FINAL

ANNUAL MONITORING REPORT
YEAR 5 (2013)
BRILES STREAM RESTORTION SITE
RANDOLPH COUNTY, NORTH CAROLINA
(EEP Project No. 047, Contract No. 004809)
Construction Completed November 2007

Submitted to:
North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
Raleigh, North Carolina

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Prepared by:
Axiom Environmental, Inc.
218 Snow Avenue
Raleigh, North Carolina 27603

Axiom Environmental, Inc.

Ecosystem Enhancement PROGRAM

January 2014

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1.0 EXECUTIVE SUMMARY

The Briles Stream Restoration Site (hereafter referred to as the "Site) is situated within the US Geological Survey (USGS) hydrologic unit 03040103 and NC Division of Water Quality (NCDWQ) Priority Sub-basin 03-07-09 of the Yadkin-Pee Dee River Basin. The Site is located on an 87-acre parcel owned by Mr. and Mrs. Kenneth Briles. It is located southeast of the intersection of Ross Wood Road and Pleasant Grove Road in Trinity, Randolph County, North Carolina. The primary land uses on the property include rangeland (pasture), a chicken egg farm, and forest. The Site stream, Unnamed Tributary to Jackson Creek (UTJC), became impaired due to poor grazing management and human impacts. This report (compiled based on NC Ecosystem Enhancement Program (NCEEP) *Procedural Guidance and Content Requirements for EEP Monitoring Reports* Version 1.4 dated 11/7/11) summarizes data for Year 5 (2013) monitoring.

The project goals are to:

- Restore stable channel morphology capable of moving flows and sediment provided by its watershed.
- Restore riparian habitat and functions.
- Improve water quality and reduce land and riparian vegetation loss resulting from lateral erosion and bed degradation.
- Improve aquatic and terrestrial habitat.

The above project goals were achieved through the following project objectives:

- Build appropriate C4 and B4c channels with stable channel dimensions.
- Plant a functional Bottomland Hardwood Forest community to create an effective riparian buffer.
- Exclude livestock from riparian areas.
- Preserve portions of the Site that currently function as a stable riverine system.

During Year 5 (2013) monitoring eight vegetation plots were sampled. Overall, the Site met or exceeded vegetation success criteria, with an average of 374 planted stems-per-acre (excluding live-stakes). Six of the eight plots met or exceeded the success criteria of 260 stems-per-acre (minimum stem count after 5 years). Vegetation Plots 2 and 7 were each below success criteria. When counting natural recruits of silky dogwood (*Cornus amomum*), vegetation plot 2 exceeded success criteria. Decreasing planted stem counts may be attributed to competition from an increasing density of blackberry (*Rubus* sp.), particularly along reaches UTJC1 and UTJC3, in and adjacent to Vegetation Plots 3, 4, 7, and 8.

Due to low stem densities along restored channel banks, a supplemental planting occurred December 30, 2011. These trees appear to be vigorous with a moderate to high survival rate, though sections of the bench remain relatively bare and have been identified as vegetation areas of concern (depicted on Figure 2 [Appendix B] and described in the table below). In addition, dense blackberry (*Rubus* sp.) occurs throughout the site, shading out many of the planted stems.

Vegetation Areas of Concern

Map Identifier	Feature/Issue
VAC1	Bare bench and low stem density on the right bank of UTJC2
VAC2	Low stem density on the right bank of UTJC2
VAC3	Low stem density on the left bank of UTJC1
VAC4	Low stem density on the right bank of UTJC1; several *Pinus taeda* individuals have established here, but planted stem density is low
VAC5	Bare bench and low stem density on the right bank of UTJC1
VAC6	Low stem density on the right bank of UTJC1
VAC7	Bare bench and low stem density on the left bank of UTJC1; woody vegetation was replanted, but area remains bare.

A visual assessment and geomorphic survey were completed for Site streams, and indicated that the project reaches were performing within established success criteria as outlined below. No significant bank erosion was recorded, and the geomorphic measurements are within the range of design parameters. The forded crossing on reach UTJC Reach 1 was stable and performing as constructed. One bankfull event was documented during the year 5 (2013) monitoring period. Two bankful events were previously documented during the 2010 and 2011 monitoring seasons for a total of 3 bankfull events over the five-year monitoring period.

Stream Success Criteria (from approved Mitigation Plan 2008):

- Little or no change from the as-built cross-sections.
- Pools shall maintain design depths with lower water surface slopes, while the riffles should remain shallower with steeper water surface slopes.
- Sediment transport shall remain relatively unchanged with respect to aggradation and deposition of sediments.
- There should be no visual indicators of instability.
- A minimum of two bankfull events must occur in separate years within the five-year monitoring.

Five small easement encroachment areas were identified at the Site. These are identified on Figure 2 (Appendix B).

Encroachment Areas

Map Identifier	Issue
Encroachment Areas 1, 2	Agricultural fields extend into the easement; no fencing is present and boundary markers are not visible
Encroachment Areas 3, 4, 5	Constructed fence extends into the easement

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in tables and figures within this report's appendices. Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly the Restoration Plan) documents available on the NCEEP website. All raw data supporting the tables and figures in the appendices is available from NCEEP upon request.

2.0 METHODOLOGY

2.1 Vegetation Assessment

Eight vegetation plots were established and marked after construction with one half-inch metal conduit and pin flags. The plots are 10-meters square and are located randomly within the Site. These plots were surveyed in September for the Year 5 (2013) monitoring season using the *CVS-EEP Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008) (http://cvs.bio.unc.edu/methods.htm); results are included in Appendix C. The taxonomic standard for vegetation used for this document was *Flora of the Southern and Mid-Atlantic States* (Weakley 2012).

2.2 Stream Assessment

Annual stream monitoring was conducted in December 2013 for the Year 5 (2013) monitoring season. Five permanent cross-sections, three riffle and two pool, were established and will be used to evaluate stream dimension; locations are depicted on Figure 2 (Appendix B). Cross-sections are permanently monumented with one half-inch by 4-foot PVC posts at each end point. Cross-sections were surveyed to provide a detailed measurement of the stream and banks including points on the adjacent floodplain, top of bank, bankfull, breaks in slope, edge of water, and thalweg. Data will be used to calculate width-depth ratios, entrenchment ratios, and bank height ratios for each cross-section. In addition, photographs and pebble counts will be conducted at each permanent cross-section location annually.

Two monitoring reaches totaling approximately 1700-linear feet were established and will be used to evaluate stream pattern and longitudinal profile; locations are depicted on Figure 2 (Appendix B). Longitudinal profile measurements include average water surface slopes, facet slopes, and pool-to-pool spacing. Twenty-three permanent photo points were established throughout the restoration reach; locations are depicted on Figure 2 (Appendix B). In addition, visual stream morphology stability assessments were completed in each of the monitoring reaches to assess the channel bed, banks, and in-stream structures.

3.0 REFERENCES

Lee, Michael T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Version 4.2. (online). Available: http://cvs.bio.unc.edu/methods.htm.

Weakley, Alan S. 2012. Flora of the Southern and Mid-Atlantic States. Available online at: http://www.herbarium.unc.edu/WeakleysFlora.pdf [September 28, 2012]. University of North Carolina Herbarium, North Carolina Botanical Garden, University of North Carolina, Chapel Hill, North Carolina.

Weather Underground. 2013. Station at Asheboro Airport, North Carolina. (online). Available: http://www.wunderground.com/history/airport/KHBI/2013/2/1/CustomHistory.html?dayend=6&monthend=6&yearend=2013&req_city=NA&req_state=NA&req_statename=NA [June 7, 2013]. Weather Underground.

APPENDIX A

PROJECT VICINITY MAP AND BACKGROUND TABLES

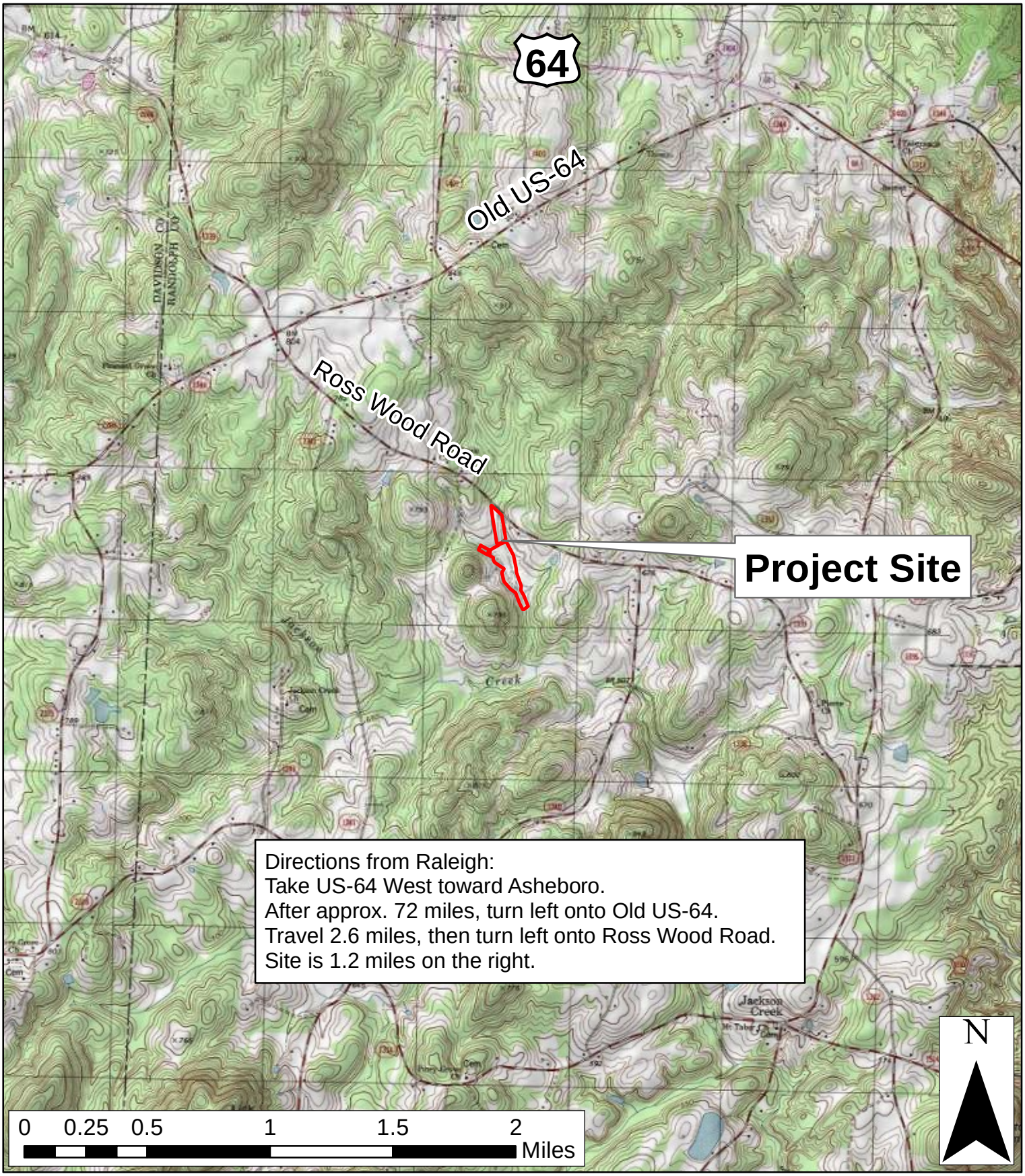
Figure 1. Site Location Map

Table 1. Project Components and Mitigation Credits

Table 2. Project Activity and Reporting History

Table 3. Project Contacts Table

Table 4. Project Attributes Table



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SITE LOCATION MAP
BRILES CREEK SITE
EEP PROJECT NUMBER 047
Randolph County, North Carolina

Dwn. by.
KRJ

Date:
October 2012

Project:
12-004.12

FIGURE
1

Table 1. Project Components and Mitigation Credits
Briles Stream Restoration Site (EEP Project Number 047)

Mitigation Credits							
	Stream		Riparian Wetland			Buffer	
Type	Restoration	Restoration Equivalent	Restoration	Restoration Equivalent			
Totals	1787	594	--	--		--	
Projects Components							
Project Component/ Reach ID	Station Range	Existing Linear Footage/ Acreage	Priority Approach	Restoration/ Restoration Equivalent	Restoration Linear Footage/ Acreage	Mitigation Ratio	Comment
UTJC1	10+00– 24+25	1358	P2	Restoration	1425	1:1	.
UTJC2	24+47– 28+09	355	P3	Restoration	362	1:1	
UTJC3	50+00- 58+17	784	P3	Enhancement 1	817	1.5:1	
UTJC4	28+88- 33+96	508	--	Preservation	508	5:1	
Component Summation							
Restoration Level		Stream (linear footage)		Riparian Wetland (acres)		Buffer (square footage)	
Restoration		1787		--		--	
Enhancement I		817				--	
Preservation		508					
Totals		3112		--		--	
Mitigation Units		2381 SMUs		--		--	

Table 2. Project Activity and Reporting History
Briles Stream Restoration Site (EEP Project Number 047)

Elapsed Time Since Grading Complete: 5 years 1 month
Elapsed Time Since Planting Complete: 5 years 1 month
Number of Reporting Years: 4

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Restoration Plan	2003/2004	December 2005
Final Design – Construction Plans		September 2006
Construction		November 2007
Containerized, bare root and B&B plantings		November 2007
Mitigation Plan / As-built (Year 0 Monitoring – baseline)	December 2007	January 2008
Year 1 Monitoring (2009)	March 2009	November 2009
Year 2 Monitoring (2010)	October 2010	January 2011
Year 3 Monitoring (2011)	August 2011	November 2011
Supplemental Planting		December 2011
Year 4 Monitoring (2012)	November 2012	December 2012
Year 5 Monitoring (2013)	December 2013	January 2014

Table 3. Project Contacts Table
Briles Stream Restoration Site (EEP Project Number 047)

