

**FINAL**  
**ANNUAL MONITORING REPORT**  
**YEAR 2 (2013)**  
**HAUSER CREEK STREAM RESTORATION SITE**  
**DAVIE COUNTY, NORTH CAROLINA**  
**(EEP Project No. 92471, Contract No. 004804)**  
**Construction Completed August 2011**



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



November 2013

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



November 2013

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## 1.0 EXECUTIVE SUMMARY

The North Carolina Ecosystem Enhancement Program (NCEEP) has completed stream mitigation at the Hauser Creek Stream Restoration Site (hereafter referred to as the “Site”) located on the property of Alethea Segal in Davie County, North Carolina to assist in fulfilling stream mitigation goals in the area. The Site is located in United States Geological Survey (USGS) Hydrologic Unit 03040101160010 (North Carolina Division of Water Quality [NCDWQ] Subbasin 03-07-02) of the Yadkin Pee-Dee River Basin. The Site is not located in a Targeted Local Watershed. The Site drainage area is an approximately 2.64-square mile rural watershed at the Site outfall consisting primarily of forest and pasture land with low-density residential property. This report (compiled based on NCEEP’s *Procedural Guidance and Content Requirements for EEP Monitoring Reports* Version 1.4 dated 11/7/11) summarizes data for year 2 (2013) monitoring.

Restoration goals outlined in the approved *Hauser Creek Restoration Plan* [NCEEP 2008] include the following.

- Improve water quality with the construction of stable stream banks, removal of cattle access, and the establishment of a protective buffer.
- Control transport of sediment recruited by stream flows from cleared adjacent floodplains with the establishment of a forested buffer.
- Improve the stream function and habitat with the connection of the channelized and incised stream back to its floodplain.
- Restore long-term stability with the restoration of channel pattern, profile, and dimension.
- Improve in-stream habitat with the installation of root wads, constructed riffles, cross vanes, and single wing vanes to enhance pool depths.
- Improve buffer habitat by creating ephemeral pools within the old channel fill areas.

Project objectives outlined in the approved *Hauser Creek Restoration Plan* [NCEEP 2008] include the following.

- The restoration of 2525 linear feet of stream with Priority I Restoration in order to raise the stream elevation, reconnect the floodplain, restore pattern, and reestablish channel dimension.
- The enhancement of 93 linear feet of stream with Enhancement Level II activities which involve buffer restoration and bank stabilization.
- The preservation of 108 linear feet of stream by placing a conservation easement along the downstream reach of channel.
- Establish a riparian buffer with an average distance of 50 feet beyond each stream bank.

Prior to construction, the Site contained a degraded stream channel located within maintained pasture and floodplain fields with wooded uplands. Site streams were characterized by a narrow buffer, increased widths ranging from 20-35 feet, steep to moderate bank slopes, incision, and elevated bank-height ratios. Project construction was completed in August 2011. The Site will be protected by a permanent conservation easement held by the State of North Carolina.

Seven vegetation monitoring plots were monitored on July 25, 2013 for Year 2 (2013) monitoring. Vegetation success criteria dictate that an average density of 320 stems-per-acre must be surviving in the first three monitoring years. Subsequently, 288 stems-per-acre must be surviving in year 4 and 260 stems-per-acre in year 5. Stem counts will be based on an average of the evaluated vegetation plots. Based on the number of stems counted, average densities were measured at 520 planted stems-per-acre (excluding livestakes) surviving in Year 2 (2013). The dominant species identified at the Site were planted stems of sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), and silky

dogwood (*Cornus amomum*). All seven vegetation plots met success criteria based on planted stems alone.

No vegetation areas of concern were observed within the Site.

Success criteria for stream restoration will be assessed using measurements of stream dimension, pattern, and profile; Site photographs; visual assessments; and vegetation sampling. Success is based on the stability of the stream.

Overall, the stream is functioning properly and as designed. Three areas of minor bank erosion were noted in Figures 2A-2B (Appendix B); however, these areas are not causing additional issues up or downstream and vegetation is establishing.

Map Label*	Station	Notes
SAC-1	22+50	Erosion and sloughing of approximately 10 feet along the right bank of an outer bend
SAC-2	18+75	Erosion and sloughing of approximately 15 feet along the left bank of an outer bend
SAC-3	12+00	Erosion and sloughing of approximately 10 feet along the right bank of an outer bend

\*Map labels on Figures 2A-2B, Appendix B

Success criteria for stream restoration will include documentation of two bankfull channel events during the monitoring period. In the event that less than two bankfull events occur during the first five years, monitoring will continue until the second event is documented. In addition, bankfull events must occur during separate monitoring years. A crest gauge is located within the Site to assist with documentation of bankfull events (Figures 2 and 2A-2B, Appendix B). Five bankfull events were documented during the Year 2 (2013) monitoring season.

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 NCEEP's 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

Seven vegetation plots were established and marked after construction with metal t-posts demarking the four corners of the plot. The plots are 10 meters square and are located randomly within the Site. These plots were surveyed on July 25, 2013 for the Year 2 (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 the week of May 30, 2013 for the Year 2 (2013) monitoring season. Measurements were taken using a Topcon GTS 303 total station and Recon data collector. The raw total station file was processed using Carlson Survey Software into a Computer Aided Design (CAD) file. Coordinates were exported as a text/ASCII file to Microsoft Excel for processing and presentation of data. Pebble counts were completed using the modified Wolman method (Rosgen 1993). A crest gauge was installed in the lower portion of the Site to assist with documentation of overbank events.

Seven permanent cross-sections, five riffle and two pool, will be used to evaluate stream dimension; locations are depicted on Figures 2 and 2A-2B (Appendix B). Cross-sections are permanently monumented with metal t-posts at each end point. Cross-sections will be surveyed annually 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, pebble counts were completed at cross-sections 3, 5, and 7, and photographs will be taken at each permanent cross-section annually.

One approximately 2500-linear foot monitoring reach will be used to evaluate stream pattern and longitudinal profile; locations are depicted on Figures 2 and 2A-2B (Appendix B). Measurement of channel pattern will include belt-width and meander length. Subsequently, data will be used to calculate meander-width ratios. Longitudinal profile measurements will include average water surface slopes and facet slopes and pool-to-pool spacing. In addition, visual stream morphology stability assessments will be completed in each of the monitoring reach annually to assess the channel bed, banks, and in-stream structures.

### 3.0 REFERENCES

- Ecosystem Enhancement Program (EEP). Unpublished. Procedural Guidance and Content Requirements for EEP Monitoring Projects, Version 1.4, dated 11/07/11. NC Department of Environment and Natural Resources. Available online at [http://portal.ncdenr.org/c/document\\_library/get\\_file?p\\_l\\_id=1169848&folderId=2288101&name=DLFE-39268.pdf](http://portal.ncdenr.org/c/document_library/get_file?p_l_id=1169848&folderId=2288101&name=DLFE-39268.pdf).
- 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>.
- N.C. Ecosystem Enhancement Program. 2008. Ripshin Branch Stream & Wetland Restoration Plan - Ashe County, NC.
- 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 Winston Salem Airport, North Carolina. (online). Available: [http://www.wunderground.com/history/airport/KINT/2013/6/3/DailyHistory.html?req\\_city=NA&req\\_state=NA&req\\_statename=NA](http://www.wunderground.com/history/airport/KINT/2013/6/3/DailyHistory.html?req_city=NA&req_state=NA&req_statename=NA) [November 25, 2013]. Weather Underground.

## APPENDIX A

### PROJECT SITE LOCATION MAP AND BACKGROUND TABLES

Figure 1. Site Location Map

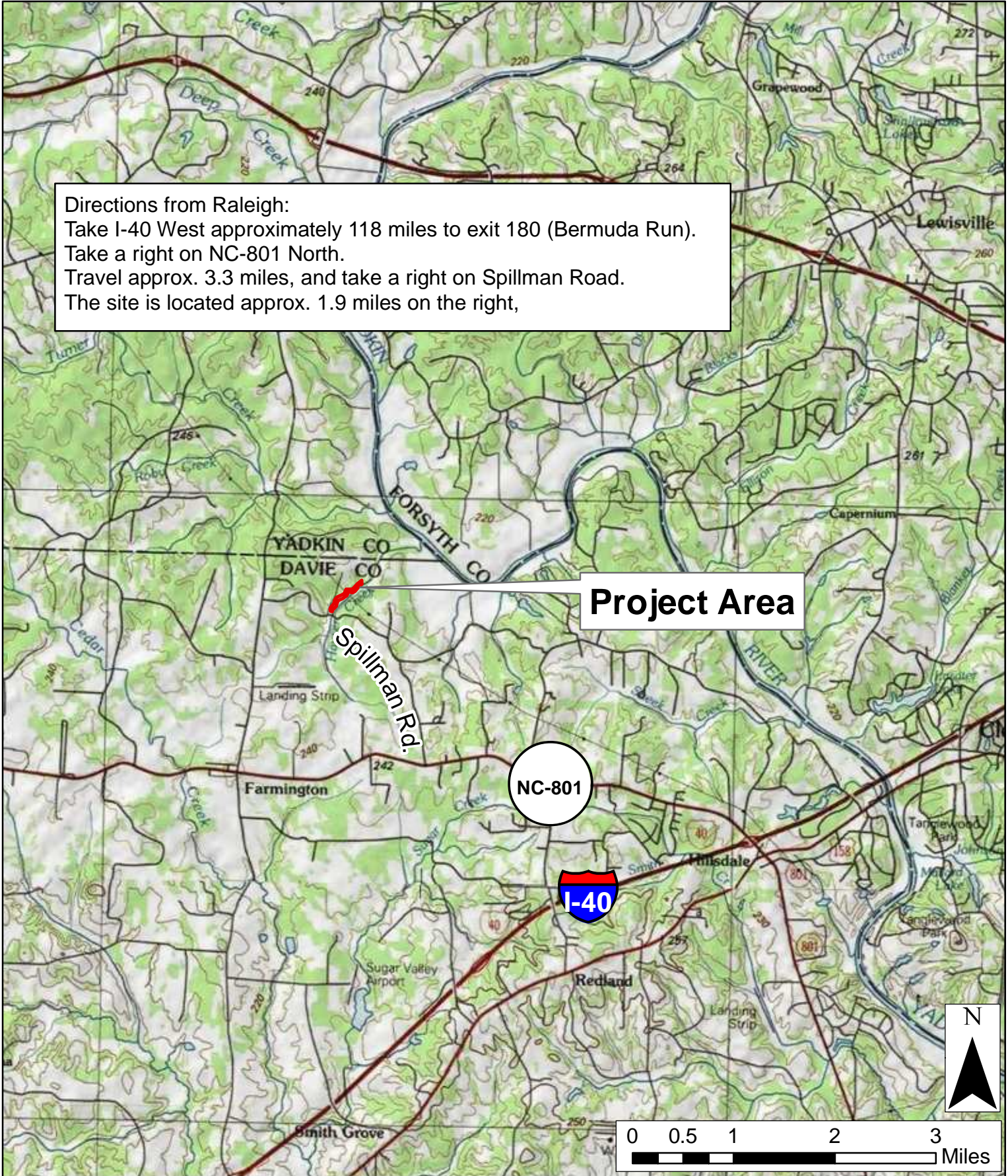
Table 1. Project Components and Mitigation Credits

