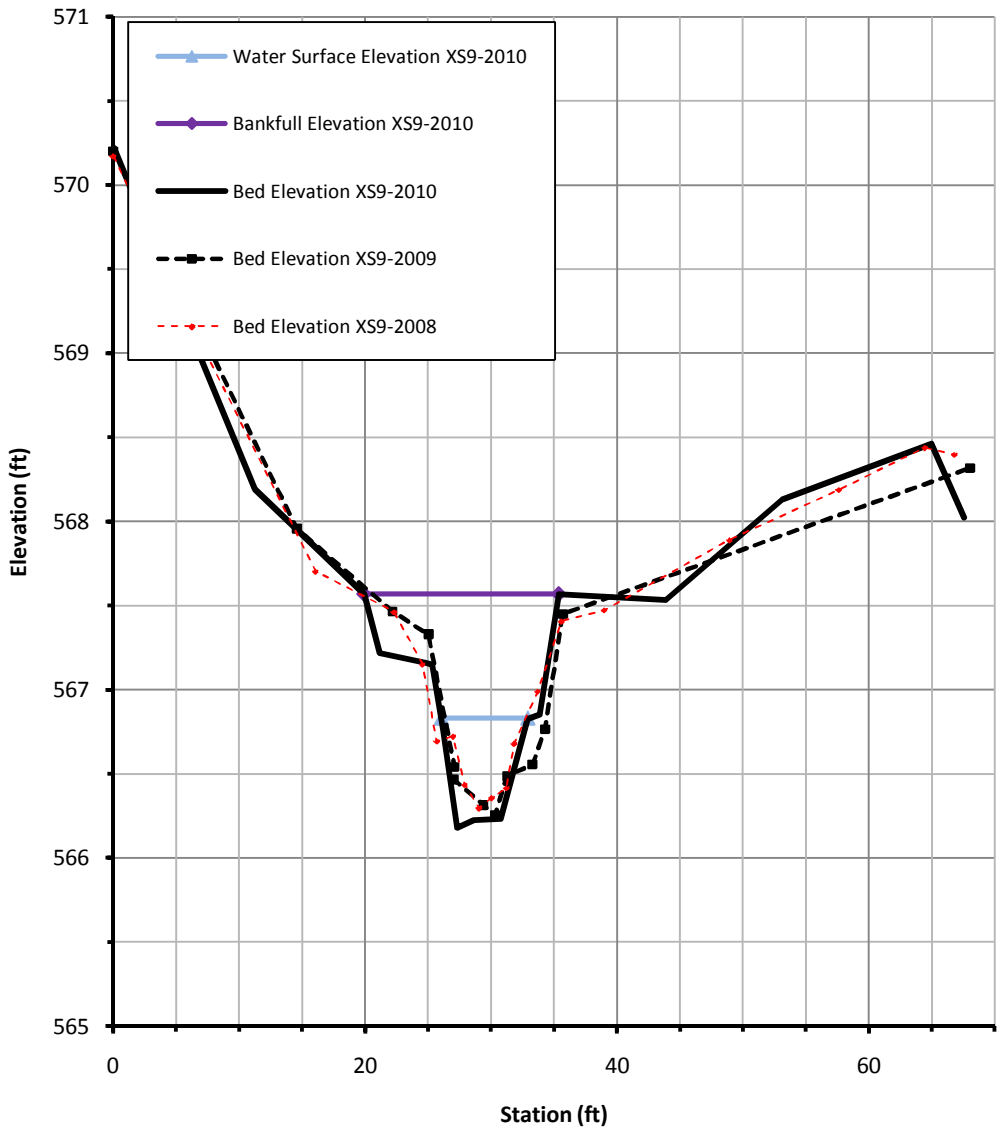
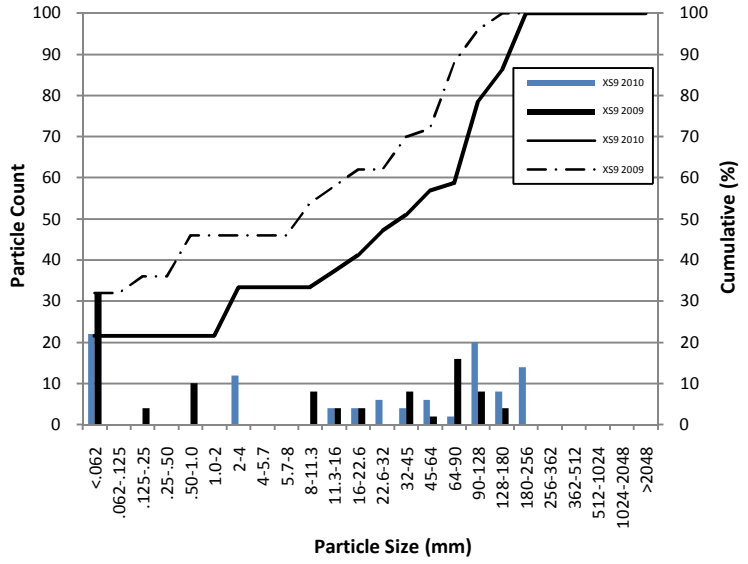