Designer	KCI Associates of NC Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Adam Spiller (919) 783-9214
Construction Contractor	L-J, Inc. 220 Stoneridge Drive, Suite 405, Columbia, SC 29210 Richard Goodwin (803) 929-1181
Survey Contractor	KCI Associates of NC Landmark Center II, Suite 220 4601 Six Forks Rd., Raleigh, NC 27609 Adam Spiller (919) 783-9214
Planting Contractor	Habitat Assessment and Restoration Program, Inc. 9305-D Monroe Road, Charlotte, NC 28270 Alan Peoples (704) 945-0881
Seed Mix Source	Evergreen Seed Company (919) 567-1333
Nursery Stock Suppliers	Foggy Mountain Nursery (919) 524-5304
Baseline Data Collection and Years 1-3 Monitoring Performers	Kimley-Horn and Associates, Inc. 3001 Weston Parkway, Cary, NC 27513 Daren Pait (919) 677-2000
Year 4 - 5 Monitoring Performer	Axiom Environmental, Inc. 218 Snow Avenue, Raleigh, NC 27603 Grant Lewis 919-215-1693

Table 4. Project Attribute Table
Briles Stream Restoration Site (EEP Project Number 047)

Project Information		
Project Name	Briles Stream Restoration Site	
Project County	Randolph	
Project Area	13.4 acres	
Project Watershed Summary Information		
Physiographic Region	Piedmont	
Ecoregion	Carolina Slate Belt	
Project River Basin	Yadkin	
USGS 8-digit HUC	03040103	
USGS 14-digit HUC	03040103050030	
NCDWQ Subbasin	03-07-09	
Project Drainage Area	0.6 square miles	
Project Drainage Area Impervious Surface	<1%	
Watershed Type	Rural	
Reach Summary Information		
Parameters	**Reach UTJC1**	**Reach UTJC2**
Restored/Enhanced Length (linear feet)	1425	362
Drainage Area (square miles)	0.4	0.6
NCDWQ Index Number	13-2-2	13-2-2
NCDWQ Classification	C	C
Valley Type/Morphological Description	VIII/C4	VIII/B4c
Dominant Soil Series	Georgeville Silt Loam	
Drainage Class	Well Drained	
Soil Hydric Status	Nonhydric	
Slope	0.0090	
FEMA Classification	Zone C	
Percent Composition of Exotic Invasives	<5	
Regulatory Considerations		
Regulation	**Applicable**	
Waters of the U.S. –Sections 404 and 401	Yes-Received Appropriate Permits	
Endangered Species Act	No	
Historic Preservation Act	No	
CZMA/CAMA	No	
FEMA Floodplain Compliance	No	
Essential Fisheries Habitat	No	

APPENDIX B

VISUAL ASSESSMENT DATA

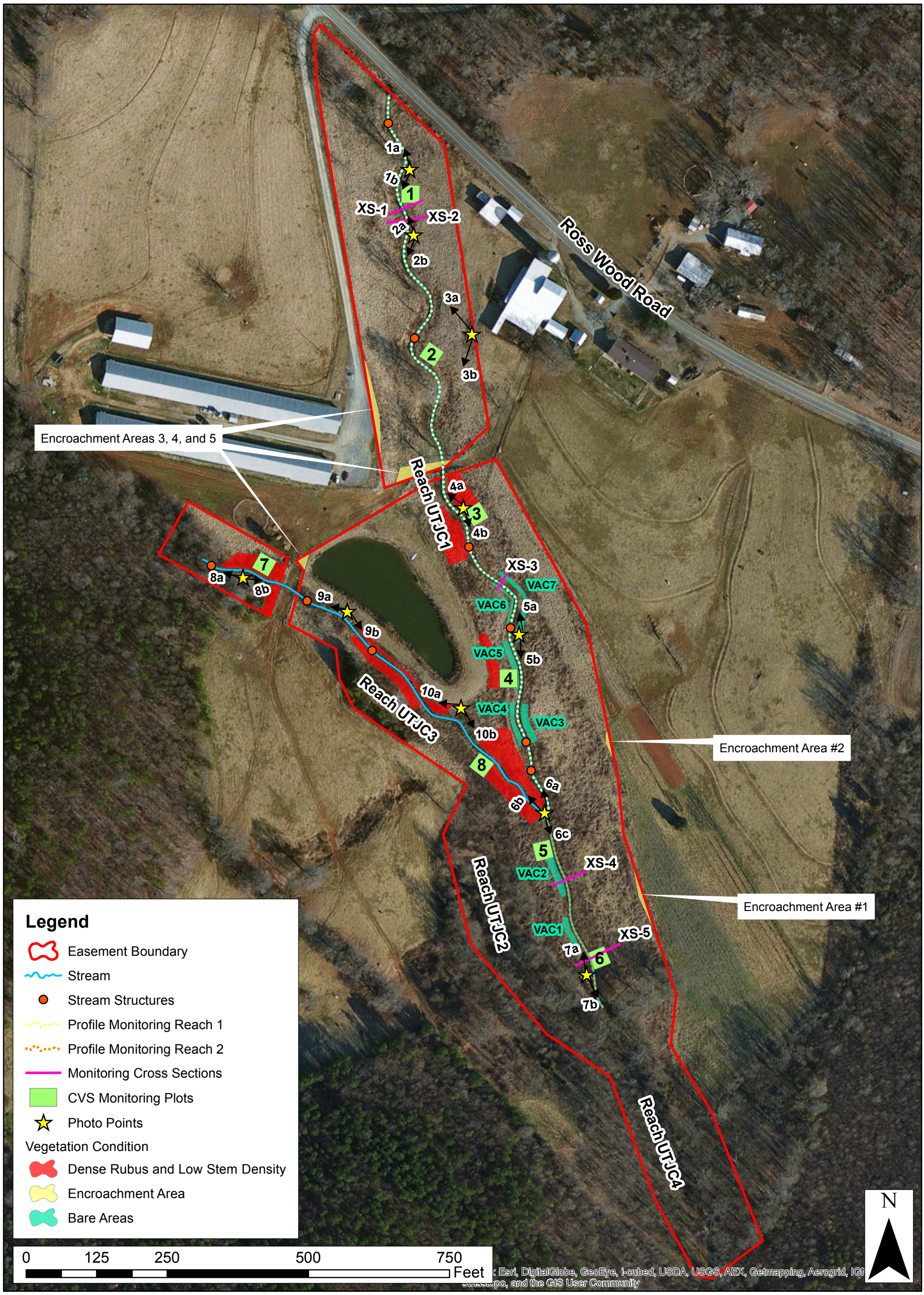
Figure 2. Monitoring Plan View

Tables 5A-5D. Visual Stream Morphology Stability Assessment

Table 6. Vegetation Condition Assessment Table

Stream Fixed-Station Photographs

Vegetation Monitoring Photographs



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CURRENT CONDITION PLAN VIEW
BRILES CREEK SITE
EEP PROJECT NUMBER 047
Randolph County, North Carolina

Dwn. by. KRJ	FIGURE 2
Date: November 2013	
Project: 12-004.12	

Table 5A **Visual Stream Morphology Stability Assessment**
Reach ID **Reach UTJC1**
Assessed Length **1425**

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	12	12			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	12	12			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	12	12			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	12	12			100%			
		2. Thalweg centering at downstream of meander (Glide)	12	12			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			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.	6	6			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	6	6			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	6	6			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)	6	6			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	6	6			100%			

Table 5B **Visual Stream Morphology Stability Assessment**
Reach ID **Reach UTJC2**
Assessed Length **362**

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	2	2			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	2	2			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	2	2			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	2	2			100%			
		2. Thalweg centering at downstream of meander (Glide)	2	2			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.	--	--			N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	--	--			N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	--	--			N/A			
	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)	--	--			N/A			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	--	--			N/A			

Table 5C **Visual Stream Morphology Stability Assessment**
Reach ID **Reach UTJC3**
Assessed Length **817**

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	7	7			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	7	7			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	7	7			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	7	7			100%			
		2. Thalweg centering at downstream of meander (Glide)	7	7			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.	4	4			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	4			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)	4	4			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	4	4			100%			

Table 5D **Visual Stream Morphology Stability Assessment**
Reach ID **Reach UTJC4**
Assessed Length **508**

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	--	--			N/A			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	--	--			N/A			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	--	--			N/A			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	--	--			N/A			
		2. Thalweg centering at downstream of meander (Glide)	--	--			N/A			
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.	--	--			N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	--	--			N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	--	--			N/A			
	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)	--	--			N/A			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	--	--			N/A			

Table 6 Vegetation Condition Assessment

Planted Acreage[1] **8.8**

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	Torquoise	7	0.14	1.6%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	Red	9	0.62	7.0%
			Total	16	0.76	8.6%
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	NA	0	0.00	0.0%
			Cumulative Total	16	0.76	8.6%

Easement Acreage[2] **14**

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	NA	0	0.00	0.0%
5. Easement Encroachment Areas[3]	Areas or points (if too small to render as polygons at map scale).	none	Yellow	5	0.11	1.3%

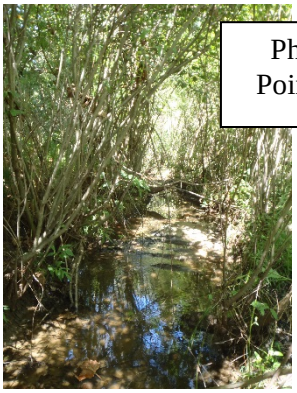
1 = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project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

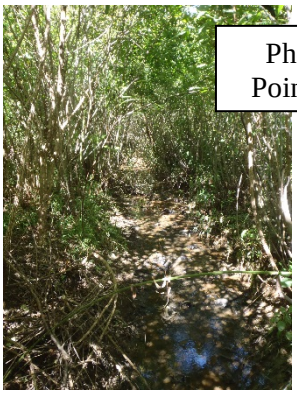
2 = The acreage within the easement boundaries.

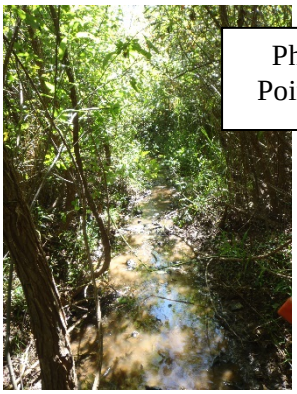
3 = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e.,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

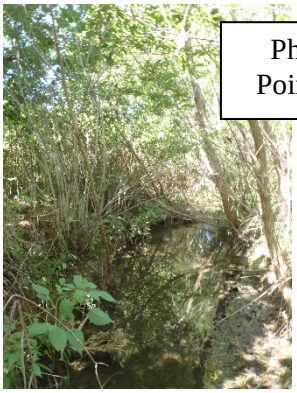
Briles Creek
Stream Fixed-Station Photographs
Taken September 2013

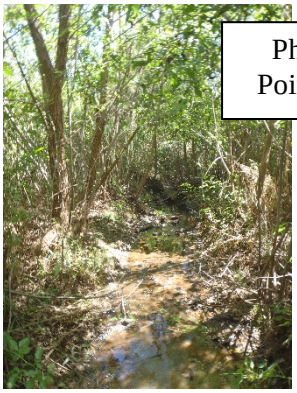


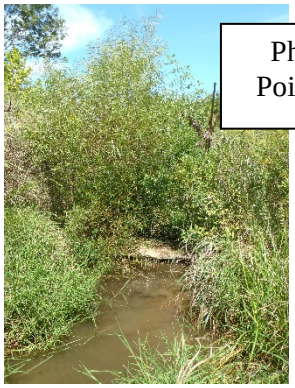


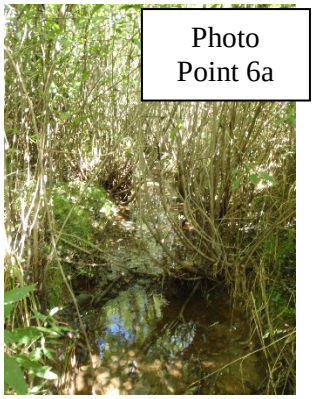


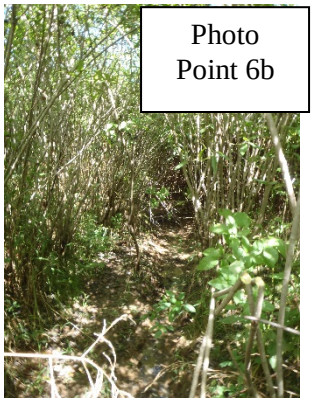
Briles Creek
Stream Fixed-Station Photographs
Taken September 2013
(continued)



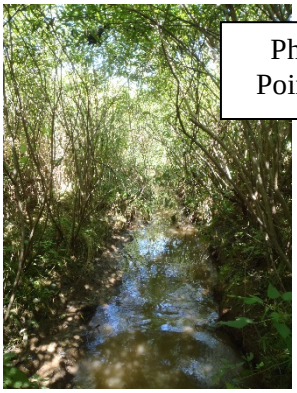


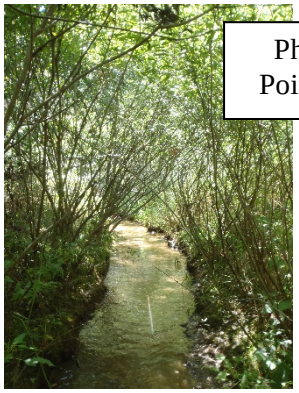




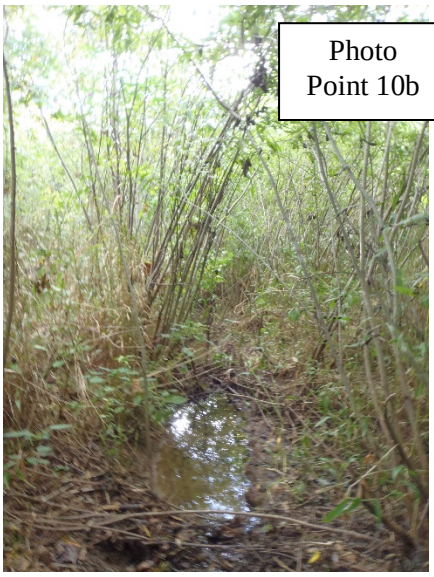


Briles Creek
Stream Fixed-Station Photographs
Taken September 2013
(continued)





Briles Creek
Stream Fixed-Station Photographs
Taken September 2013
(continued)



Briles Creek
Vegetation Monitoring Photographs
Taken September 2013

Briles Creek
Vegetation Monitoring Photographs
Taken September 2013
(continued)

APPENDIX C

VEGETATION PLOT DATA

Table 7. Vegetation Plot Criteria Attainment

Table 8. CVS Vegetation Plot Metadata

Table 9. Total and Planted Stems by Plot and Species

Table 7. Vegetation Plot Criteria Attainment Based on Planted Stems
Briles Stream Restoration Site (EEP Project Number 047)

Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	75%
2	No*	
3	Yes	
4	Yes	
5	Yes	
6	Yes	
7	No	
8	Yes	

*Based on planted stems alone, this plot doesn't meet success criteria; however, when including naturally recruited stems of silky dogwood (*Cornus amomum*) these plots were well-above 260 stems per acre.