Table 2. Project Activity and Reporting History

Table 3. Project Contacts Table

Table 4. Project Baseline Information and Attributes

Directions from Raleigh:  
 Take I-40 West approximately 118 miles to exit 180 (Bermuda Run).  
 Take a right on NC-801 North.  
 Travel approx. 3.3 miles, and take a right on Spillman Road.  
 The site is located approx. 1.9 miles on the right,



**Project Area**

NC-801

I-40



0 0.5 1 2 3 Miles

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**SITE LOCATION MAP**  
**HAUSER CREEK**  
**EPP PROJECT NUMBER 92471**  
**Davie County, North Carolina**

Dwn. by:  
 KRJ

Date:  
 October 2012

Project:  
 12-004.11

FIGURE

**1**



**Table 1. Project Components and Mitigation Credits  
Hauser Stream Restoration Site (EEP Project Number 92741)**

Mitigation Credits							
Type	Stream			Riparian Wetland		Buffer	
	Restoration	Restoration Equivalent		Restoration	Restoration Equivalent		
<b>Totals</b>	<b>2387</b>	<b>22</b>		<b>--</b>	<b>--</b>	<b>--</b>	
Projects Components							
Project Component/ Reach ID	Station Range	Existing Linear Footage/ Acreage	Priority Approach	Restoration/ Restoration Equivalent	Restoration Linear Footage/ Acreage	Mitigation Ratio	Comment
Reach 1	00+72 – 16+40	--	P1	Restoration	1568	1:1	Priority 1 Restoration
Reach 2	16+40 – 19+90	--	P1	Restoration	350	2:1	Half Credit Due to Location Within a Utilities Easement
Reach 3	19+90 – 26+31	641	P1	Restoration	607	1:1	34 ft is Outside of Easement in a Piped Crossing
Reach 4	26+31–27+39	108	Pres	Preservation	108	5:1	Preservation
Reach 5	--	93	E11	Enhancement (Level II)	93	2.5:1	Level 11 Enhancement.
Component Summation							
Restoration Level			Stream (linear footage)		Riparian Wetland (acres)		Buffer (square footage)
Restoration			2525*		--		--
Enhancement (Level II)			93		--		--
Preservation			108		--		--
<b>Totals</b>			<b>2726</b>		<b>--</b>		<b>--</b>
<b>Mitigation Units</b>			<b>2409 SMUs</b>		<b>--</b>		<b>--</b>

\*34 linear feet is located outside of the easement in a piped crossing and is therefore not counted for mitigation credit; in addition, 350 linear feet is located within a utilities easement and therefore only receives half credit (2:1 mitigation ratio)

**Table 2. Project Activity and Reporting History**  
**Hauser Stream Restoration Site (EEP Project Number 92471)**

**Elapsed Time Since Grading Complete: 2 years 4 months**  
**Elapsed Time Since Planting Complete: 1 year 11 months**  
**Number of Reporting Years: 2**

<b>Activity or Deliverable</b>	<b>Data Collection Complete</b>	<b>Completion or Delivery</b>
ERTR		April 2008
Restoration Plan		May 2008
No-rise Flood Study Approval		December 2009
Construction Plans / Erosion Control Plan		June 2010
Land Quality Approval		May 2011
Construction and Grading Begins		April 2011
Temporary S&E Mix Applied		April-August 2011
Permanent Seed Mix Applied		April-August 2011
Construction and Grading Ends		August 2011
Containerized Planting for Entire Reach		January 2012
As-Built Construction Drawings		March 2012
SCO Final Report		March 2012
Year 1 Monitoring (2012)	October 2012	December 2012
Year 2 Monitoring (2013)	October 2013	November 2013
Year 3 Monitoring (2014)		
Year 4 Monitoring (2015)		
Year 5 Monitoring (2016)		

**Table 3. Project Contacts Table**  
**Hauser Stream Restoration Site (EEP Project Number 92471)**

<b>Designer</b>	Ward Consulting Engineers, P.C. 8368 Six Forks Road Suite 104 Raleigh, NC 27615-5083 Becky Ward 919-870-0526
<b>Construction, Planting, and Seeding Contractor</b>	Carolina Environmental Contracting, Inc. Mt. Airy, North Carolina 336-320-3849
<b>Surveyor</b>	Turner Land Surveying PLLC 3201 Glenridge Drive Raleigh, NC 27604 Elizabeth Turner 919-875-1378
<b>Seed Mix Source</b>	Unknown
<b>Baseline Data Collection</b>	Not Applicable
<b>Year 1 Monitoring Performer</b>	Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693

**Table 4. Project Baseline Information and Attributes  
Hauser Stream Restoration Site (EEP Project Number 92471)**

<b>Project Information</b>	
Project Name	Hauser Stream Restoration Site
Project County	Davie County, North Carolina
Project Area	9.11 acres
Project Coordinates	836,322.303°N, 1,551,907.668°E
<b>Project Watershed Summary Information</b>	
Physiographic Region	Piedmont
Ecoregion	Southern Outer Piedmont
Project River Basin	Yadkin Pee-dee
USGS 8-digit HUC	03040101
USGS 14-digit HUC	03040101160010
NCDWQ Subbasin	03-07-02
Project Drainage Area	2.64 square miles
Project Drainage Area Impervious Surface	0.6%
Watershed Type	Rural
<b>Reach Summary Information</b>	
<b>Parameters</b>	<b>Hauser Creek</b>
Restored/Enhanced Length	2726 linear feet
Drainage Area	2.64 square miles
NCDWQ Index Number	12-86
NCDWQ Classification	WS-IV
Valley Type/Morphological Description	VIII/C4
Dominant Soil Series	Wehadkee, Chewacla
Drainage Class	Poorly Drained, Somewhat poorly drained
Soil Hydric Status	Hydric, Nonhydric may contain hydric Wehadkee inclusions
Slope	0.0025
FEMA Classification	Regulated Stream
Native Vegetation Community	Piedmont/Low Mountain Alluvial Forest
Percent Composition of Exotic Invasives	<5%
<b>Regulatory Considerations</b>	
<b>Regulation</b>	<b>Applicable</b>
Waters of the U.S. –Sections 404 and 401	Yes-Received Appropriate Permits
Endangered Species Act	Yes-No Effect
Historic Preservation Act	No
CZMA/CAMA	No
FEMA Floodplain Compliance	Yes-Received a No Rise Certification
Essential Fisheries Habitat	No

APPENDIX B

VISUAL ASSESSMENT DATA

Figures 2 and 2A-2B. Current Conditions Plan View

Table 5. Visual Stream Morphology Stability Assessment

Table 6. Vegetation Condition Assessment

Stream Fixed Station Photographs

Vegetation Monitoring Photographs



Prepared for:



Project:

**HAUSER CREEK RESTORATION SITE**

EEP Project Number 92471  
Davie County, NC

Title:

**CURRENT CONDITIONS PLAN VIEW**

Drawn by:

KRJ/CLF

Date:

October 2013

Scale:

1 in = 180 ft

Project No.:

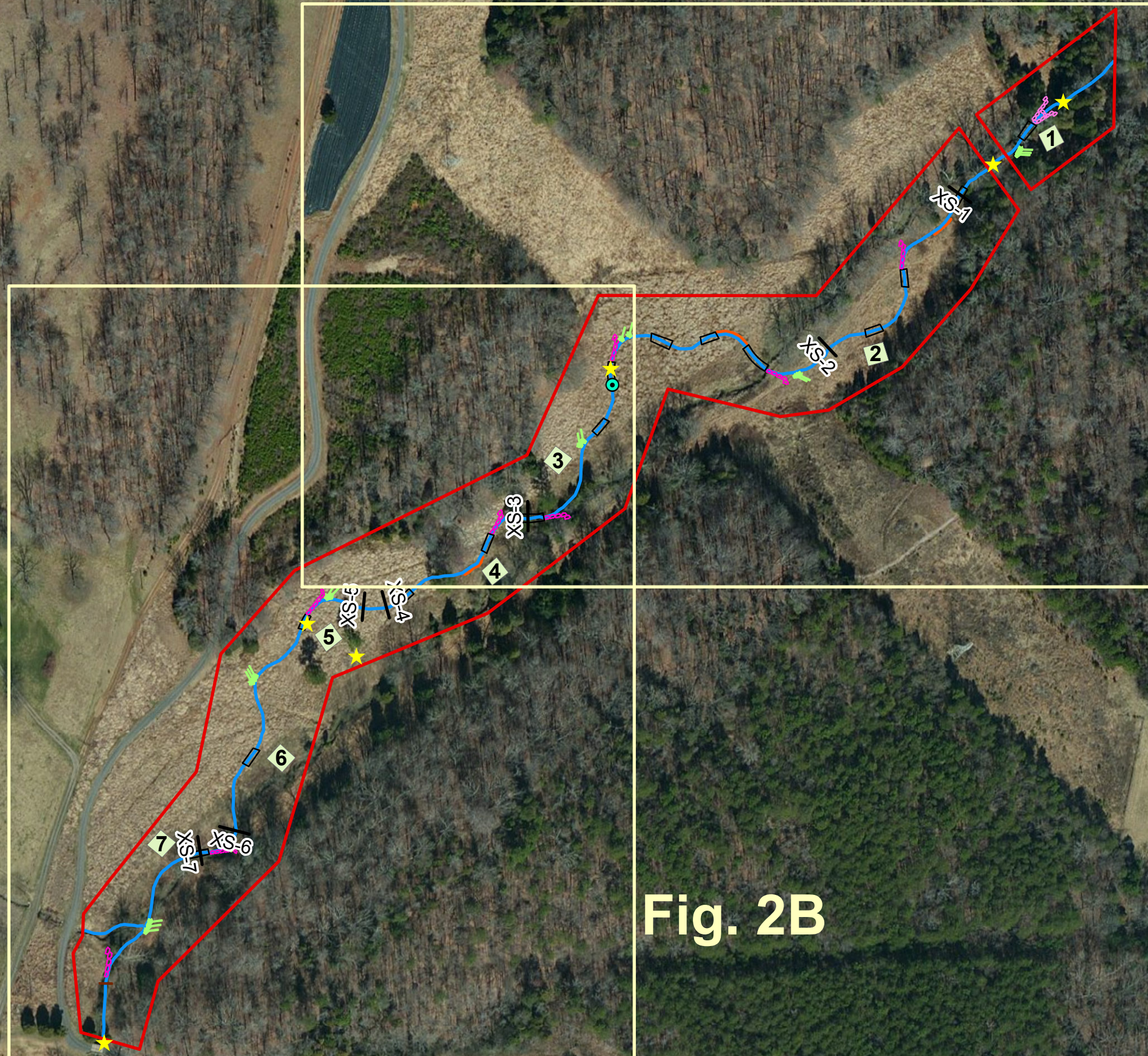
12-004.11

FIGURE

**2**

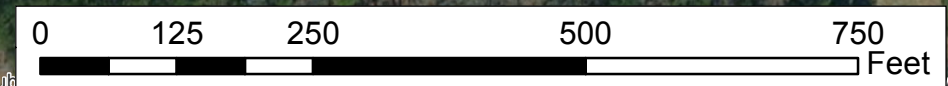
**Fig. 2A**

**Fig. 2B**



**Legend**

- Easement Boundary
- Stream
- In-Stream Structures**
  - Constructed Riffle
  - Cross Vane
  - Log Structure
  - Root Wad
  - Single Arm Vane
- Stream Areas of Concern
- Cross Sections
- CVS Monitoring Plots
- Photo Points
- Crest Gauge

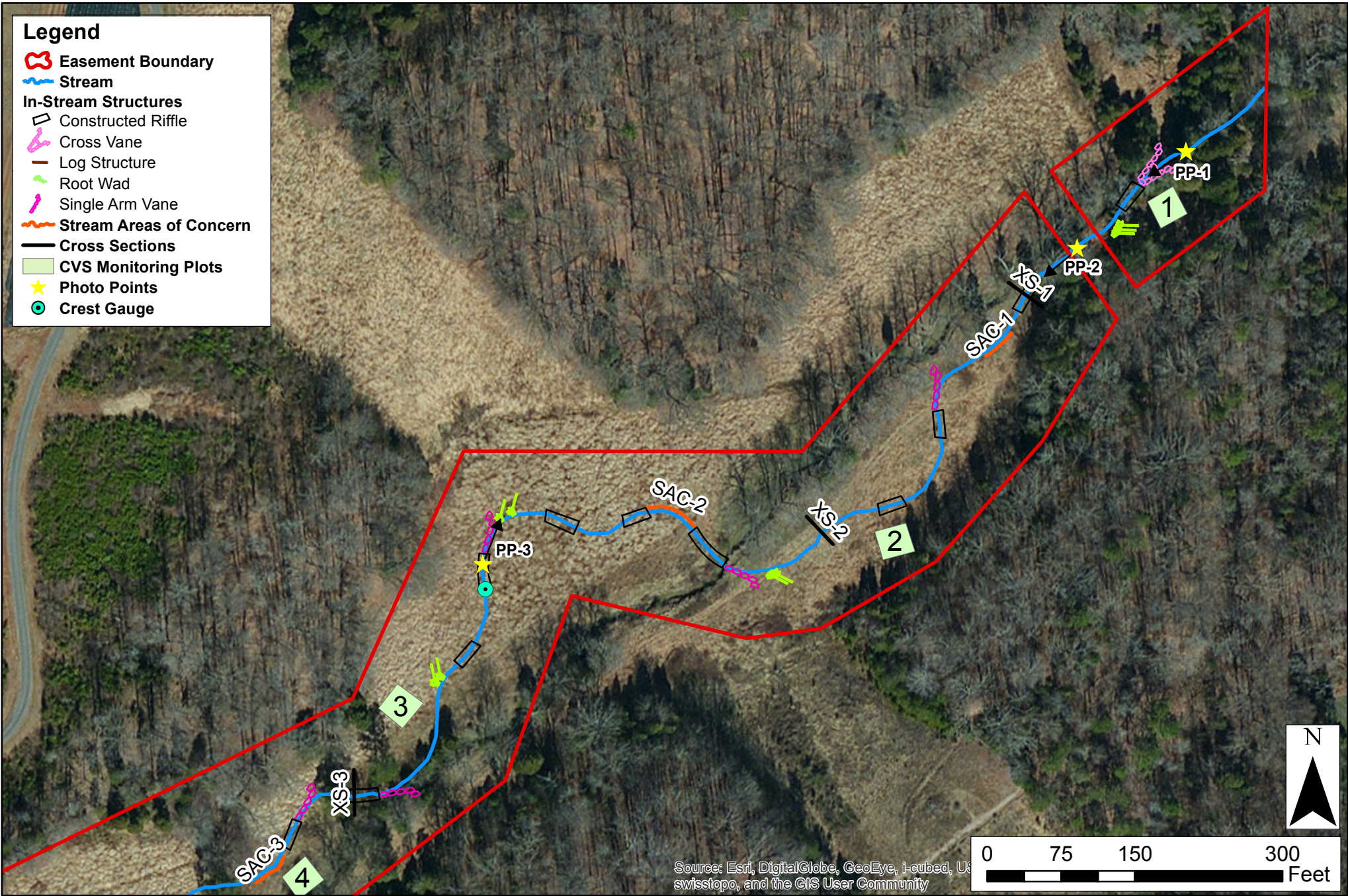


Spillman Road

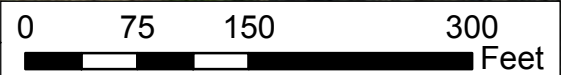
Source: Esri, DigitalGlobe, GeoEye, i-out

**Legend**

-  Easement Boundary
-  Stream
- In-Stream Structures**
-  Constructed Riffle
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-  Root Wad
-  Single Arm Vane
-  Stream Areas of Concern
-  Cross Sections
-  CVS Monitoring Plots
-  Photo Points
-  Crest Gauge



Source: Esri, DigitalGlobe, GeoEye, i-cubed, UK swisstopo, and the GIS User Community