ID	YEAR	PHASE	FACET TYPE	Wbkf	Abkf	Dbkf
XS8	2008	CD	RIFFLE	10.2	8.0	0.8
XS8	2008	MY1	RIFFLE	12.0	8.4	0.7
XS8	2009	MY2	RIFFLE	11.7	8.5	0.7
XS8	2010	MY3	RIFFLE	13.7	7.3	0.5

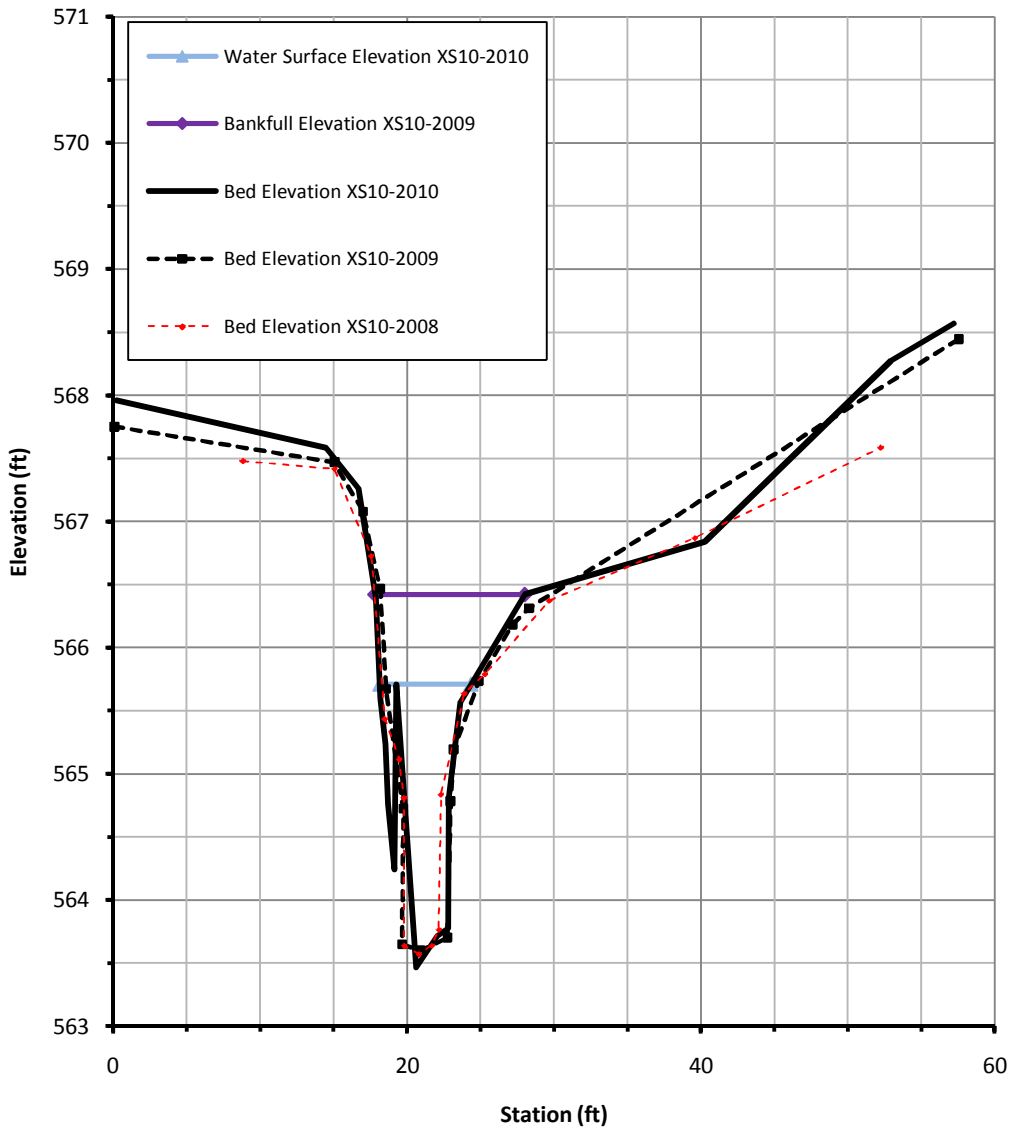
ID	YEAR	PHASE	d50 (mm)	d84 (mm)
XS8	2009	MY2	16	90
XS8	2010	MY3	20.95	90