Table 8. CVS Vegetation Plot Metadata
Briles Stream Restoration Site (EEP Project Number 047)

Report Prepared By	Corri Faquin
Date Prepared	9/13/2013 12:10
database name	Axiom-EEP-2013-A-v2.3.1.mdb
database location	\\AE-SBS\RedirectedFolders\pperkinson\Desktop
computer name	PHILLIP-PC
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	47
project Name	Briles
Description	Stream Restoration in Randolph county, North Carolina
River Basin	Yadkin-Pee Dee
length(ft)	2628
stream-to-edge width (ft)	50
area (sq m)	24412.45
Required Plots (calculated)	8
Sampled Plots	8

Table 9. Total and Planted Stems by Plot and Species

Briles Creek - EEP Project Code 47

			Current Plot Data (MY5 2013)																						
			E47-01-0001			E47-01-0002			E47-01-0003			E47-01-0004			E47-01-0005			E47-01-0006			E47-01-0007			E47-01-0008		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Alnus serrulata	hazel alder	Shrub										1	1	1											
Betula nigra	river birch	Tree	2	2	2	2	2	2	3	3	3				1	1	1									
Callicarpa americana	American beautyberry	Shrub										1	1	1				1	1	1						
Celtis laevigata	sugarberry	Tree	6	6	6																					
Celtis occidentalis	common hackberry	Tree																1	1	1						
Cercis canadensis	eastern redbud	Tree																			1	1	1			
Cornus amomum	silky dogwood	Shrub	2	3	3	2	3	3								5	5	1	1	1		1	1	4	4	4
Diospyros virginiana	common persimmon	Tree										1	1	1				2	2	2						
Fraxinus nigra	black ash	Tree	1	1	1																					
Fraxinus pennsylvanica	green ash	Tree	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	5	5	5				2	2	2
Juglans	walnut	Tree																								
Juglans nigra	black walnut	Tree																			2	2	2			
Liriodendron tulipifera	tuliptree	Tree	2	2	2				2	2	2	1	1	1	2	2	2									
Platanus occidentalis	American sycamore	Tree										2	2	2												
Prunus serotina	black cherry	Tree										1	1	1												
Quercus pagoda	cherrybark oak	Tree							1	1	1	1	1	1	1	1	1	2	2	2				1	1	1
Quercus phellos	willow oak	Tree																								
Salix nigra	black willow	Tree					1	1					1	1										5	5	5
Salix sericea	silky willow	Shrub					2	2					2	2								1	1			
Sambucus canadensis	Common Elderberry	Shrub																						1	1	1
Sambucus nigra	European black elderberry	Shrub																						1	1	1
Ulmus americana	American elm	Tree							1	1	1															
		Stem count	14	15	15	5	9	9	9	9	9	10	13	13	7	12	12	12	12	12	3	5	5	14	14	14
		size (ares)	1			1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	6	6	6	3	5	5	5	5	5	8	10	10	4	5	5	6	6	6	2	4	4	6	6	6
		Stems per ACRE	566.6	607	607	202.3	364.2	364.2	364.2	364.2	364.2	404.7	526.1	526.1	283.3	485.6	485.6	485.6	485.6	485.6	121.4	202.3	202.3	566.6	566.6	566.6

Color for Density

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

Table 9. Total and Planted Stems by Plot and Species (continued)

Briles Creek - EEP Project Code 47

			Annual Means																	
			MY5 (2013)			MY4 (2012)			MY3 (2010)			MY2 (2009)			MY1 (2008)			MY0 (2007)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Alnus serrulata	hazel alder	Shrub	1	1	1	1	1	1												
Betula nigra	river birch	Tree	8	8	8	8	8	8	7	7	7	7	7	7	15	15	15	15	15	15
Callicarpa americana	American beautyberry	Shrub	2	2	2	2	2	2												
Celtis laevigata	sugarberry	Tree	6	6	6	6	6	6												
Celtis occidentalis	common hackberry	Tree	1	1	1	1	1	1												
Cercis canadensis	eastern redbud	Tree	1	1	1	2	2	2												
Cornus amomum	silky dogwood	Shrub	9	17	17	9	18	18	5	16	16	17	35	35	19	45	45	19	44	44
Diospyros virginiana	common persimmon	Tree	3	3	3	3	3	3												
Fraxinus nigra	black ash	Tree	1	1	1	1	1	1	1	1	1	1	1	1				1	1	1
Fraxinus pennsylvanica	green ash	Tree	16	16	16	15	15	15	13	13	13	16	16	16	27	27	27	26	26	26
Juglans	walnut	Tree							1	1	1									
Juglans nigra	black walnut	Tree	2	2	2	2	2	2												
Liriodendron tulipifera	tuliptree	Tree	7	7	7	7	7	7	3	3	3	3	3	3	8	8	8	8	8	8
Platanus occidentalis	American sycamore	Tree	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3
Prunus serotina	black cherry	Tree	1	1	1	1	1	1												
Quercus pagoda	cherrybark oak	Tree	6	6	6	6	6	6	3	3	3	8	8	8	11	11	11	11	11	11
Quercus phellos	willow oak	Tree													2	2	2	2	2	2
Salix nigra	black willow	Tree	5	7	7	5	7	7	5	7	7		3	3		4	4		3	3
Salix sericea	silky willow	Shrub		5	5		7	7		9	9		12	12		10	10		11	11
Sambucus canadensis	Common Elderberry	Shrub	1	1	1	2	5	5		1	1	1	9	9		10	10		11	11
Sambucus nigra	European black elderberry	Shrub	1	1	1	1	1	1												
Ulmus americana	American elm	Tree	1	1	1	1	1	1												
		Stem count	74	89	89	75	96	96	40	63	63	55	96	96	85	135	135	85	135	135
		size (ares)	8			8			8			8			8			8		
		size (ACRES)	0.20			0.20			0.20			0.20			0.20			0.20		
		Species count	19	20	20	19	20	20	9	11	11	8	10	10	7	10	10	8	11	11
		Stems per ACRE	374.3	450.2	450.2	379.4	485.6	485.6	202.3	318.7	318.7	278.2	485.6	485.6	430	682.9	682.9	429.9785	682.907	682.907