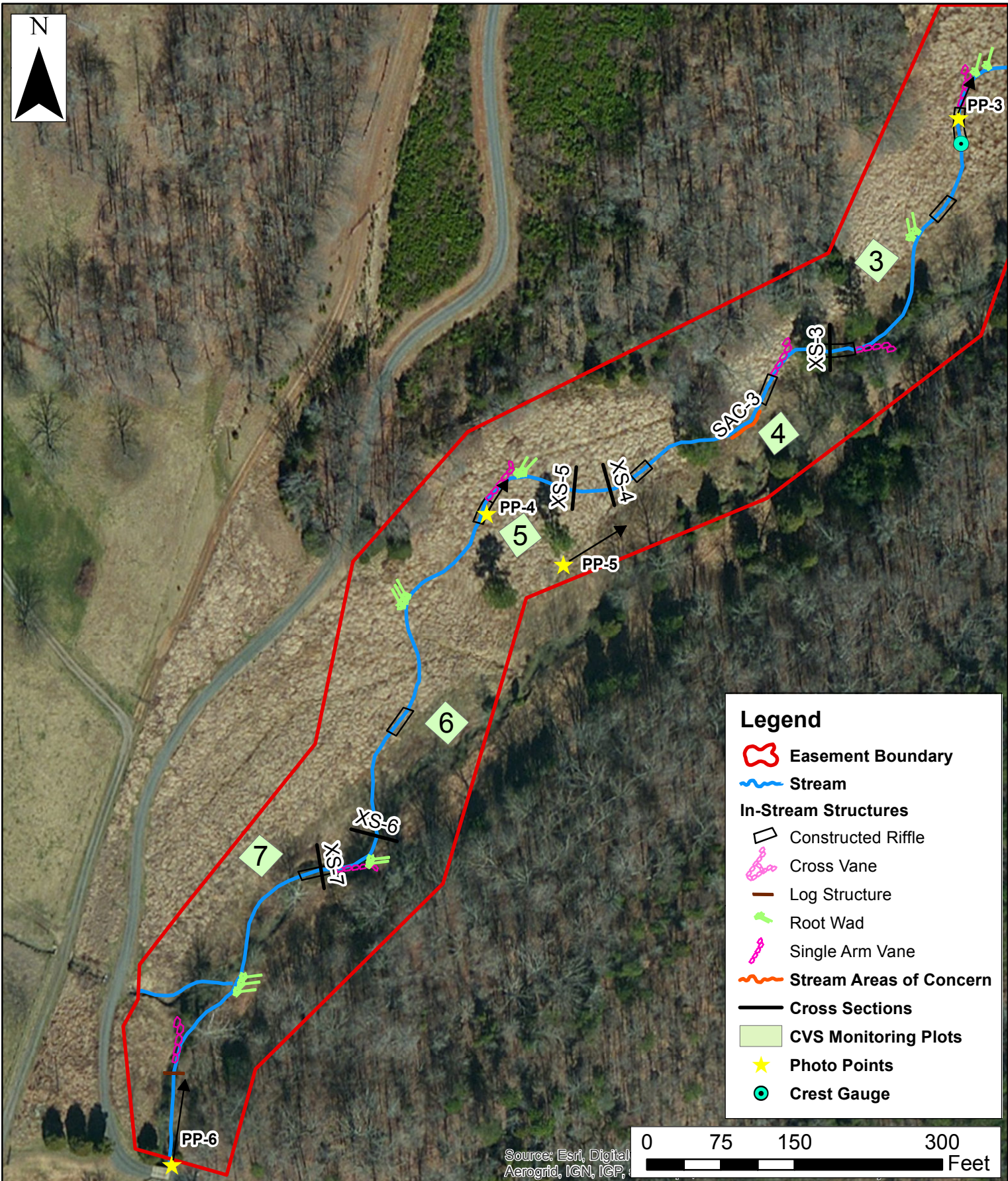

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**CURRENT CONDITIONS PLAN VIEW  
HAUSER CREEK  
EEP PROJECT NUMBER 92471  
Davie County, North Carolina**

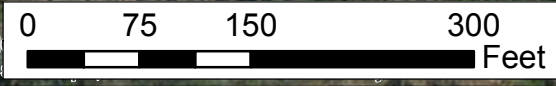
Dwn. by:	KRJ/CLF
Date:	October 2013
Project:	12-004.11

FIGURE  
**2A**



**Legend**

- Easement Boundary
- Stream
- In-Stream Structures**
  - Constructed Riffle
  - Cross Vane
  - Log Structure
  - Root Wad
  - Single Arm Vane
- Stream Areas of Concern
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Source: Esri, Digital Aeronod, IGN, ICP,

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**CURRENT CONDITIONS PLAN VIEW  
HAUSER CREEK  
EEP PROJECT NUMBER 92471  
Davie County, North Carolina**

Dwn. by.  
KRJ/CLF

Date:  
October 2013

Project:  
12-004.11

FIGURE  
**2B**

Table 5  
 Reach ID  
 Assessed Length

**Visual Stream Morphology Stability Assessment**  
 Hauser  
 2468

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. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	15	15			100%			
		3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6)	24	24					
	2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)		100	100			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	100	100			100%			
2. Thalweg centering at downstream of meander (Glide)		100	100			100%				
<b>Totals</b>										
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <b>NOT</b> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			3	35	99%			99%
<b>Totals</b>										
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	8	8			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio $\geq$ 1.6 Rootwads/logs providing some cover at base-flow.	8	8			100%			



HAUSER

**Table 6** Vegetation Condition Assessment

Planted Acreage<sup>1</sup>

5.9

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of planted woody and herbaceous material on stream banks	0.1 acres	N/A	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on visual observations and MY3 stem count criteria.	0.1 acres	N/A	0	0.00	0.0%
<b>Total</b>					0.00	0.0%
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	N/A	0	0.00	0.0%
<b>Cumulative Total</b>					0	0.00

Easement Acreage<sup>2</sup>

13.34

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern <sup>4</sup>	Microstegium, tall fescue, multiflora rose, Chinese privet, Chinese lespedeza	1000 SF	N/A	0	0.00	0.0%
5. Easement Encroachment Areas <sup>3</sup>	Microstegium encroachment	none	N/A	0	0.00	0.0%

<sup>1</sup> = 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.

<sup>2</sup> = The acreage within the easement boundaries.

<sup>3</sup> = 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.

<sup>4</sup> = 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 species 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 likely 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 early 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 symbolizing invasives polygons, particularly for situations where the condition 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.

**Hauser Creek  
Stream Fixed Station Photographs  
Taken October 11, 2013**



Stream Photo 1



Stream Photo 2



Stream Photo 3



Stream Photo 4

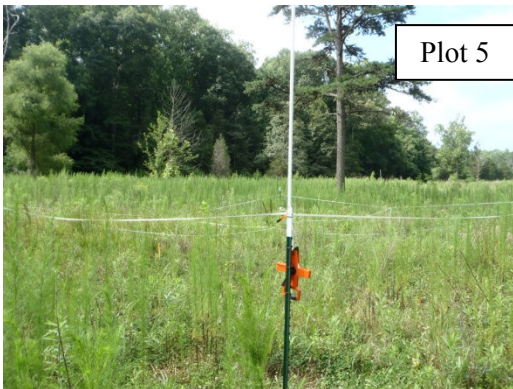


Stream Photo 5



Stream Photo 6

**Hauser Creek  
Vegetation Monitoring Photographs  
Taken July 25, 2013**



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  
Hauser Restoration Site (EEP Project Number 92741)**

<b>Vegetation Plot ID</b>	<b>Vegetation Survival Threshold Met?</b>	<b>Tract Mean</b>
1	Yes	100%
2	Yes	
3	Yes	
4	Yes	
5	Yes	
6	Yes	
7	Yes	

**Table 8. CVS Vegetation Plot Metadata  
Hauser Restoration Site (EEP Project Number 92741)**

<b>Report Prepared By</b>	Corri Faquin
<b>Date Prepared</b>	8/1/2013 13:26
<b>database name</b>	Axiom-EEP-2013-A-v2.3.1.mdb
<b>database location</b>	\\AE-SBS\RedirectedFolders\pperkinson\Desktop
<b>computer name</b>	PHILLIP-PC
<b>file size</b>	53940224
<b>DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT</b>	
<b>Metadata</b>	Description of database file, the report worksheets, and a summary of project(s) and project data.
<b>Proj, planted</b>	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
<b>Proj, total stems</b>	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.
<b>Plots</b>	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
<b>Vigor</b>	Frequency distribution of vigor classes for stems for all plots.
<b>Vigor by Spp</b>	Frequency distribution of vigor classes listed by species.
<b>Damage</b>	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
<b>Damage by Spp</b>	Damage values tallied by type for each species.
<b>Damage by Plot</b>	Damage values tallied by type for each plot.
<b>Planted Stems by Plot and Spp</b>	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
<b>ALL Stems by Plot and spp</b>	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
<b>PROJECT SUMMARY</b>	
<b>Project Code</b>	92471
<b>project Name</b>	UT to Hauser Creek
<b>Description</b>	Stream Restoration
<b>River Basin</b>	Yadkin-Pee Dee
<b>length(ft)</b>	
<b>area (sq m)</b>	
<b>Required Plots (calculated)</b>	
<b>Sampled Plots</b>	7

Table 9. Planted Stems by Plot and Species

Hauser Creek EEP #92471

Scientific Name	Common Name	Species Type	Current Plot Data (MY2 2013)																					Annual Means								
			92471-01-0001			92471-01-0002			92471-01-0003			92471-01-0004			92471-01-0005			92471-01-0006			92471-01-0007			MY2 (2013)			MY1 (2012)					
			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	PnoLS	P-all	T	PnoLS	P-all	T
Abelia	abelia			2																								2				
Acer negundo	boxelder	Tree								10					3													14		15		
Acer rubrum	red maple	Tree																												2		
Alnus serrulata	hazel alder	Shrub	1	1	1				2							2	2	2												5		
Betula nigra	river birch	Tree							2	2	2	1	1	5	3	3	3	1	1	1										11		
Callicarpa americana	American beautyberry	Shrub							2	2	2				1	1	1													3		
Cornus amomum	silky dogwood	Shrub	3	3	3	4	4	4	1	1	1				1	1	1	2	2	2										11		
Diospyros virginiana	common persimmon	Tree	3	3	3	1	1	1				1	1	1				1	1	1	2	2	2							8		
Fraxinus pennsylvanica	green ash	Tree	4	4	4	3	3	33	4	4	35	4	4	47	1	1	44	4	4	4											20	
Juglans nigra	black walnut	Tree																													1	
Liquidambar styraciflua	sweetgum	Tree			33						13																				189	
Liriodendron tulipifera	tuliptree	Tree	1	1	1													1	1	1	1	1	1								6	
Nyssa	tupelo	Tree														2	2	2													2	
Nyssa sylvatica	blackgum	Tree							1	1	1																				1	
Physocarpus opulifolius	common ninebark	Shrub							2	2	2																				2	
Platanus occidentalis	American sycamore	Tree	2	2	2	1	1	1	2	2	2	8	8	15	1	1	4				4	4	4									18
Quercus michauxii	swamp chestnut oak	Tree	1	1	1				1	1	1							1	1	1	2	2	2									5
Sambucus canadensis	Common Elderberry	Shrub	1	1	1																1	1	1									2
Ulmus americana	American elm	Tree																														1
Unknown		Shrub or Tree																1	1	1												1
Viburnum dentatum	southern arrowwood	Shrub																4	4	4												4
<b>Stem count</b>			16	16	51	9	9	54	15	15	122	14	14	145	13	13	64	13	13	16	10	10	11	90	90	463	73	73	177			
<b>size (ares)</b>			1			1			1			1			1			1			1			7			7					
<b>size (ACRES)</b>			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.17			0.17					
<b>Species count</b>			8	8	10	4	4	6	8	8	11	4	4	7	7	7	8	8	8	11	5	5	6	15	15	20	12	12	15			
<b>Stems per ACRE</b>			647.5	647.5	2064	364.2	364.2	2185	607	607	4937	566.6	566.6	5868	526.1	526.1	2590	526.1	526.1	647.5	404.7	404.7	445.2	520.3	520.3	2677	422	422	1023			