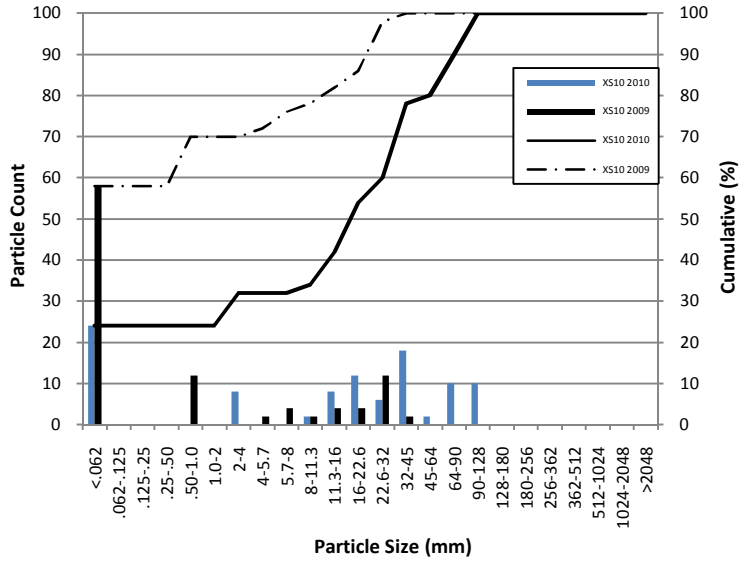




ID	YEAR	PHASE	FACET TYPE	Wbkf	Abkf	Dbkf
XS9	2008	CD	RIFFLE	10.2	8.0	0.8
XS9	2008	MY1	RIFFLE	12.9	7.9	0.6
XS9	2009	MY2	RIFFLE	13.3	8.9	0.7
XS9	2010	MY3	RIFFLE	15.5	11.8	0.8

ID	YEAR	PHASE	d50 (mm)	d84 (mm)
XS9	2009	MY2	8	64
XS9	2010	MY3	41.75	164.94





ID	YEAR	PHASE	FACET TYPE	Wbkf	Abkf	Dbkf
XS10	2008	CD	POOL	15.0	18.5	1.2
XS10	2008	MY1	POOL	11.9	12.7	1.1
XS10	2009	MY2	POOL	10.1	12.6	1.3
XS10	2010	MY3	POOL	10.2	13.1	1.3

ID	YEAR	PHASE	d50 (mm)	d84 (mm)
XS10	2009	MY2	<0.062	16
XS10	2010	MY3	20.4	74.4

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/f^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 loosely 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-constrution 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 loosely 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-construction 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 loosely 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-constrution 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 11a.1 Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Meredell Farm Stream Restoration Site/247 - Reach: UT1b (780 feet)

	Cross Section 1 (Pool)							Cross Section 2 (Riffle)							Cross Section 3 (Pool)																		
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used		600.4	600.4	600.4					595.7	595.7	595.7					595.4	595.4	595.4																
Bankfull Width (ft)	12.0	62.9	68.0	61.1				7.3	45.9	47.7	34.4				12.0	12.5	11.4	11.4																
Floodprone Width (ft)	70.4	91.5	91.6	90.7				71.1	71.6	71.6	66.2				97.6	96.5	89.0	91.2																
Bankfull Mean Depth (ft)	1.0	1.2	1.0	1.0				0.6	0.3	0.3	0.3				1.0	0.8	0.7	0.6																
Bankfull Max Depth (ft)	1.6	2.5	2.4	2.3				0.8	0.7	0.7	0.7				1.6	2.4	1.4	1.7																
Bankfull Cross Sectional Area (ft^2)	11.5	77.7	69.6	61.8				4.5	12.4	16.1	11.4				11.5	10.1	8.5	7.3																
Bankfull Width/Depth Ratio	12.5	50.7	66.7	60.5				12.0	170.0	140.2	104.1				12.5	15.7	15.4	17.7																
Bankfull Entrenchment Ratio	5.9	1.5	1.4	1.5				9.7	1.6	1.5	1.9				8.1	7.7	7.8	8.0																
Bankfull Bank Height Ratio	1.0	1.0	1.2	1.1				1.0	1.0	1.0	1.0				1.0	1.0	1.1	1.2																
Cross Sectional Area between end pins (ft^2)																																	
d50 (mm)			<0.062	0.8						8	22.05						0.5	0.08																