Color for Density

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

APPENDIX D

STREAM SURVEY DATA

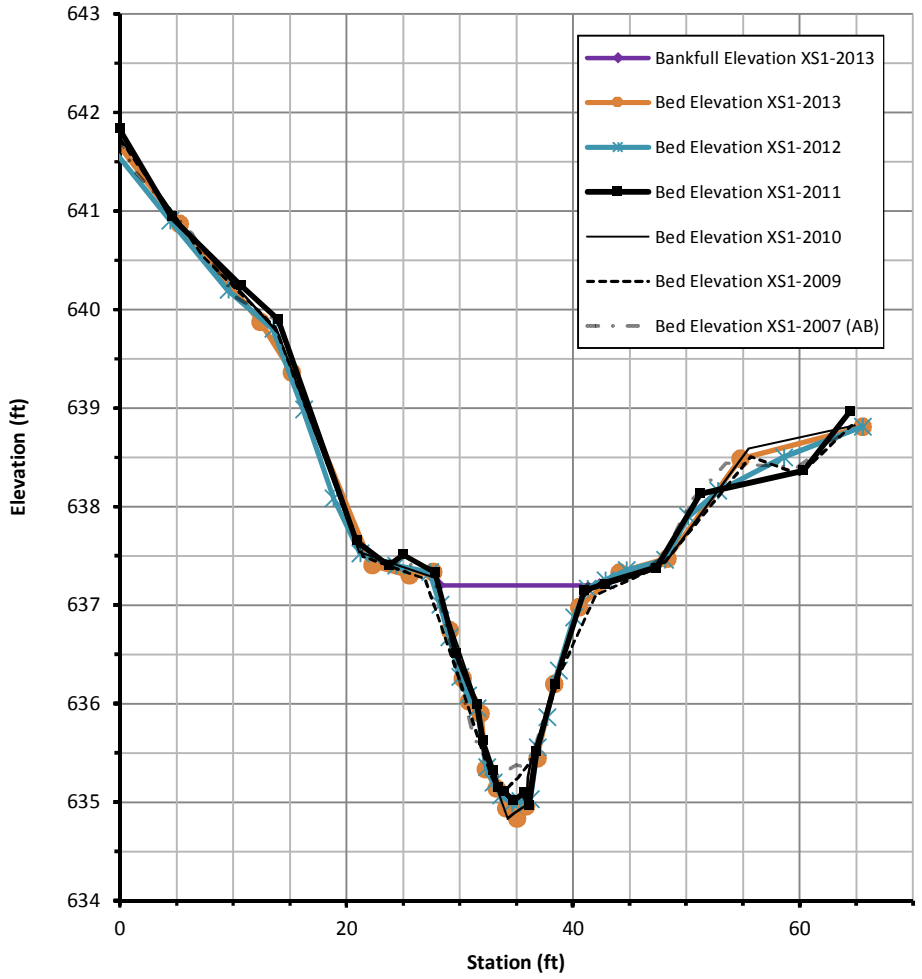
Cross-section Plots

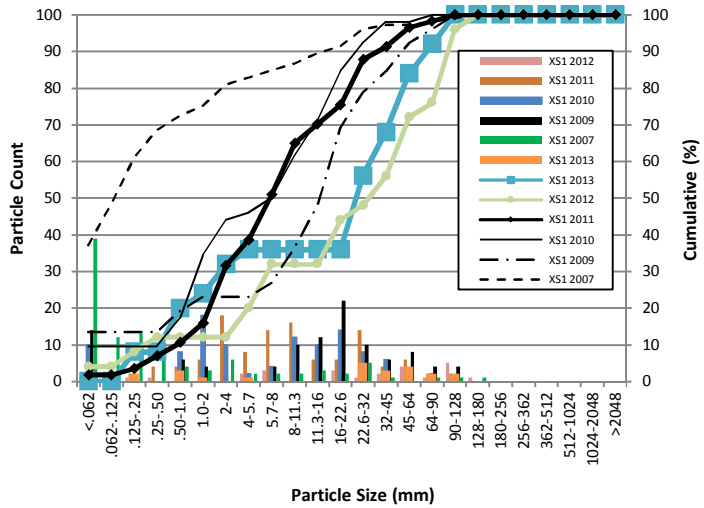
Longitudinal Profile Plots

Substrate Plots

Tables 10a-b. Baseline Stream Data Summary

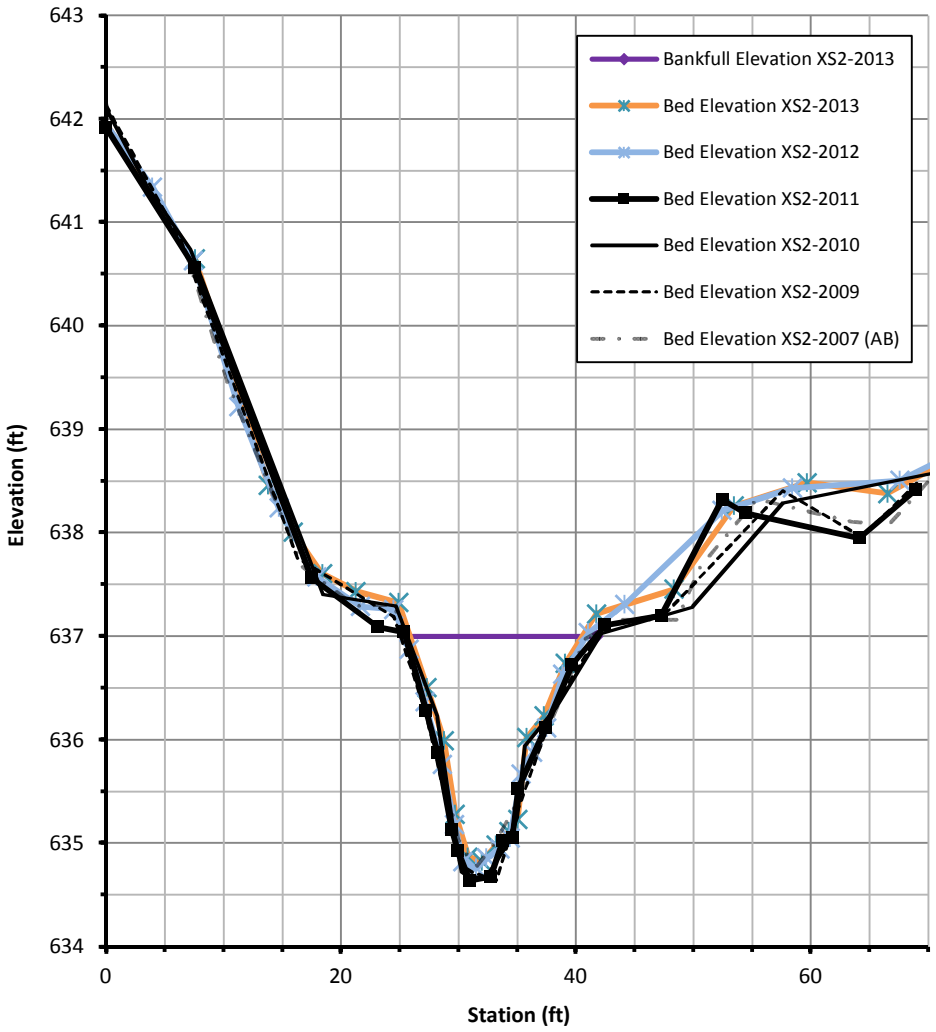
Tables 11a-b. Monitoring Data

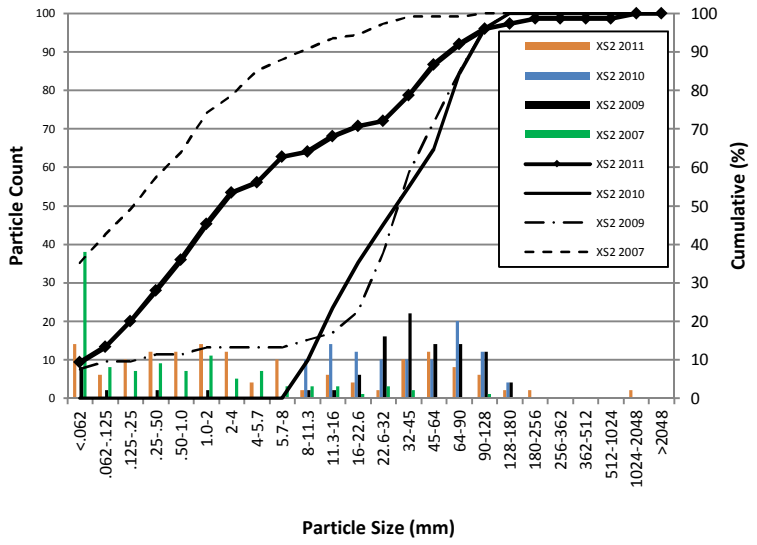




ID	Year	Phase	Facet Type	Wbkf	Abkf	Dbkf
XS1	2007	AB	Riffle	13.4	15.9	1.2
XS1	2009	MY1	Riffle	14.6	16	1.1
XS1	2010	MY2	Riffle	14.5	16.5	1.1
XS1	2011	MY3	Riffle	14.3	16.2	1.1
XS1	2012	MY4	Riffle	13.5	16.4	1.2
XS1	2013	MY4	Riffle	14.4	16.6	1.2

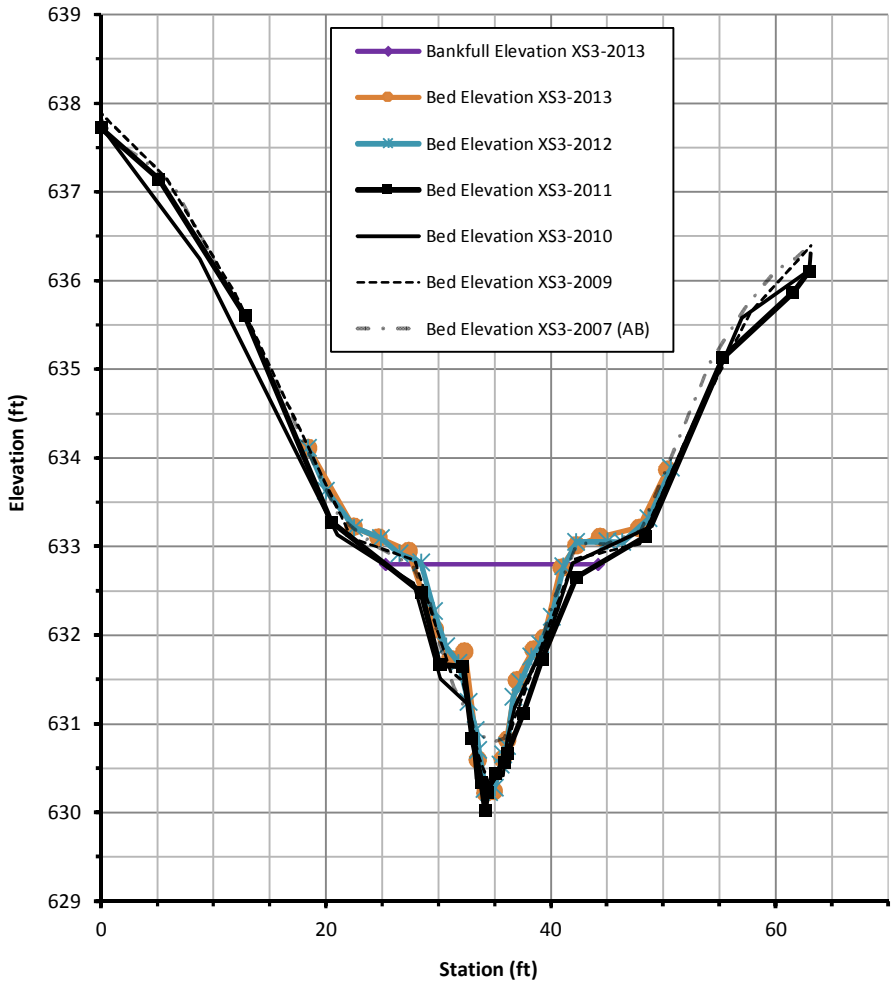
ID	Year	Phase	d50(mm)	d84(mm)
XS1	2007	AB	0.07	5.02
XS1	2009	MY1	11.73	31
XS1	2010	MY2	8	22.3
XS1	2011	MY3	7.84	29.15
XS1	2012	MY4	34.8	104
XS1	2013	MY5	28.6	64

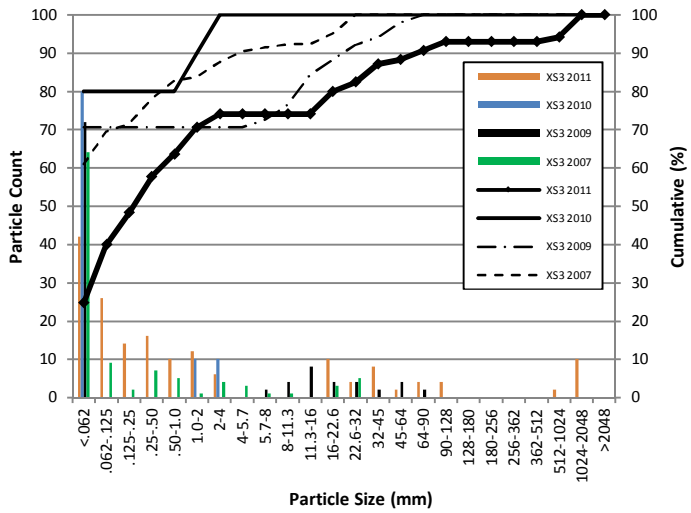




ID	Year	Phase	Facet Type	Wbkf	Abkf	Dbkf
XS2	2007	AB	Pool	15.9	18.9	1.2
XS2	2009	MY1	Pool	17.6	22.5	1.3
XS2	2010	MY2	Pool	16.6	19.4	1.2
XS2	2011	MY3	Pool	16.3	19.8	1.2
XS2	2012	MY4	Pool	19.4	23.2	1.2
XS2	2013	MY5	Pool	16.7	20.4	1.2

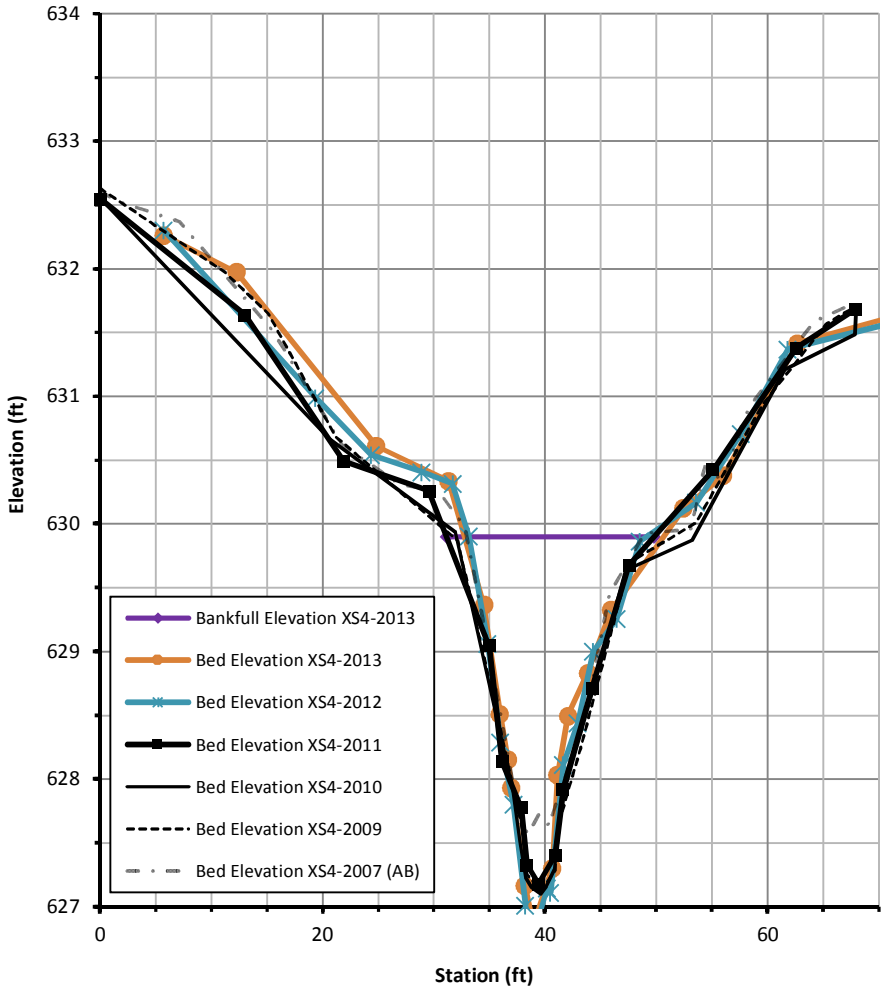
ID	Year	Phase	d50(mm)	d84(mm)
XS2	2007	AB	0.14	3.6
XS2	2009	MY1	28.2	62.7
XS2	2010	MY2	38.5	89.6
XS2	2011	MY3	3.2	57.7
XS2	2012	MY4	--	--
XS2	2013	MY5	--	--

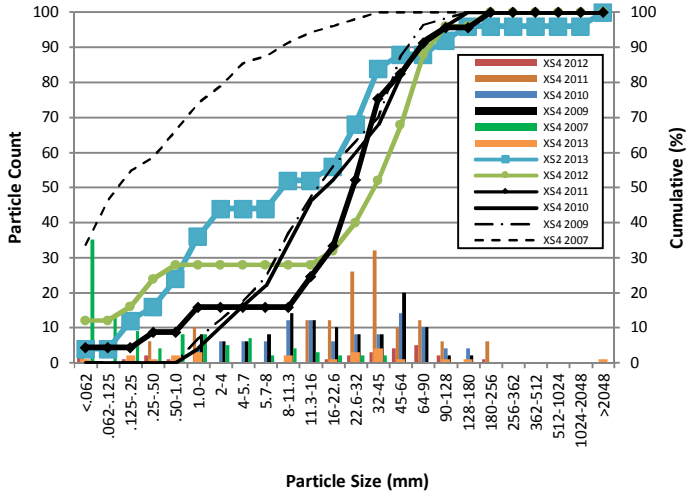




ID	Year	Phase	Facet Type	Wbkf	Abkf	Dbkf
XS3	2007	AB	Pool	14.2	16.2	1.1
XS3	2009	MY1	Pool	14.1	17.9	1.3
XS3	2010	MY2	Pool	13.6	16	1.2
XS3	2011	MY3	Pool	18.9	19.7	1
XS3	2012	MY4	Pool	12.9	16.1	1.3
XS3	2013	MY5	Pool	13.5	16.2	1.2

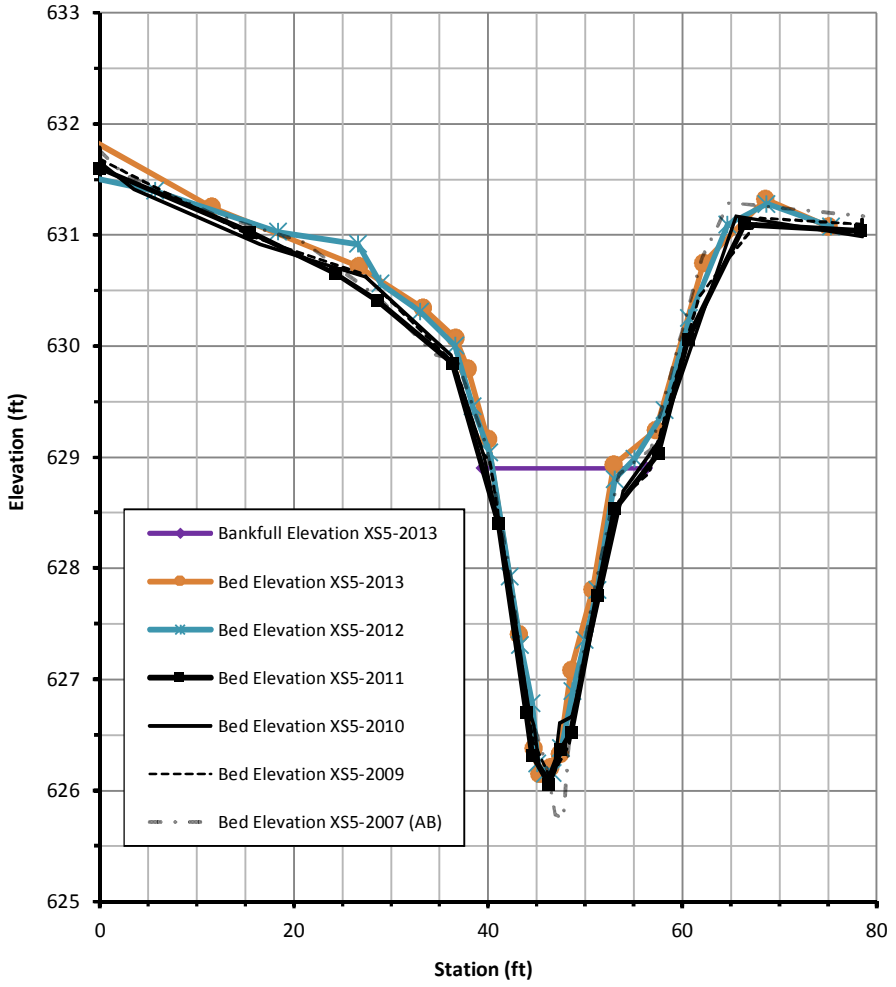
ID	Year	Phase	d50(mm)	d84(mm)
XS3	2007	AB	--	1.05
XS3	2009	MY1	--	11.2
XS3	2010	MY2	0.04	1.4
XS3	2011	MY3	0.3	36.6
XS3	2012	MY4	--	--
XS3	2013	MY5	--	--