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%

PnoLS = Planted excluding livestakes

P-all = Planting including livestakes

T = All planted and natural recruits including livestakes

T includes natural recruits

APPENDIX D  
STREAM SURVEY DATA

Cross-section Plots

Longitudinal Profile Plots

Substrate Plots

Table 10. Baseline Stream Data Summary

Tables 11a-b. Monitoring Data



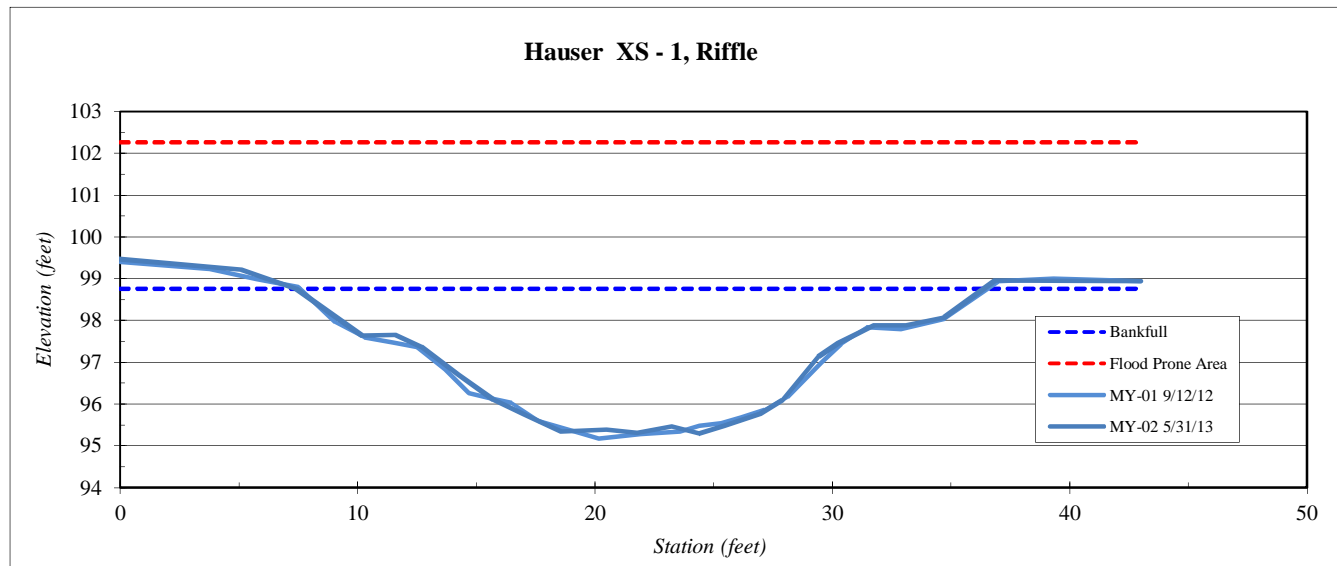
<b>Site</b>	Hauser Creek
<b>Watershed:</b>	Yadkin Pee Dee
<b>XS ID</b>	XS - 1, Riffle
<b>Feature</b>	Riffle
<b>Date:</b>	5/31/2013
<b>Field Crew:</b>	Perkinson, Jernigan



Station	Elevation
-0.4	99.48
5.1	99.22
7.4	98.76
10.2	97.63
11.6	97.65
12.7	97.36
14.3	96.70
15.7	96.11
17.0	95.76
18.6	95.35
20.5	95.39
21.8	95.32
23.2	95.47
24.4	95.29
25.4	95.48
27.0	95.77
27.9	96.10
29.4	97.14
30.3	97.46
31.8	97.88
33.1	97.9
34.7	98.1
36.9	99.0
43.0	98.9

SUMMARY DATA	
<b>Bankfull Elevation:</b>	98.8
<b>Bankfull Cross-Sectional Area:</b>	59.2
<b>Bankfull Width:</b>	29.0
<b>Flood Prone Area Elevation:</b>	102.3
<b>Flood Prone Width:</b>	150.0
<b>Max Depth at Bankfull:</b>	3.5
<b>Mean Depth at Bankfull:</b>	2.0
<b>W / D Ratio:</b>	14.2
<b>Entrenchment Ratio:</b>	5.2
<b>Bank Height Ratio:</b>	1.0

<b>Stream Type</b>	E
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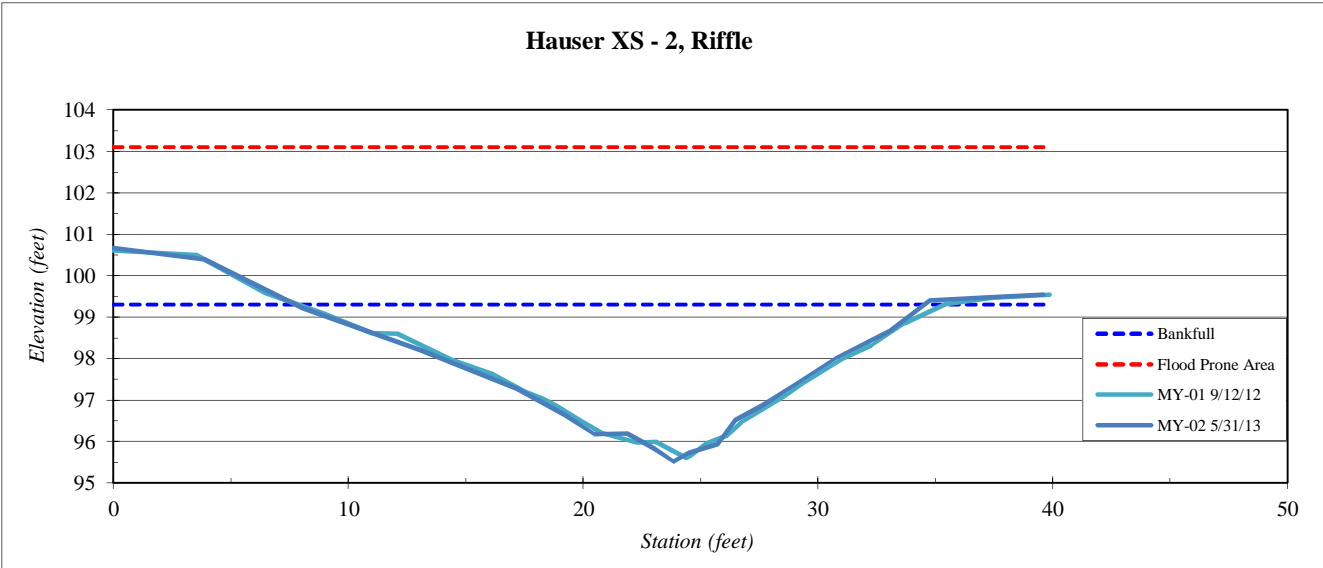
<b>Site</b>	Hauser Creek
<b>Watershed:</b>	Yadkin Pee Dee
<b>XS ID</b>	XS - 2, Riffle
<b>Feature</b>	Riffle
<b>Date:</b>	5/31/2013
<b>Field Crew:</b>	Perkinson, Jernigan



<b>Stream Type</b>	E
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SUMMARY DATA	
<b>Bankfull Elevation:</b>	99.3
<b>Bankfull Cross-Sectional Area:</b>	49.6
<b>Bankfull Width:</b>	26.8
<b>Flood Prone Area Elevation:</b>	103.1
<b>Flood Prone Width:</b>	150.0
<b>Max Depth at Bankfull:</b>	3.8
<b>Mean Depth at Bankfull:</b>	1.9
<b>W / D Ratio:</b>	14.5
<b>Entrenchment Ratio:</b>	5.6
<b>Bank Height Ratio:</b>	1.0

Station	Elevation
0.00	100.67
3.87	100.39
8.06	99.22
13.09	98.20
17.18	97.28
19.16	96.65
20.48	96.18
21.87	96.19
22.49	96.00
23.06	95.82
23.88	95.50
24.53	95.72
25.71	95.93
26.48	96.52
27.68	96.88
29.1	97.41
30.8	98.03
33.1	98.67
34.8	99.41
37.3	99.49
39.6	99.54