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Table 11a.2 Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Meredell Farm Stream Restoration Site/247 - Reach: UT2b (294 feet)

	Cross Section 4 (Riffle)							Cross Section 5 (Pool)																							
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used		594.4	594.4	594.4					593.7	593.7	593.7																							
Bankfull Width (ft)	12.0	50.0	64.5	42.2				7.3	48.1	33.9	16.5																							
Floodprone Width (ft)	97.6	116.0	115.3	115.4				110.8	115.3	115.3	113.9																							
Bankfull Mean Depth (ft)	1.0	0.4	0.4	0.4				0.6	0.5	0.6	1.0																							
Bankfull Max Depth (ft)	1.6	1.5	1.4	1.4				0.8	2.6	2.3	2.4																							
Bankfull Cross Sectional Area (ft^2)	11.5	20.3	27.9	15.8				4.5	24.8	18.7	15.9																							
Bankfull Width/Depth Ratio	12.5	122.0	150.0	114.0				12.0	92.5	61.6	17.2																							
Bankfull Entrenchment Ratio	8.1	2.3	1.8	2.7				15.2	2.4	3.4	6.9																							
Bankfull Bank Height Ratio	1.0	1.0	1.3	1.1				1.0	1.1	1.1	1.1																							
Cross Sectional Area between end pins (ft^2)																																		
d50 (mm)			0.5	0.08						<0.062	<0.062																							

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Table 11a.3 Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Meredell Farm Stream Restoration Site/247 - Reach: M1 (3200 feet)

	Cross Section 6 (Riffle)							Cross Section 7 (Pool)							Cross Section 8 (Riffle)							Cross Section 9 (Riffle)							Cross Section 10 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used		587.9	587.9	587.9					586.4	586.4	586.4					574.7	574.7	574.7					567.4	567.4	567.4					566.4	566.4	566.4			
Bankfull Width (ft)	10.2	65.7	62.8	65.9				15.0	8.3	7.6	6.9				10.2	59.6	50.7	37.4				10.2	12.9	13.1	14.5				15.0	11.9	11.0	9.9			
Floodprone Width (ft)	80.8	83.6	83.6	83.6				114.2	96.1	93.8	91.6				116.4	118.3	118.3	117.8				56.3	56.3	57.4	58.8				43.4	52.3	57.5	57.3			
Bankfull Mean Depth (ft)	0.8	0.7	0.6	0.6				1.2	0.9	0.8	0.9				0.8	0.2	0.3	0.3				0.8	0.6	0.7	0.6				1.2	1.1	1.2	1.4			
Bankfull Max Depth (ft)	1.1	1.5	1.3	1.2				2.2	1.7	1.5	1.6				1.1	1.2	1.1	1.1				1.1	1.1	1.2	1.2				2.2	2.8	2.8	2.9			
Bankfull Cross Sectional Area (ft^2)	8.0	45.6	39.8	36.4				18.5	7.2	6.1	6.2				8.0	13.2	12.9	9.3				8.0	7.9	9.3	9.3				18.5	12.7	13.2	14.2			
Bankfull Width/Depth Ratio	12.0	95.2	99.7	119.8				12.2	9.4	9.4	7.7				12.0	271.1	202.9	149.6				12.0	21.2	18.5	22.7				12.2	11.2	9.1	6.9			
Bankfull Entrenchment Ratio	7.9	1.3	1.3	1.3				7.6	11.6	12.4	13.2				11.4	2.0	2.3	3.2				5.5	4.4	4.4	4.1				2.9	4.4	5.2	5.8			
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0				1.0	1.3	1.5	1.5				1.0	1.3	1.1	1.0				1.0	1.0	1.0	1.1				1.0	1.2	1.3	1.0			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)			<0.062	0.15						<0.062	<0.062						16	20.95						8	41.75						<0.062	20.4			

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Exhibit Table 11b.1 Monitoring Data - Stream Reach Data Summary
Meredell Farm Stream Restoration Site/247 - Reach: UT1b (780 feet)