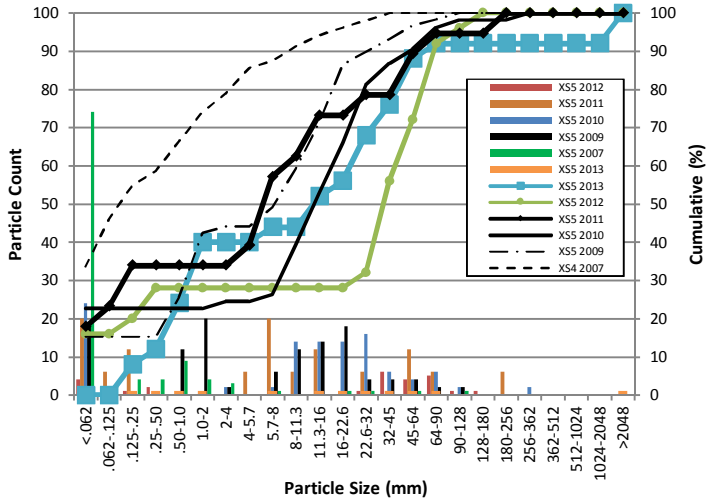




ID	Year	Phase	Facet Type	Wbkf	Abkf	Dbkf
XS4	2007	AB	Riffle	15.8	19.8	1.3
XS4	2009	MY1	Riffle	15	20.2	1.4
XS4	2010	MY2	Riffle	14.5	19.1	1.3
XS4	2011	MY3	Riffle	18.6	22.6	1.2
XS4	2012	MY4	Riffle	15.4	21.8	1.4
XS4	2013	MY5	Riffle	17.5	20.7	1.2

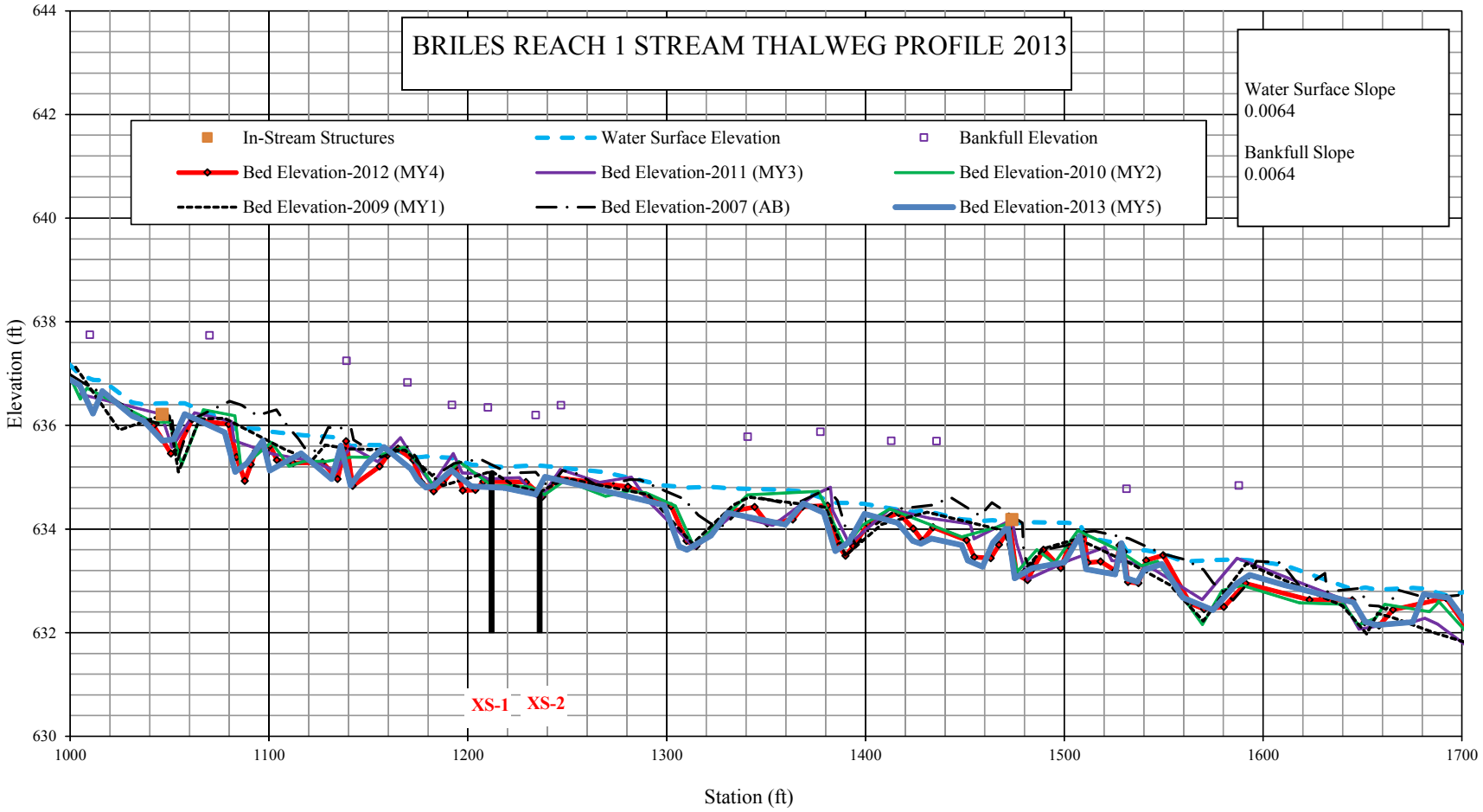
ID	Year	Phase	d50(mm)	d84(mm)
XS4	2007	AB	0.09	3.5
XS4	2009	MY1	12.7	42.2
XS4	2010	MY2	20.4	69.2
XS4	2011	MY3	30.9	68.2
XS4	2012	MY4	42.5	84
XS4	2013	MY5	9.4	42

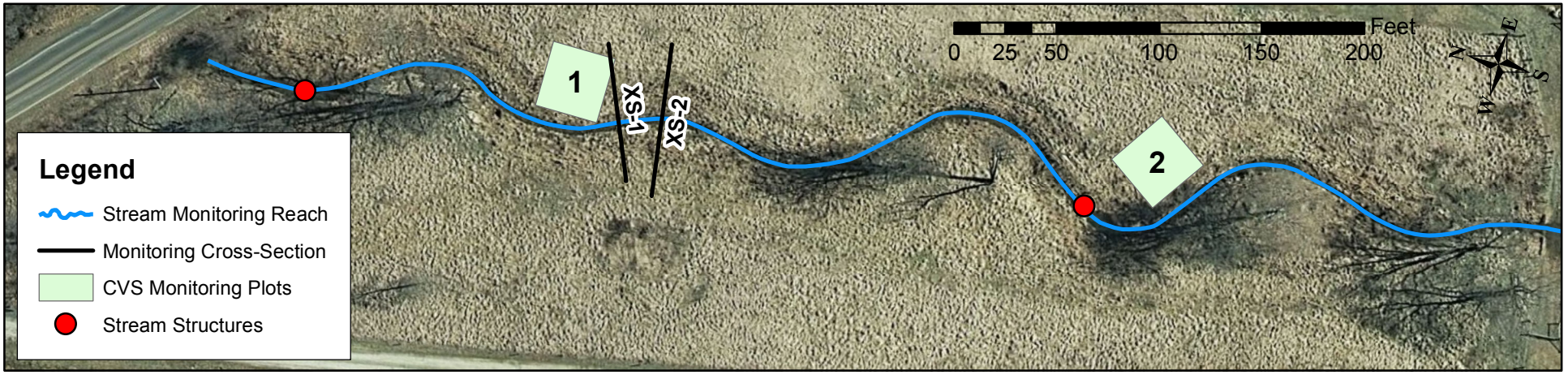


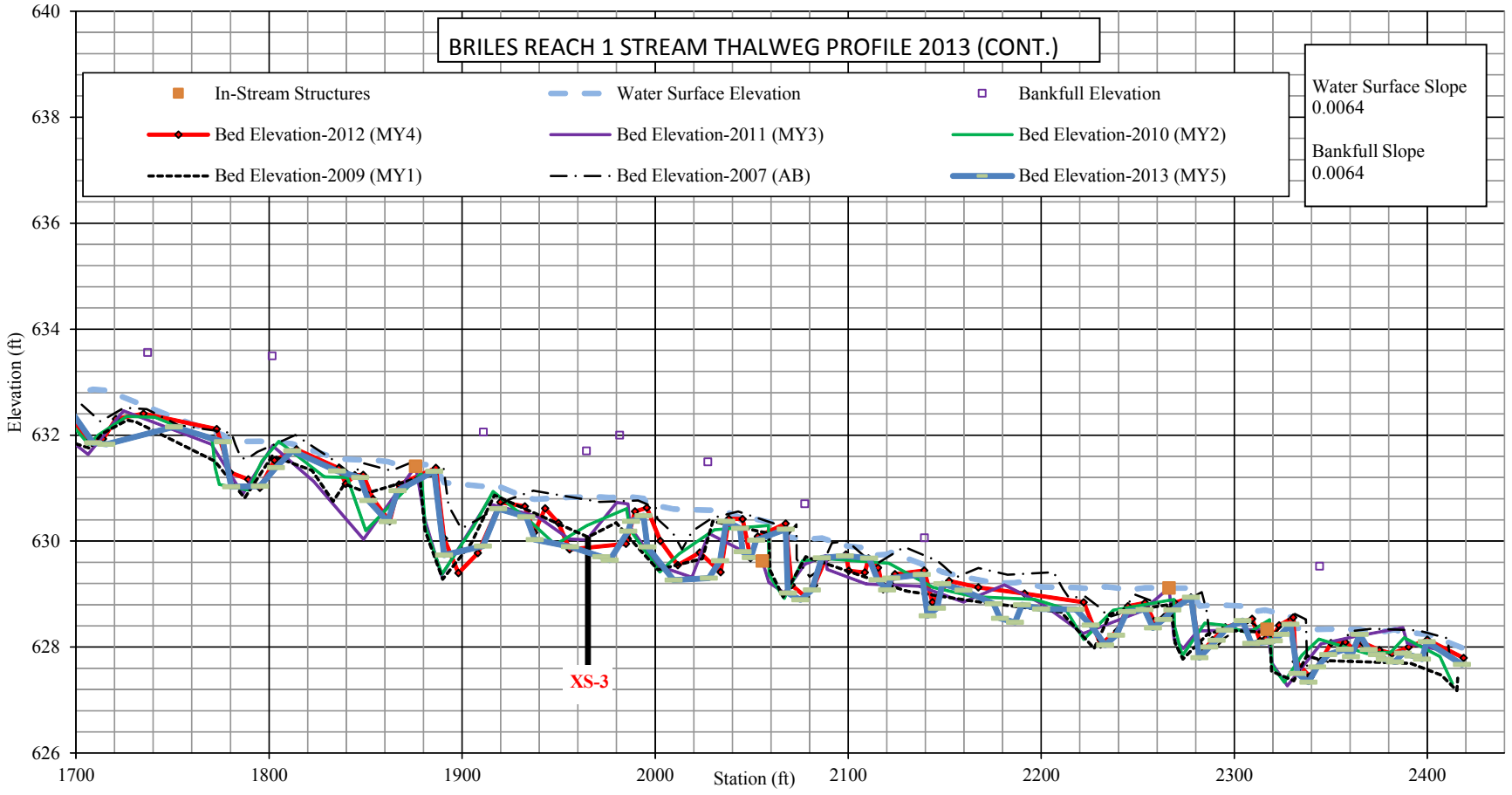


ID	Year	Phase	Facet Type	Wbkf	Abkf	Dbkf
XS5	2007	AB	Riffle	14	21.4	1.5
XS5	2009	MY1	Riffle	12.7	18.2	1.4
XS5	2010	MY2	Riffle	13.6	19.1	1.4
XS5	2011	MY3	Riffle	16.9	23	1.4
XS5	2012	MY4	Riffle	15.3	22.2	1.5
XS5	2013	MY5	Riffle	14.2	21.1	1.5