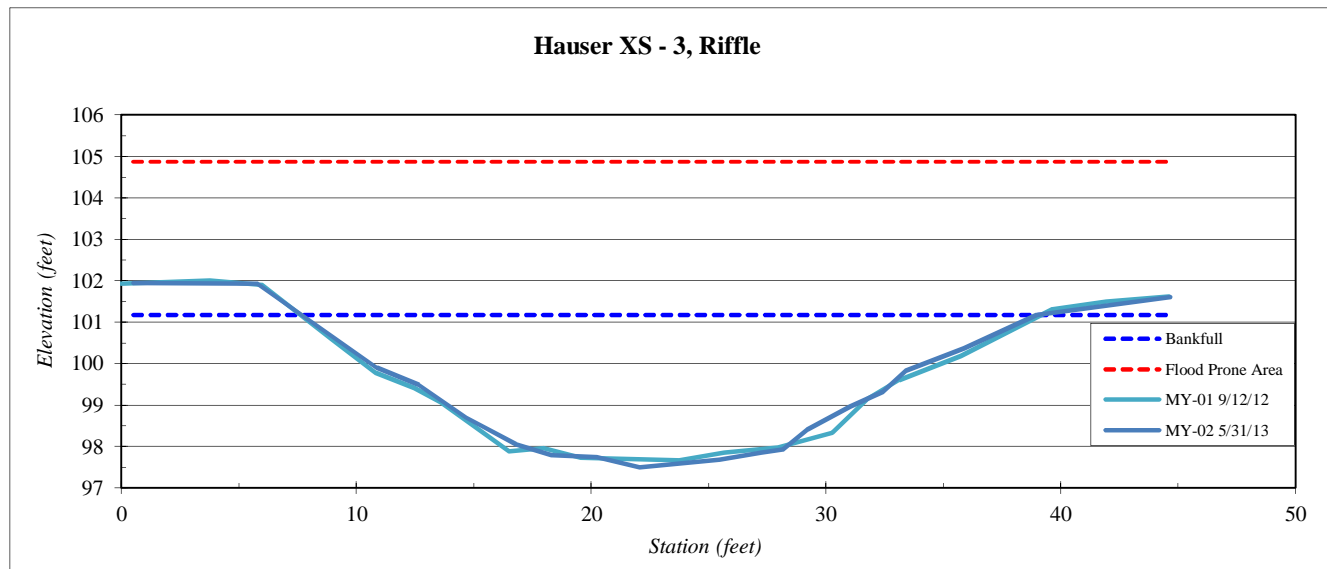
<b>Site</b>	Hauser Creek
<b>Watershed:</b>	Yadkin Pee Dee
<b>XS ID</b>	XS - 3, Riffle
<b>Feature</b>	Riffle
<b>Date:</b>	5/31/2013
<b>Field Crew:</b>	Perkinson, Jernigan



<b>Stream Type</b>	E
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Station	Elevation
0.50	101.94
5.80	101.92
10.87	99.90
12.65	99.49
14.68	98.71
16.81	98.06
18.34	97.78
20.24	97.74
22.06	97.49
25.48	97.68
27.25	97.85
28.17	97.93
29.20	98.41
31.02	98.96
32.43	99.32
33.4	99.82
35.9	100.38
39.0	101.18
44.7	101.61

SUMMARY DATA	
<b>Bankfull Elevation:</b>	101.2
<b>Bankfull Cross-Sectional Area:</b>	70.2
<b>Bankfull Width:</b>	31.3
<b>Flood Prone Area Elevation:</b>	104.9
<b>Flood Prone Width:</b>	150.0
<b>Max Depth at Bankfull:</b>	3.7
<b>Mean Depth at Bankfull:</b>	2.2
<b>W / D Ratio:</b>	14.0
<b>Entrenchment Ratio:</b>	4.8
<b>Bank Height Ratio:</b>	1.0



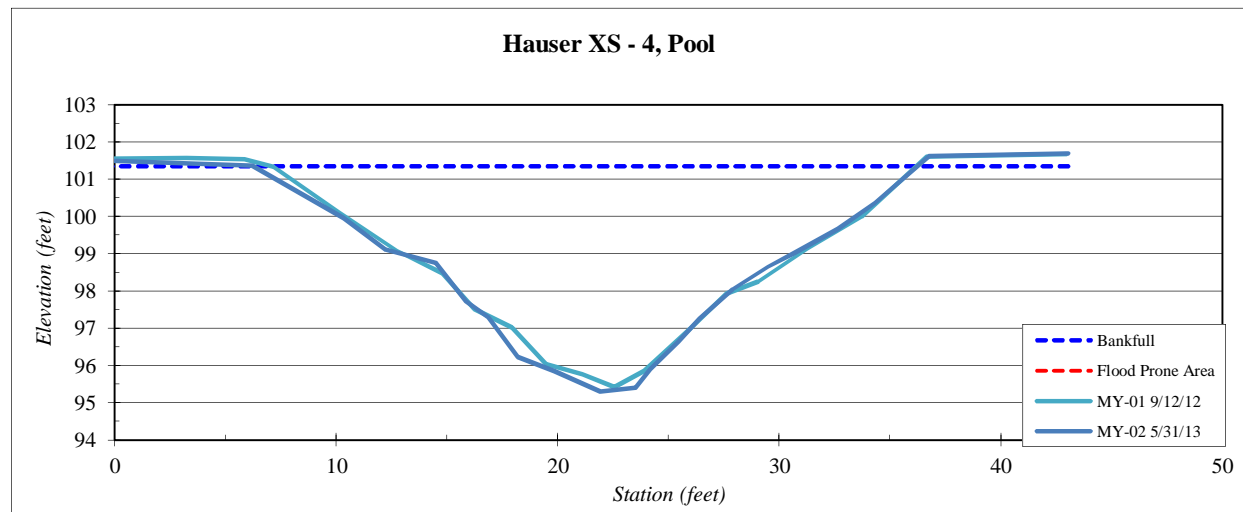
<b>Site</b>	Hauser Creek
<b>Watershed:</b>	Yadkin Pee Dee
<b>XS ID</b>	XS - 4, Pool
<b>Feature</b>	Pool
<b>Date:</b>	5/31/2013
<b>Field Crew:</b>	Perkinson, Jernigan



Station	Elevation
-0.5	101.5
6.2	101.4
10.3	99.9
12.2	99.1
14.5	98.7
15.9	97.7
16.9	97.3
18.2	96.2
19.8	95.8
21.9	95.3
23.5	95.4
24.2	95.9
25.5	96.6
26.4	97.3
27.9	98.0
29.5	98.6
30.7	99.0
32.6	99.7
34.4	100.4
36.8	101.6
43.0	101.68

SUMMARY DATA	
<b>Bankfull Elevation:</b>	101.4
<b>Bankfull Cross-Sectional Area:</b>	91.3
<b>Bankfull Width:</b>	30.0
<b>Flood Prone Area Elevation:</b>	NA
<b>Flood Prone Width:</b>	NA
<b>Max Depth at Bankfull:</b>	6.1
<b>Mean Depth at Bankfull:</b>	3.0
<b>W / D Ratio:</b>	NA
<b>Entrenchment Ratio:</b>	NA
<b>Bank Height Ratio:</b>	1.0

Stream Type C/E



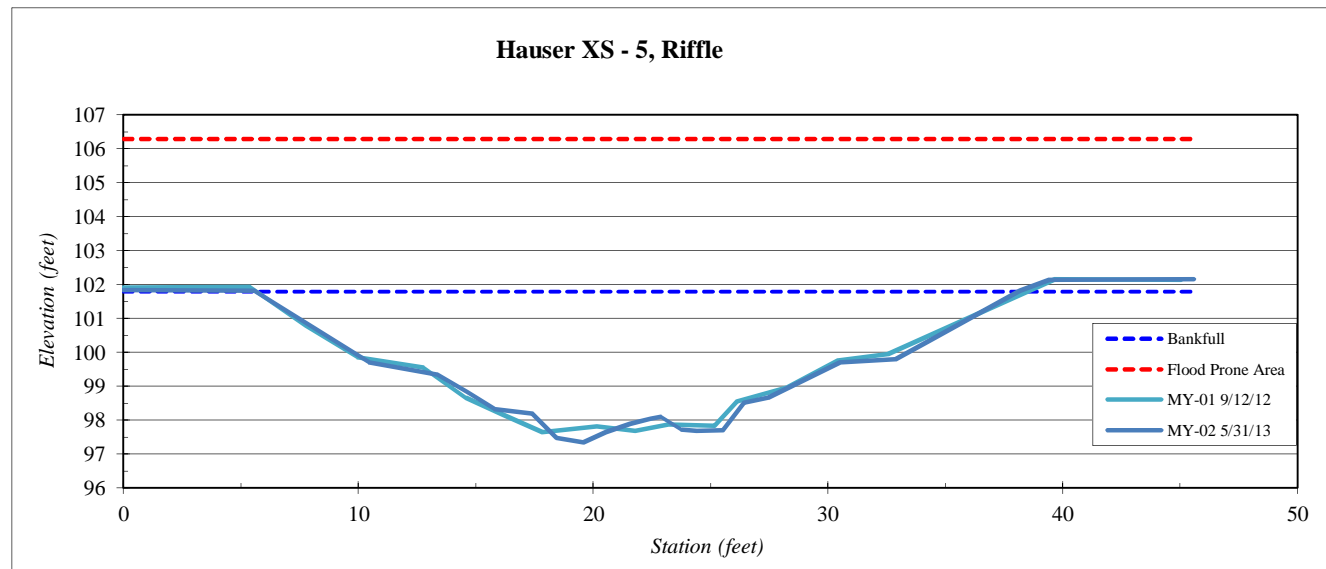
<b>Site</b>	Hauser Creek
<b>Watershed:</b>	Yadkin Pee Dee
<b>XS ID</b>	XS - 5, Riffle
<b>Feature</b>	Riffle
<b>Date:</b>	5/31/2013
<b>Field Crew:</b>	Perkinson, Jernigan