Parameter	Baseline (Design)						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)			7.3						8.9						8.7						8.1															
Floodprone Width (ft)			71.1						71.1						71.1						63.7															
Bankfull Mean Depth (ft)			0.6						0.4						0.4						0.5															
[1]Bankfull Max Depth (ft)			0.8						0.7						0.7						0.7															
Bankfull Cross Sectional Area (ft[2])			4.5						3.8						3.8						3.6															
Width/Depth Ratio			12.0						21.3						19.9						17.9															
Entrenchment Ratio			9.7						7.9						8.2						7.9															
[1]Bank Height Ratio			1.0						1.4						1.4						1.4															
Profile																																				
Riffle Length (ft)																																				
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max depth (ft)																																				
Pool Spacing (ft)																																				
Pattern																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																																				
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification																																				
Channel Thalweg length (ft)																																				
Sinuosity (ft)																																				
Water Surface Slope (Channel) (ft/ft)																																				
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

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 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Exhibit Table 11b.2 Monitoring Data - Stream Reach Data Summary
Meredell Farm Stream Restoration Site/247 - Reach: UT2 (294 feet)

Parameter	Baseline (Design)						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)			7.3						10.0						8.4						13.1															
Floodprone Width (ft)			110.8						110.8						110.8						116.4															
Bankfull Mean Depth (ft)			0.6						0.8						0.6						0.7															
[1]Bankfull Max Depth (ft)			0.8						1.5						1.2						1.5															
Bankfull Cross Sectional Area (ft[2])			4.5						8.2						5.2						9.2															
Width/Depth Ratio			12.0						12.2						13.6						18.7															
Entrenchment Ratio			15.2						11.1						13.1						8.9															
[1]Bank Height Ratio			1.0						1.3						1.4						1.0															
Profile																																				
Riffle Length (ft)																																				
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max depth (ft)																																				
Pool Spacing (ft)																																				
Pattern																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																																				
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification																																				
Channel Thalweg length (ft)																																				
Sinuosity (ft)																																				
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BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%																																				
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[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

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 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

Exhibit Table 11b.3 Monitoring Data - Stream Reach Data Summary
Meredell Farm Stream Restoration Site/247 - Reach: M1 (3200 feet)

Parameter	Baseline (Design)						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	10.2	10.2	10.2	10.2	0.0	3	12.9	46.1	59.6	65.7	28.9	3	13.1	42.2	50.7	62.8	25.9	3	14.5	39.4	37.7	66.0	25.8	3												
Floodprone Width (ft)	56.3	84.5	80.8	116.4	30.2	3	56.3	86.1	83.6	118.3	31.1	3	57.4	86.4	83.6	118.3	30.5	3	58.8	86.7	83.6	117.8	29.6	3												
Bankfull Mean Depth (ft)	0.8	3.2	0.8	8.0	4.2	3	0.2	0.5	0.6	0.7	0.3	3	0.3	0.5	0.6	0.7	0.2	3	0.3	0.5	0.6	0.6	0.2	3												
[1]Bankfull Max Depth (ft)	0.8	1.0	1.1	1.1	0.2	3	1.1	1.3	1.2	1.5	0.2	3	1.1	1.2	1.2	1.3	0.1	3	1.1	1.2	1.2	1.2	0.1	3												
Bankfull Cross Sectional Area (ft^2)	1.1	5.7	8.0	8.0	4.0	3	7.9	22.2	13.2	45.6	20.4	3	9.3	20.7	12.9	39.8	16.6	3	9.3	18.4	9.4	36.4	15.6	3												
Width/Depth Ratio	12.0	12.0	12.0	12.0	0.0	3	21.2	129.1	95.2	271.1	128.4	3	18.5	107.0	99.7	202.9	92.4	3	22.7	97.9	120.1	150.8	66.9	3												
Entrenchment Ratio	5.5	8.3	7.9	11.4	3.0	3	1.3	2.5	2.0	4.4	1.6	3	1.3	2.7	2.3	4.4	1.5	3	1.3	2.8	3.1	4.0	1.4	3												
[1]Bank Height Ratio	1.0	1.0	1.0	1.0	0.0	3	1.0	1.0	1.0	1.0	0.0	3	1.0	1.0	1.0	1.0	0.0	3	1.0	1.0	1.0	1.1	0.1	3												
Profile																																				
Riffle Length (ft)																																				
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max depth (ft)																																				
Pool Spacing (ft)																																				
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Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Additional Reach Parameters																																				
Rosgen Classification																																				
Channel Thalweg length (ft)																																				
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Water Surface Slope (Channel) (ft/ft)																																				
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APPENDIX E
HYDROLOGIC DATA

Table 12. Verification of Bankfull Events Meredell Farm Stream Restoration Site/247			
Date of Data Collection	Date of Occurrence	Method	Photo # (if available)
8/4/2010	N/A	Crest Gage Reading: 1.96' above WS	SP1