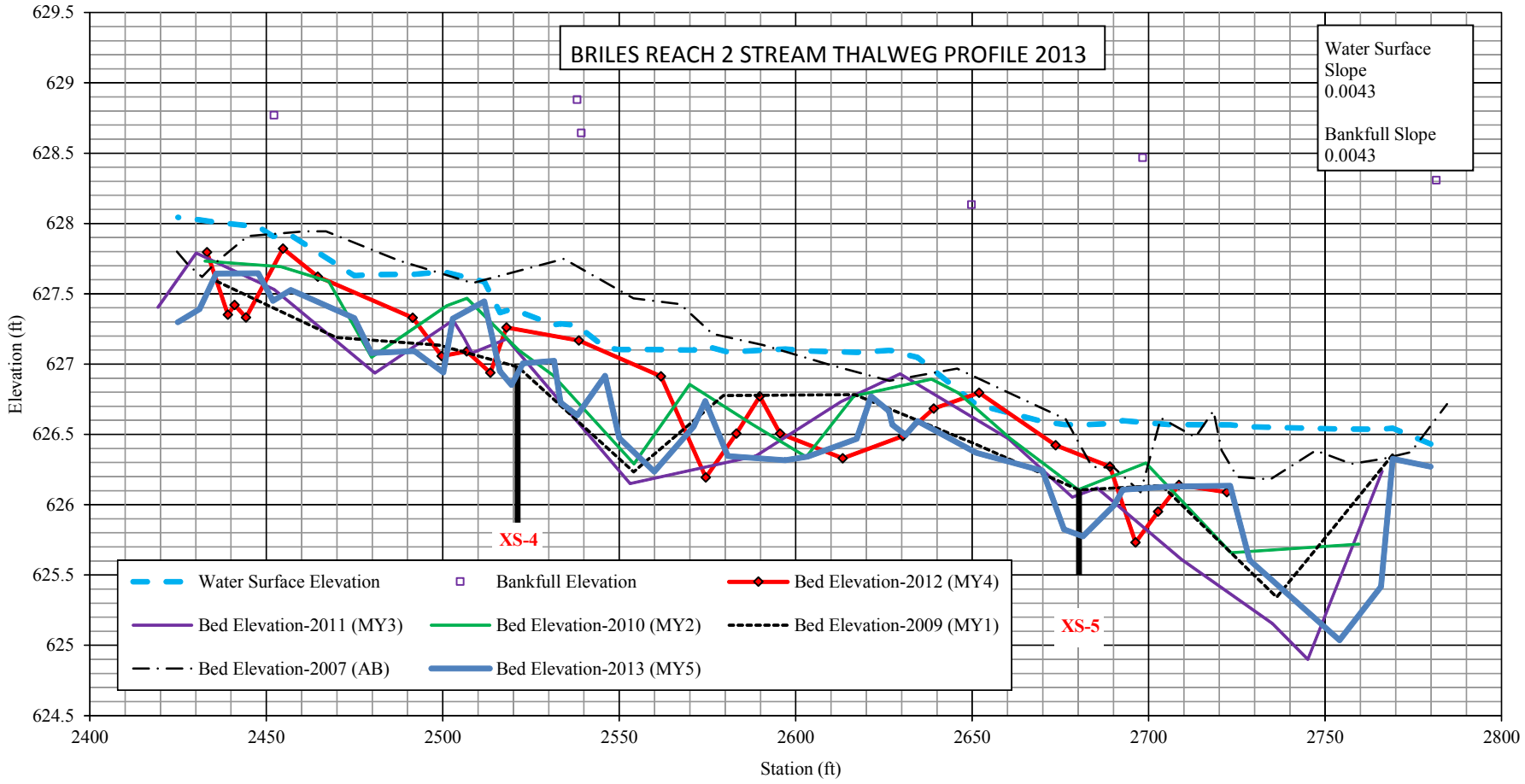
ID	Year	Phase	d50(mm)	d84(mm)
XS5	2007	AB	--	0.37
XS5	2009	MY1	5.9	15.3
XS5	2010	MY2	15	38.6
XS5	2011	MY3	7.1	54.6
XS5	2012	MY4	41.3	79
XS5	2013	MY5	12.1	47


BRILES REACH 1 STREAM THALWEG PROFILE 2013
In-Stream Structures
Water Surface Elevation
Bankfull Elevation
Bed Elevation-2012 (MY4)
Bed Elevation-2011 (MY3)
Bed Elevation-2010 (MY2)
Bed Elevation-2009 (MY1)
Bed Elevation-2007 (AB)
Bed Elevation-2013 (MY5)
Water Surface Slope
0.0064
Bankfull Slope
0.0064
Elevation (ft)
644
642
640
638
636
634
632
630
1000
1100
1200
1300
1400
1500
1600
1700
Station (ft)
XS-1
XS-2


Legend
Stream Monitoring Reach
Monitoring Cross-Section
CVS Monitoring Plots
Stream Structures
1
2
XS-1
XS-2
Feet
0
25
50
100
150
200
N
E
S
W


BRILES REACH 1 STREAM THALWEG PROFILE 2013 (CONT.)
In-Stream Structures
Water Surface Elevation
Bankfull Elevation
Bed Elevation-2012 (MY4)
Bed Elevation-2011 (MY3)
Bed Elevation-2010 (MY2)
Bed Elevation-2009 (MY1)
Bed Elevation-2007 (AB)
Bed Elevation-2013 (MY5)
Water Surface Slope
0.0064
Bankfull Slope
0.0064
Elevation (ft)
640
638
636
634
632
630
628
626
1700
1800
1900
2000
2100
2200
2300
2400
Station (ft)
XS-3

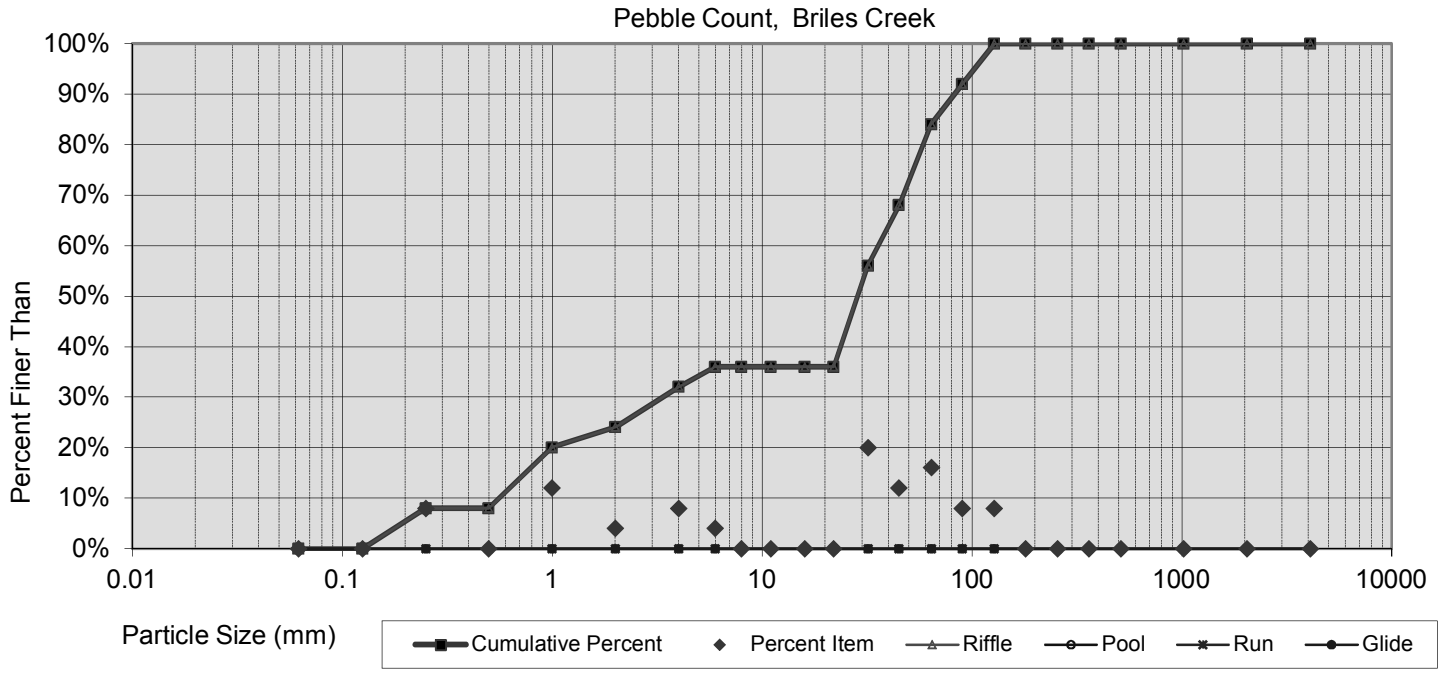

3
XS-3
4
5
8
Feet
0
25
50
100
150
200
N
E
S
W
Legend
Stream Monitoring Reach
Monitoring Cross-Section
CVS Monitoring Plots
Stream Structures


BRILES REACH 2 STREAM THALWEG PROFILE 2013
Water Surface Slope 0.0043
Bankfull Slope 0.0043
Elevation (ft)
Station (ft)
629.5
629
628.5
628
627.5
627
626.5
626
625.5
625
624.5
2400
2450
2500
2550
2600
2650
2700
2750
2800
XS-4
XS-5
Water Surface Elevation
Bankfull Elevation
Bed Elevation-2012 (MY4)
Bed Elevation-2011 (MY3)
Bed Elevation-2010 (MY2)
Bed Elevation-2009 (MY1)
Bed Elevation-2007 (AB)
Bed Elevation-2013 (MY5)


8
5
XS-4
XS-5
6
Legend
Stream Monitoring Reach
Monitoring Cross-Section
CVS Monitoring Plots
Stream Structures
0
25
50
100
150
200
Feet

	Pebble Count,
	Briles Creek

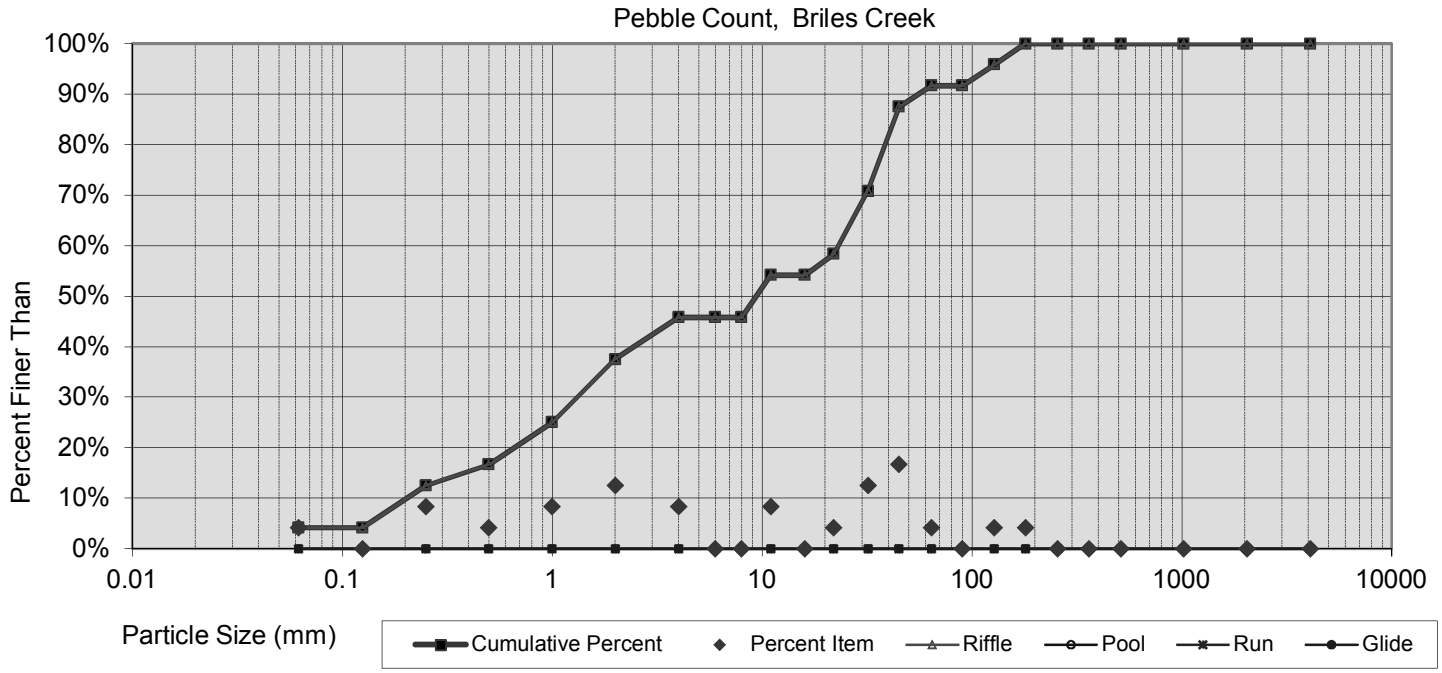
Note:	**Cross Section 1**



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
0.794	5.42	28.6	64	103	0%	24%	60%	16%	0%	0%

	Pebble Count,
	Briles Creek

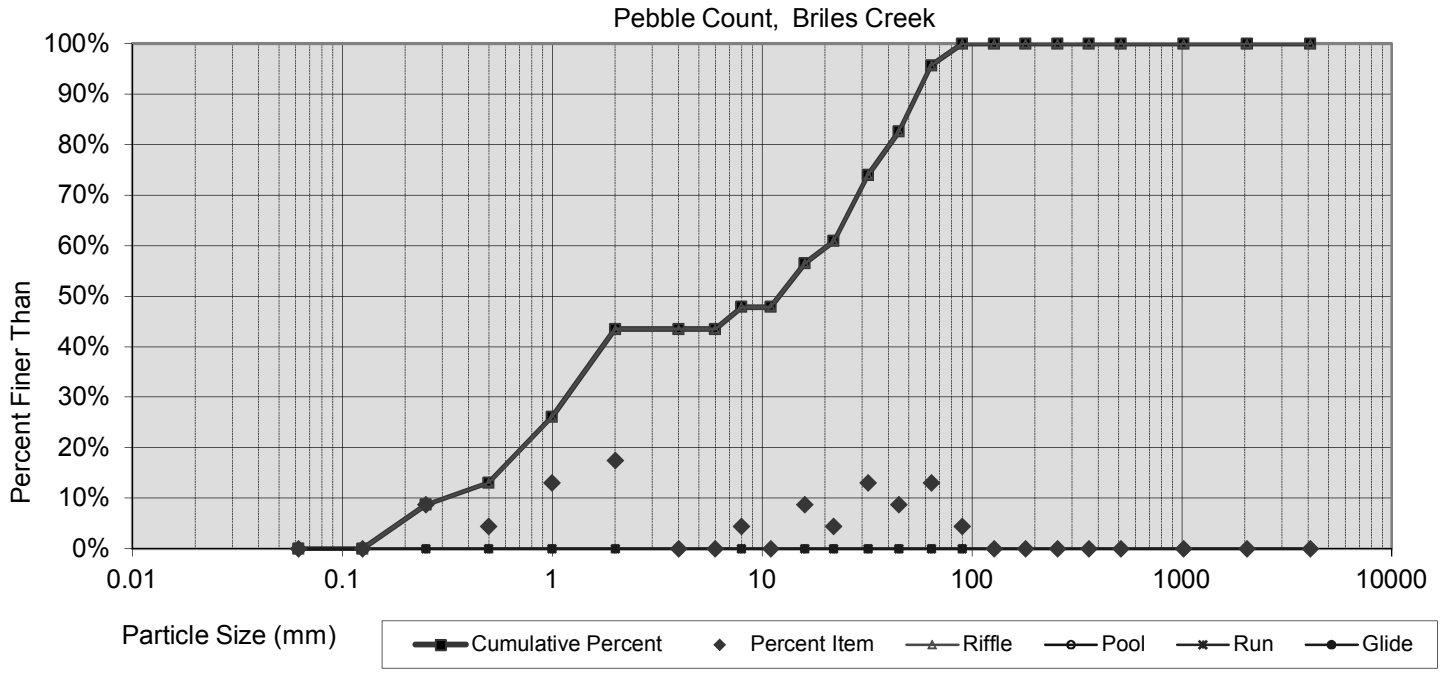
Note:	**Cross Section 4**



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
0.448	1.74	9.4	42	119	4%	32%	52%	8%	0%	4%