Station	Elevation
0.00	101.84
5.56	101.81
10.46	99.70
13.35	99.34
14.64	98.82
15.80	98.32
17.40	98.20
18.43	97.48
19.59	97.33
20.54	97.64
21.57	97.88
22.45	98.04
22.89	98.10
23.76	97.72
24.40	97.68
25.5	97.70
26.4	98.51
27.5	98.67
29.0	99.17
30.5	99.70
32.9	99.80
34.3	100.33
38.2	101.81
39.4	102.14
45.59	102.15

SUMMARY DATA	
<b>Bankfull Elevation:</b>	101.8
<b>Bankfull Cross-Sectional Area:</b>	82.5
<b>Bankfull Width:</b>	32.6
<b>Flood Prone Area Elevation:</b>	106.3
<b>Flood Prone Width:</b>	150.0
<b>Max Depth at Bankfull:</b>	4.5
<b>Mean Depth at Bankfull:</b>	2.5
<b>W / D Ratio:</b>	12.9
<b>Entrenchment Ratio:</b>	4.6
<b>Bank Height Ratio:</b>	1.0

<b>Stream Type</b>	E
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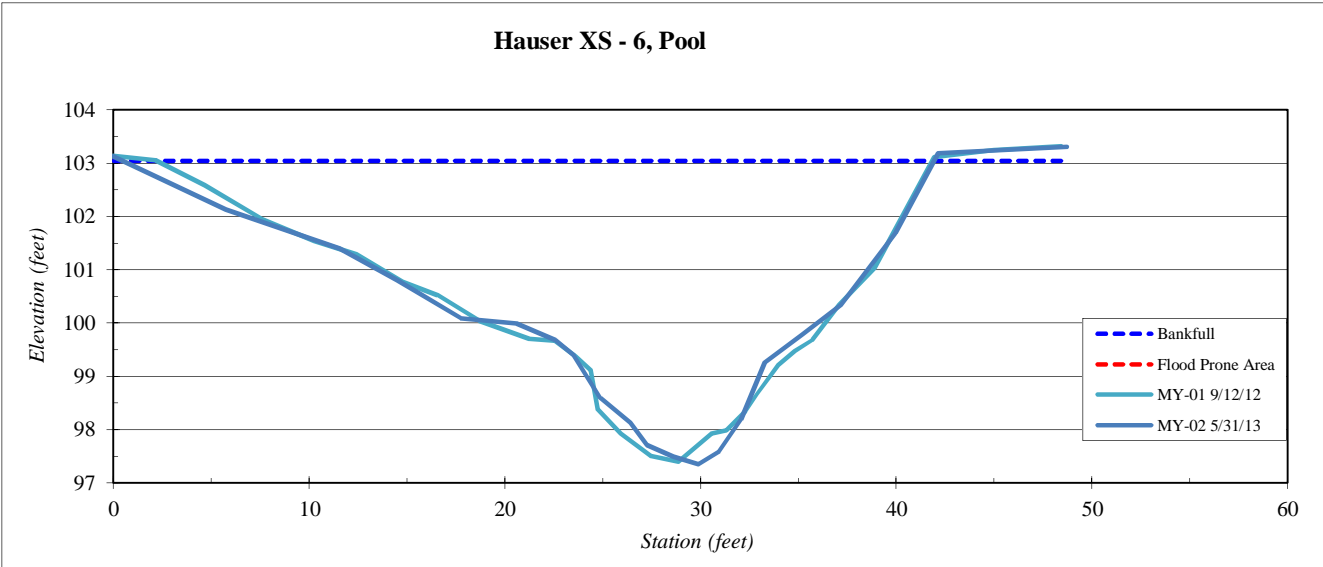
<b>Site</b>	Hauser Creek
<b>Watershed:</b>	Yadkin Pee Dee
<b>XS ID</b>	XS - 6, Pool
<b>Feature</b>	Pool
<b>Date:</b>	5/31/2013
<b>Field Crew:</b>	Perkinson, Jernigan



Station	Elevation
0.00	103.13
5.75	102.13
11.56	101.39
14.48	100.82
17.75	100.09
20.60	99.99
22.60	99.69
23.54	99.40
24.86	98.60
26.40	98.13
27.25	97.71
28.61	97.49
29.93	97.35
30.91	97.57
32.06	98.19
33.29	99.26
35.22	99.79
37.16	100.34
39.97	101.69
42.14	103.18
48.71	103.31

SUMMARY DATA	
<b>Bankfull Elevation:</b>	103.1
<b>Bankfull Cross-Sectional Area:</b>	110.6
<b>Bankfull Width:</b>	41.5
<b>Flood Prone Area Elevation:</b>	NA
<b>Flood Prone Width:</b>	NA
<b>Max Depth at Bankfull:</b>	5.7
<b>Mean Depth at Bankfull:</b>	2.7
<b>W / D Ratio:</b>	NA
<b>Entrenchment Ratio:</b>	NA
<b>Bank Height Ratio:</b>	1.0

<b>Stream Type</b>	E
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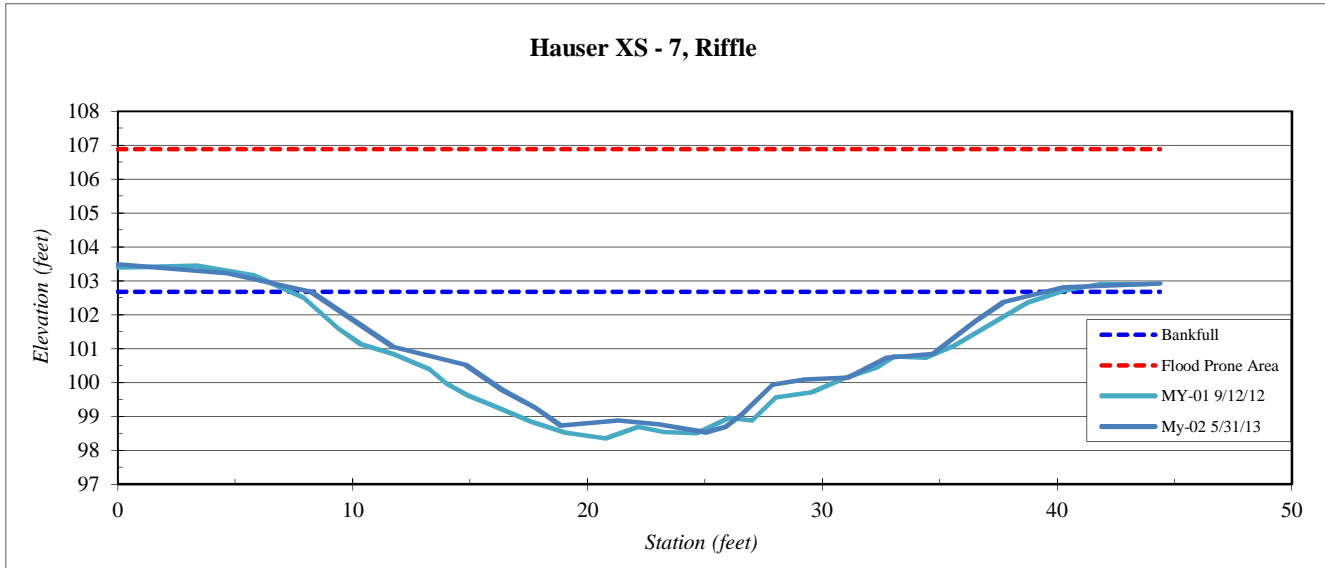
<b>Site</b>	Hauser Creek
<b>Watershed:</b>	Yadkin Pee Dee
<b>XS ID</b>	XS - 7, Riffle
<b>Feature</b>	Riffle
<b>Date:</b>	5/31/2013
<b>Field Crew:</b>	Perkinson, Jernigan



SUMMARY DATA	
<b>Bankfull Elevation:</b>	102.7
<b>Bankfull Cross-Sectional Area:</b>	74.8
<b>Bankfull Width:</b>	31.3
<b>Flood Prone Area Elevation:</b>	106.9
<b>Flood Prone Width:</b>	150.0
<b>Max Depth at Bankfull:</b>	4.2
<b>Mean Depth at Bankfull:</b>	2.4
<b>W / D Ratio:</b>	13.1
<b>Entrenchment Ratio:</b>	4.8
<b>Bank Height Ratio:</b>	1.0