	Pebble Count,
	Briles Creek

Note:	**Cross Section 5**



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
0.585	1.43	12.1	47	63	0%	40%	48%	4%	0%	8%

Table 10a.1 Baseline Stream Data Summary
Briles Stream Restoration Site/047 - UTJC1 (1,425 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)		7.617	8.419	8.018	8.5	15.2	11.7	28.8	8.9295	4	9.0	13.1	12.6	18.0	3.7	6	15.4			13.4	13.8		14.2		2
Floodprone Width (ft)					20	42	44	60	16	4	13	114	150	200	79	6	>35			38	43		>48		2
Bankfull Mean Depth (ft)		1.063	1.175	1.119	0.6	1.4	1.4	2.2	0.6532	4	0.9	1.2	1.2	1.5	0.2449	6	1.1			1.1	1.2		1.2		2
[1]Bankfull Max Depth (ft)					1.5	2.0	1.8	2.8	0.556	4	1.3	1.6	1.6	2	0.2872	6	1.5			1.9	2.0		2.0		2
Bankfull Cross Sectional Area (ft^2)		10.92	12.07	11.49	15.1	17.6	18.2	18.8	1.6256	4	10.4	15.3	13.5	22.3	5.0408	6	17.0			15.9	16.1		16.2		2
Width/Depth Ratio					3.8	16.3	8.2	44.9	18.474	4	7.6	11.5	9.7	18	4.4922	6	14.0			11.3	11.9		12.4		2
Entrenchment Ratio					1.8	3.5	3.7	4.7	1.2038	4	1.3	7.5	8.4	14.4	5.361	6	>2.2			2.7	3.1		>3.5		2
[1]Bank Height Ratio					1.0	1.7	1.9	1.8	0.4082	4	1.0	1.0	1.0	1.0	0.0	6	1.0			1.0	1.0		1.0		2
Profile																									
Riffle Length (ft)																				20	46	44	115	40.91	19
Riffle Slope (ft/ft)					0.004	0.008		0.012			0.003	0.04		0.076			0.005	0.009	0.012	0.001	0.01	0.01	0.016	0.006	19
Pool Length (ft)											28			108			15		30	7	12	10	27	8.9069	17
Pool Max depth (ft)																				1	1.23		4.12	1.7387	17
Pool Spacing (ft)											38			181			46		154	50	82	78	157	45.77	17
Pattern																									
Channel Beltwidth (ft)					50						75			135			77			31	51	56	60	12.87	5
Radius of Curvature (ft)					25			57			14.5			26.8			20		50	28	41	42	55	11.03	14
Rc:Bankfull width (ft/ft)					**0.9**			**6.7**			**1**			**1.6**			**1.5**		**3.2**	**2**	**3**	**3**	**4**		
Meander Wavelength (ft)					50			100			70			148			105		170	78	92	91	110	13.15	6
Meander Width Ratio					1.7			5.9			3.6			13			5			2.2	3.7	4.1	4.3		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					0.69888												0.58344			0.71136					
Max part size (mm) mobilized at bankfull					53.6750893												44.47063129			54.67420176					
Stream Power (transport capacity) W/m^2					120.5568												128.0916			143.1612					
Additional Reach Parameters																									
Rosgen Classification					G4c/E4/C4/5						C4						C4			C4					
Bankfull Velocity (fps)		3.805	4.206	4.005	1.8-3.6												3-3.8								
Bankfull Discharge (cfs)		43.73	48.33	46.03	50-65																				
Valley length (ft)																									
Channel Thalweg length (ft)					1375												1446			1432					
Sinuosity (ft)					1						1.5						1.2			1.1					
Water Surface Slope (Channel) (ft/ft)					0.004-0.012						0.007-0.012						0.005			0.0063					
BF slope (ft/ft)																	**0.005**			**0.0057**					
[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
Briles Stream Restoration Site/047 - UTJC2 (362 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)		9.068	10.02	9.545		22.9				1	9.0	9.5		10.0		2	14.3				15.8				1
Floodprone Width (ft)						37				1	13	17		21		2	19		32		>60				1
Bankfull Mean Depth (ft)		1.21	1.337	1.274		0.8				1	1.1	1.2		1.2		2	1.2				1.3				1
[1]Bankfull Max Depth (ft)						2.2				1	1.3	1.4		1.5		2	2.5				2.3				1
Bankfull Cross Sectional Area (ft^2)		14.38	15.9	15.14		18.8				1	10.4	10.6		10.7		2	17.0				19.8				1
Width/Depth Ratio						27.9				1	8.0	10.0		12.0		2	12.0				12.6				1
Entrenchment Ratio						1.6				1	1.3	1.8		2.3		2	2.3				>3				1
[1]Bank Height Ratio						2				1	1.0	1.0		1.0		2	1.0				1.0				1
Profile																									
Riffle Length (ft)																				17	150		232		2
Riffle Slope (ft/ft)					0.004	0.008		0.012			0.01	0.015		0.02			0.005	0.009	0.012	0.005	0.006		0.006		2
Pool Length (ft)											3			25			15		30	8	11		14		2
Pool Max depth (ft)																				0.5	0.94		1.38		2
Pool Spacing (ft)											30			59			28		86		256				1
Pattern																									
Channel Beltwidth (ft)					50						45						70			28	29		30		2
Radius of Curvature (ft)					25			57			13			42			28		100	44	53	48	66		3
Rc:Bankfull width (ft/ft)					**0.8**			**6.7**			**1.3**			**4.4**			**2**		**7**	**2.8**	**3.4**	**3**	**4.2**		
Meander Wavelength (ft)					50			100			96			136			72		215	45	63		81		2
Meander Width Ratio					1.7			5.9			4.5			5			5			1.7	1.8		1.9		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					0.39936												0.63648			0.454272					
Max part size (mm) mobilized at bankfull					29.9589873												48.6910315			34.26324512					
Stream Power (transport capacity) W/m^2					120.5568												128.0916			84.38976					
Additional Reach Parameters																									
Rosgen Classification					G4c/E4/C4/5						B4c						B4c			C4					
Bankfull Velocity (fps)		3.867	4.274	4.071	2.1												3-3.8								
Bankfull Discharge (cfs)		58.56	64.72	61.64	50-65																				
Valley length (ft)																									
Channel Thalweg length (ft)					365												362			353					
Sinuosity (ft)					1						1.2						1.1			1.05					
Water Surface Slope (Channel) (ft/ft)					0.004-0.012						0.013						0.06			0.0047					
BF slope (ft/ft)																	**0.06**			**0.0043**					
[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)
Briles Stream Restoration Site/047 - UTJC1 (1,425 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%	14	27	47	7		5																						
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)	0.3	1.2	6.1	10.6	61.9																							
[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)
Briles Stream Restoration Site/047 - UTJC2 (362 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%	14	27	47	7		5																						
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)	0.3	1.2	6.1	10.6	61.9																							
[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 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Briles Stream Restoration Site/047

	Cross Section 1 (Riffle)							Cross Section 2 (Pool)							Cross Section 3 (Riffle)							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	637.2	637.2	637.2	637.2	637.2	637.2		637	637	637	637	637.3	637.2		632.8	632.8	632.8	632.8	632.8	632.8		629.9	629.9	629.9	629.9	629.9	629.9		628.9	628.9	628.9	628.9	629	629	
Bankfull Width (ft)	13.4	16.47	14.2	14.28	13.5	14.4		15.36	17.04	16.12	16.25	19.4	16.7		14.2	13.85	16.69	18.91	12.9	13.5		15.8	19.62	21.34	18.6	15.4	17.5		14.0	16.12	15.54	16.89	15.3	14.2	
Floodprone Width (ft)	>48	49.05	50.28	49.04	55	55		60.27	57.95	59.51	57.49	NA	NA		38	42.42	43.54	46.14	42	42		>60	68.03	67.95	67.89	70	70		78.65	78.7	78.45	78.37	NA	NA	
Bankfull Mean Depth (ft)	1.2	1.06	1.14	1.13	1.2	1.2		1.2	1.22	1.18	1.22	1.2	1.2		1.1	1.25	1.16	1.04	1.3	1.2		2.3	1.21	1.12	1.22	1.4	1.2		1.5	1.4	1.42	1.36	1.5	1.5	
Bankfull Max Depth (ft)	1.9	2.08	2.37	2.23	2.2	2.3		2.2	2.36	2.33	2.36	2.5	2.4		2.0	2.51	2.5	2.77	2.6	2.6		1.3	2.78	2.8	2.72	3	3		3.5	2.8	2.79	2.85	2.9	2.9	
Bankfull Cross Sectional Area (ft^2)	15.9	17.46	16.16	16.21	16.4	16.6		18.9	20.86	19.01	19.84	23.2	20.4		16.2	17.3	19.33	19.72	16.1	16.2		19.8	23.65	23.9	22.61	21.8	20.7		21.4	22.61	22.02	22.97	22.2	21.1	
Bankfull Width/Depth Ratio	11.3	15.54	12.46	12.64	11.1	12.5		12.49	13.97	13.66	13.32	NA	NA		12.4	11.08	14.39	18.18	10.3	11.3		12.6	16.21	19.05	15.25	10.8	14.8		8.83	11.51	10.94	12.42	NA	NA	
Bankfull Entrenchment Ratio	>3.5	2.98	3.54	3.43	4.1	3.8		3.92	3.4	3.69	3.54	NA	NA		2.7	3.06	2.61	2.44	3.3	3.1		>3.0	3.47	3.18	3.65	4.6	4		5.71	4.88	5.05	4.64	NA	NA	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	1	1		1.1	1.1	1.0	1	1	1		1.0	1.0	1.1	1	1	1		1.0	1.0	1.0	1	1	1		1.0	1.0	1.0	1	1	1	
Cross Sectional Area between end pins (ft^2)	67	67	67	67	--	--		84	84	84	84	--	--		146	146	146	146	--	--		86	86	86	86	--	--		82	82	82	82	--	--	
d50 (mm)	0.14	31	8	7.84	34.8	28.6		0.27	62.7	38.5	3.17	--	--		0.062	11.17	0.04	0.3	--	--		0.17	42.24	20.4	30.92	42.5	9.4		0.062	15.25	14.99	7.08	41.3	12.1	

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
Briles Stream Restoration Site/047 - UTJC1 (1,425 feet)

Parameter	Baseline						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)	13.4	13.8		14.2		2	13.85	15.16		16.47		2	14.2	15.45		16.69		2	14.3	16.6		18.9		2	12.9	13.2		13.5		2	13.5	14	14	14.4	0.6	2
Floodprone Width (ft)	38	43		>48		2	42.42	45.74		49.05		2	43.54	46.91		50.28		2	46.1	47.6		49.0		2	42	48.5		55		2	42	48.5	48.5	55	9.2	2
Bankfull Mean Depth (ft)	1.1	1.2		1.2		2	1.06	1.155		1.25		2	1.14	1.15		1.16		2	1.0	1.1		1.1		2	1.2	1.3		1.3		2	1.2	1.2	1.2	1.2	0	2
[1]Bankfull Max Depth (ft)	1.9	2.0		2.0		2	2.08	2.295		2.51		2	2.37	2.435		2.5		2	2.2	2.5		2.8		2	2.2	2.4		2.6		2	2.3	2.5	2.5	2.6	0.2	2
Bankfull Cross Sectional Area (ft^2)	15.9	16.1		16.2		2	17.3	17.38		17.46		2	16.16	17.75		19.33		2	16.2	18.0		19.7		2	16.1	16.3		16.4		2	16.2	16.4	16.4	16.6	0.3	2
Width/Depth Ratio	11.3	11.9		12.4		2	11.08	13.31		15.54		2	12.46	13.43		14.39		2	12.6	15.4		18.2		2	9.9	10.6		11.3		2	11.3	11.6	11.6	12	0.5	2
Entrenchment Ratio	2.7	3.1		>3.5		2	2.98	3.02		3.06		2	2.61	3.075		3.54		2	2.4	2.9		3.4		2	3.3	3.7		4.1		2	3.1	3.5	3.5	3.8	0.5	2
[1]Bank Height Ratio	1.0	1.0		1.0		2	1.0	1.0		1.0		2	1.0	1.1		1.1		2	1.0	1.0		1.0		2	1.0	1.0		1.0		2	1	1	1	1	0	2
Profile																																				
Riffle Length (ft)	20	46	44	115	40.9095	19													19.1	38.4		78.9			4.4	18.6	12.8	69.7	16.5	34	4.6	20.3	15.1	60.4	16.2	30
Riffle Slope (ft/ft)	0.0014	0.0095	0.0102	0.0163	0.0061	19													0.00535	0.01012		0.03324			0.0000	0.0106	0.0090	0.0532	0.0103	34	0.0000	0.0096	0.0081	0.0366	0.0081	30
Pool Length (ft)	7	12	10	27	8.906926	17													14.0	42.8		86.1			7.9	20.5	18.5	42.4	9.5	37	7.8	23.2	19.6	54.3	11.6	36
Pool Max depth (ft)																			0.1	0.8		1.6			2.2	2.4	2.4	2.6		2	2.4	2.4	2.4	2.4	0	1
Pool Spacing (ft)	50	82	78	157	45.7703	17													14.0	76.5		178.7			8.9	37	31.9	95.1	20.5	39	12.3	40.1	35.5	107.1	22.5	36
Pattern																																				
Channel Beltwidth (ft)	31	51	56	60	12.8712	5																														
Radius of Curvature (ft)	28	41	42	55	11.0303	14																														
Rc:Bankfull width (ft/ft)	**2**	**3**	**3**	**4**																																
Meander Wavelength (ft)	78	92	91	110	13.1498	6																														
Meander Width Ratio	2.2	3.7	4.1	4.3																																

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	C4						C4						C4						C4						E/C4						E/C4					
Channel Thalweg length (ft)	1432						1432						1432						1432						1432						1432					
Sinuosity (ft)	1.1						1.1						1.1						1.1						1.1						1.1					
Water Surface Slope (Channel) (ft/ft)	0.0063																								0.0062						0.0064					
BF slope (ft/ft)	**0.0057**																								**----**						**----**					
[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																																				

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
Briles Stream Restoration Site/047 - UTJC2 (362 feet)

Parameter	Baseline						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)		15.8				1		19.6				1		21.3				1		18.6				1		15.4				1		17.5				1
Floodprone Width (ft)		>60				1		68				1		68				1		67.9				1		70				1		70				1
Bankfull Mean Depth (ft)		1.3				1		1.21				1		1.12				1		1.2				1		1.4				1		1.2				1
[1]Bankfull Max Depth (ft)		2.3				1		2.78				1		2.8				1		2.7				1		3				1		3				1
Bankfull Cross Sectional Area (ft^2)		19.8				1		23.7				1		23.9				1		22.6				1		21.8				1		20.7				1
Width/Depth Ratio		12.6				1		16.2				1		19.1				1		15.3				1		10.8				1		14.8				1
Entrenchment Ratio		>3				1		3.47				1		3.18				1		3.7				1		4.6				1		4				1
[1]Bank Height Ratio		1.0				1		1.0				1		1.0				1		1.0				1		1				1		**1**				1
Profile																																				
Riffle Length (ft)	17	150		232		2													16.0	31.9		56.4			36.8	42.6	41.8	49.9	5.7	4	5	16.2	11.3	35.4	11	8
Riffle Slope (ft/ft)	0.01	0.01		0.01		2													0.0109	0.0123		0.0147			0.0104	0.0110	0.0108	0.0118	0.0007	3	0.0000	0.0073	0.0078	0.0160	0.0058	8
Pool Length (ft)	8	11		14		2													50.5	81.3		112.1			19.6	30.1	27.3	49.3	12.8	4	8.1	23.9	22.7	47	14.9	9
Pool Max depth (ft)																			0.6	0.9		1.4				3				1		2.9				1
Pool Spacing (ft)		256				1													126.9	131.9		136.9			28	64.2	64.9	99.2	29.4	4	14.5	36.9	36.8	56.8	15.4	9
Pattern																																				
Channel Beltwidth (ft)	28	29		30		2																														
Radius of Curvature (ft)	44	53	48	66		3																														
Rc:Bankfull width (ft/ft)	**2.8**	**3.4**	**3**	**4.2**																																
Meander Wavelength (ft)	45	63		81		2																														
Meander Width Ratio	1.7	1.8		1.9																																

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	C4						C4						C4						C4						E/C4						E/C4					
Channel Thalweg length (ft)	353						353						353						353						353						353					
Sinuosity (ft)	1.05						1.05						1.05						1.05						1.05						1.05					
Water Surface Slope (Channel) (ft/ft)	0.0047																								0.0057						0.0043					
BF slope (ft/ft)	**0.0043**																								**----**						**----**					
[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																																				

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1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
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APPENDIX E

HYDROLOGY DATA

Table 12. Verification of Bankfull Events

Table 12. Verification of Bankfull Events

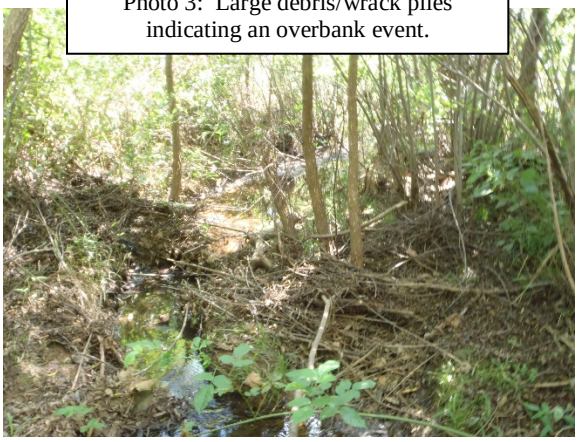
Briles Stream Restoration Site (EEP Project Number 047)

Date of Data Collection	Date of Occurrence	Method	Photo (if available)
July 6, 2010	NA	Wrack lines observed along channel bank	NA
April 19, 2011	NA	Wrack lines observed along channel bank	1-2
June 7, 2013	May 6, 2013	Wrack piles observed after approximately 1.17 inches of rain was documented* on May 6, 2013 following 1.9 inches of rain documented the prior week.	3

*Asheboro Airport (KHBI) weather station (Weatherunderground 2013)

Photos 1 and 2: Evidence of overbank including flow within adjacent floodplain, laid back vegetation, and large debris/wrack piles.

Photo 3: Large debris/wrack piles indicating an overbank event.



APPENDIX F

ADDITIONAL SITE PHOTOGRAPHS

Preconstruction Site Photographs

Asbuilt Site Photographs

Preconstruction Site Photographs








Asbuilt Site Photographs

APPENDIX G

ADDITIONAL SITE MAPPING

Figure 2 from 2005 Restoration Plan: Project Watershed (USGS Topo Map)

Figure 3 from 2005 Restoration Plan: Soils

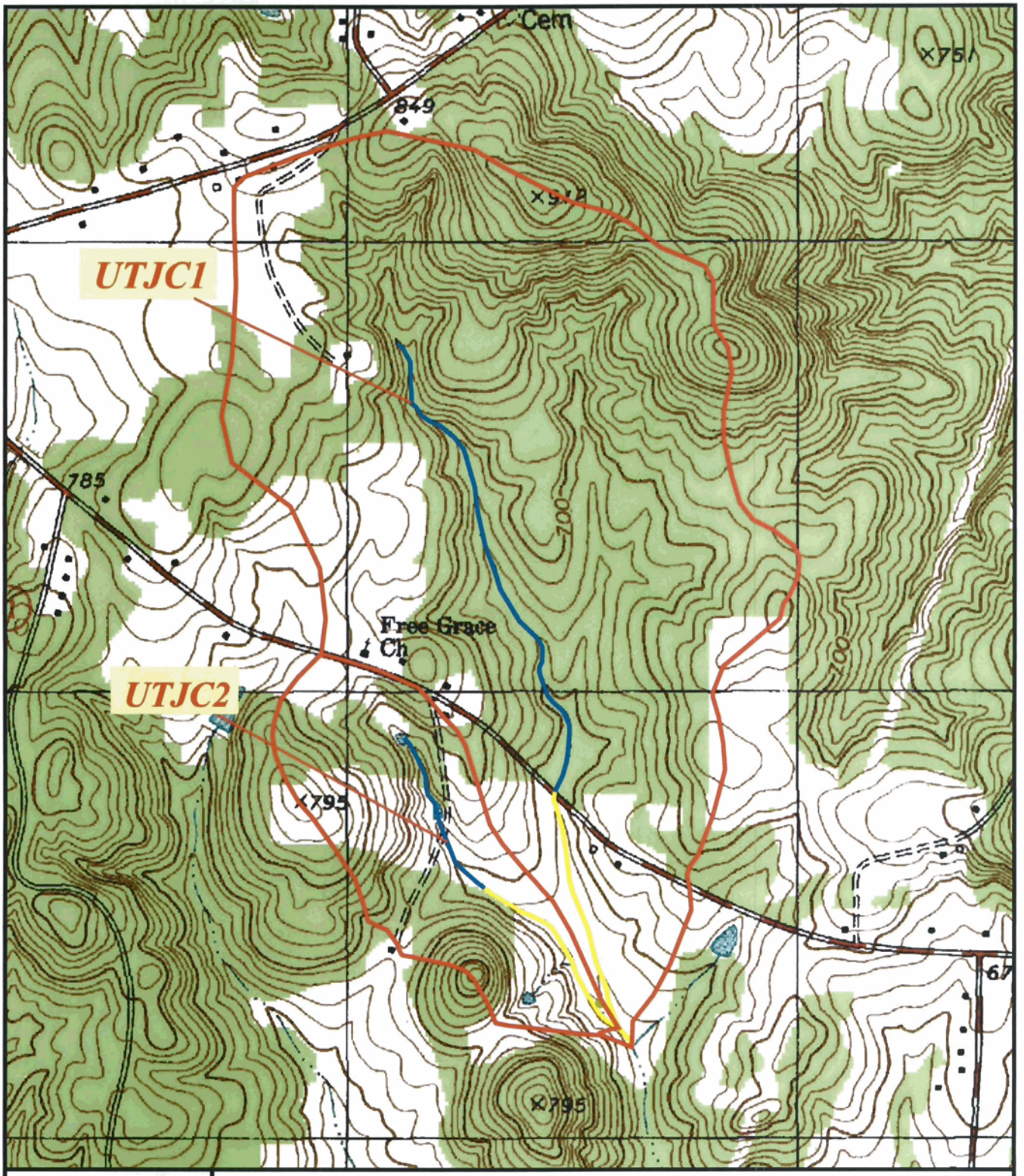


Figure 2. Project Watershed **Briles Site**

Ecosystem Enhancement PROGRAM

Project Reach
Streams
Drainage Area 0.62 **Sq.** Miles
UTJC1 - **0.51 Sq.** Miles
UTJC2 - 0.11 **Sq.** Miles

N

800 0 800 **Feet**

Source: Denton USGS 7.5' Topographic Quadrangle

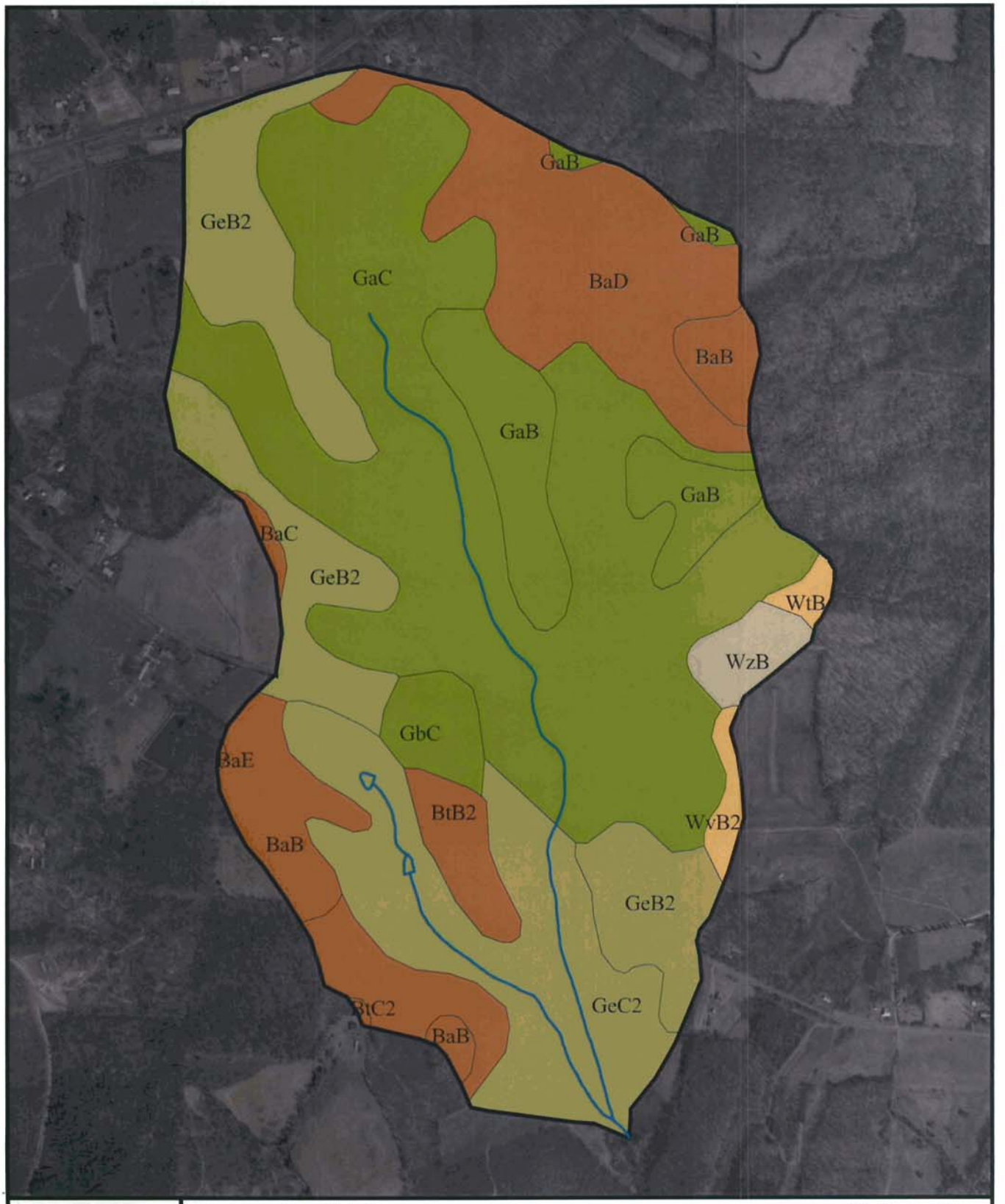


Figure 3. Soils

Briles Site

Soil Types
- Badin-Tatum Complex
- Georgeville Silt Loam
- Georgeville Silty Clay Loam
- Wynott-Enon Complex
- Wynott-Wilkes Poindexer Complex

Streams
Drainage Area

N

400 0 400 Feet

Source: 1998 Aerial Photographs - Randolph County GIS Department

Ecosystem Enhancement PROGRAM