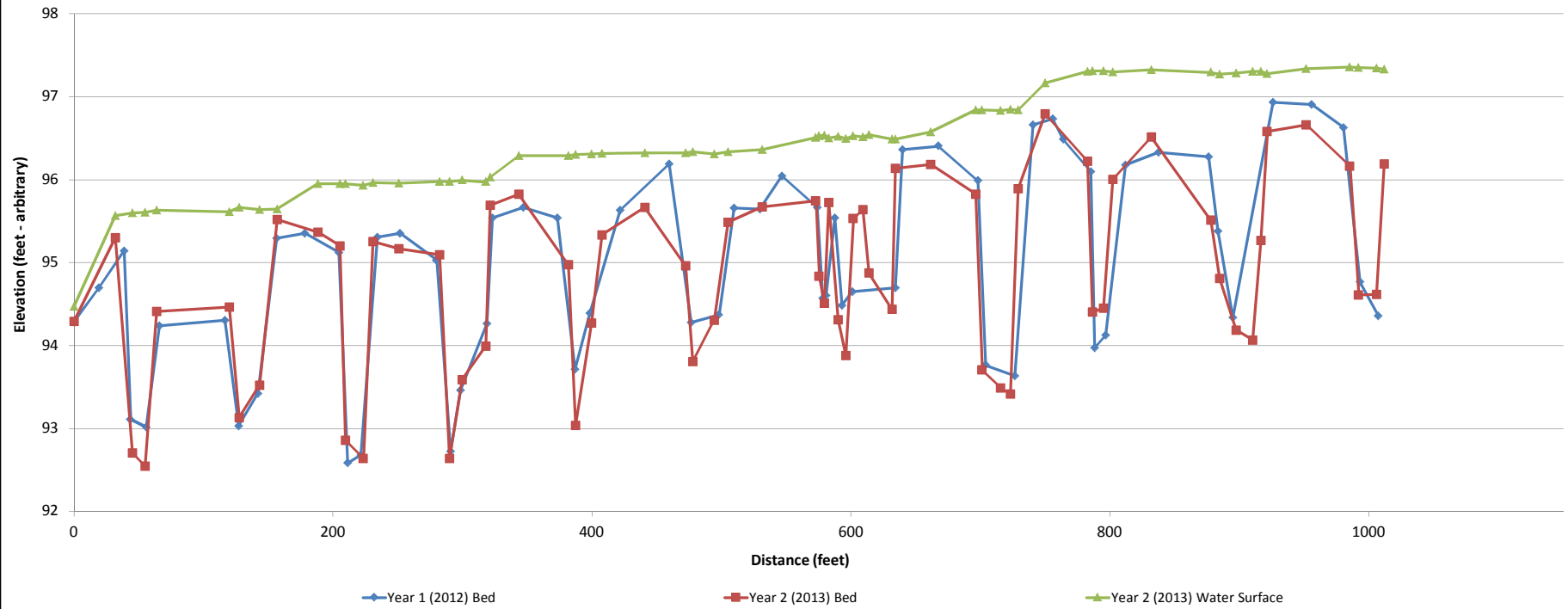
Station	Elevation
0.00	103.49
4.66	103.23
8.22	102.68
11.72	101.06
14.81	100.52
16.36	99.79
17.76	99.25
18.86	98.72
21.31	98.88
23.03	98.77
25.04	98.53
25.89	98.68
26.54	99.04
27.87	99.93
29.26	100.10
31.09	100.14
32.74	100.72
34.71	100.85
36.50	101.79
37.74	102.38
40.26	102.81
44.38	102.92

Stream Type      E



<b>Project Name</b>	Hauser Creek - Year 2 (2013) Profile	<b>Avg. Water Surface Slope</b>	2012 0.0022	2013 0.0022	2014	2015	
<b>Reach</b>	Main Reach (00+00 - 10+00)	<b>Riffle Length</b>	48	56			
<b>Feature</b>	Profile	<b>Avg. Riffle Slope</b>	0.0047	0.0039			
<b>Date</b>	5/30/13	<b>Pool Length</b>	16	18			
<b>Crew</b>	Perkinson, Dean, Jernigan	<b>Avg. Pool Slope</b>	0.0005	0.0004			

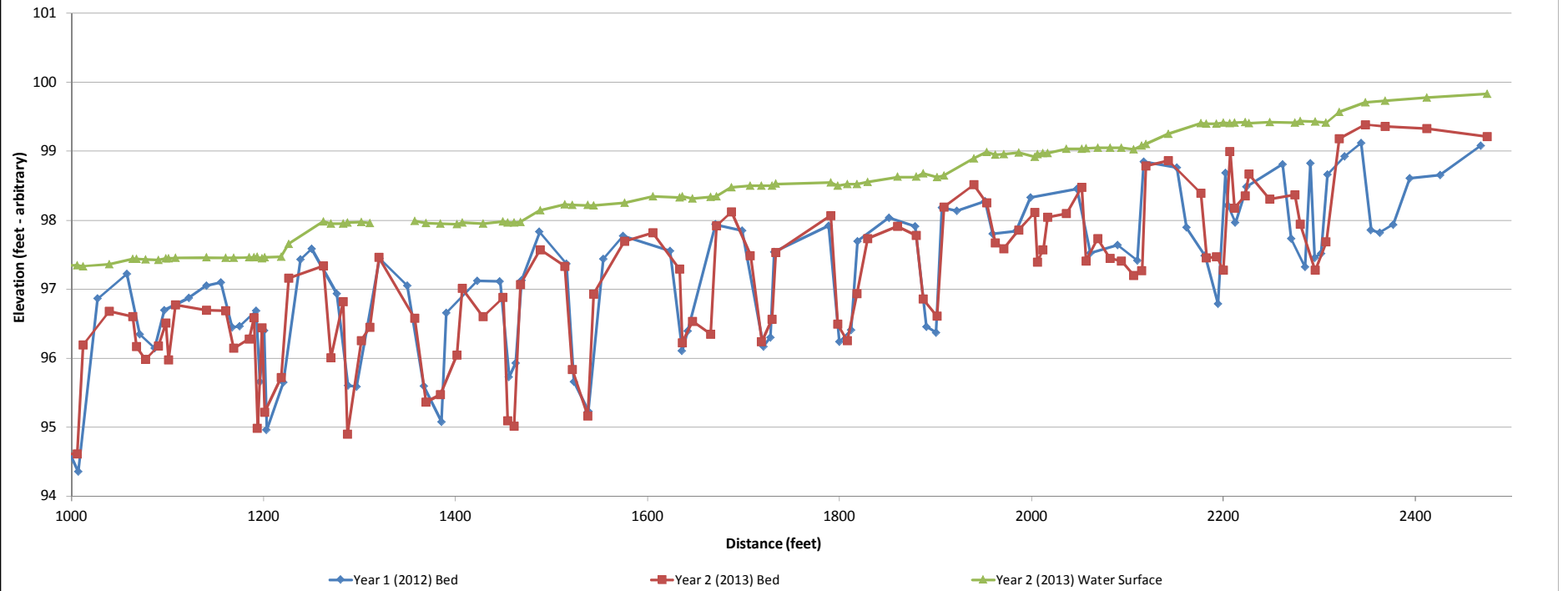
Hauser Creek Year 2 (2013) Profile - Reach 00+00 to 10+00



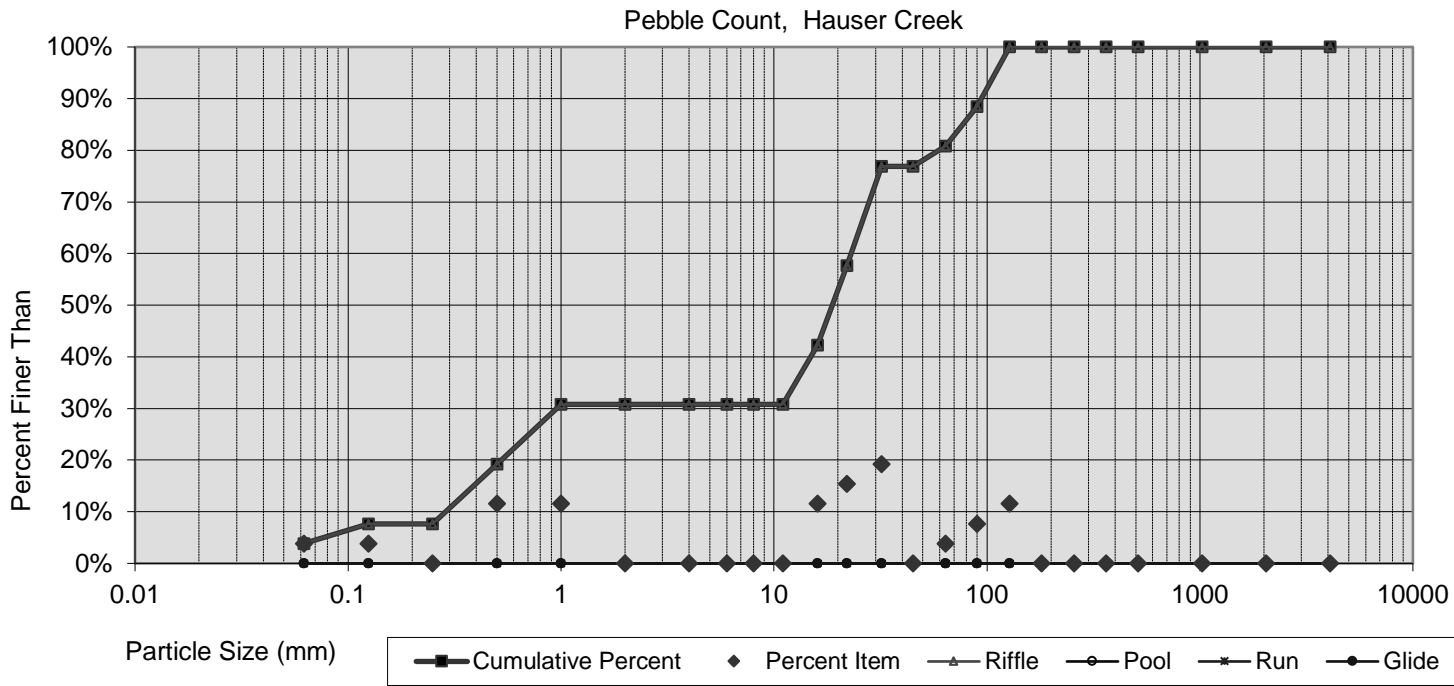


<b>Project Name</b>	Hauser Creek - Year 2 (2013) Profile	<b>Avg. Water Surface Slope</b>	2012 0.0022	2013 0.0022	2014	2015	
<b>Reach</b>	Main Reach (10+00 - 22+50)	<b>Riffle Length</b>	48	56			
<b>Feature</b>	Profile	<b>Avg. Riffle Slope</b>	0.0047	0.0039			
<b>Date</b>	5/30/13	<b>Pool Length</b>	16	18			
<b>Crew</b>	Perkinson, Dean, Jernigan	<b>Avg. Pool Slope</b>	0.0005	0.0004			

Hauser Creek Year 2 (2013) Profile - Reach 10+00 to 22+50

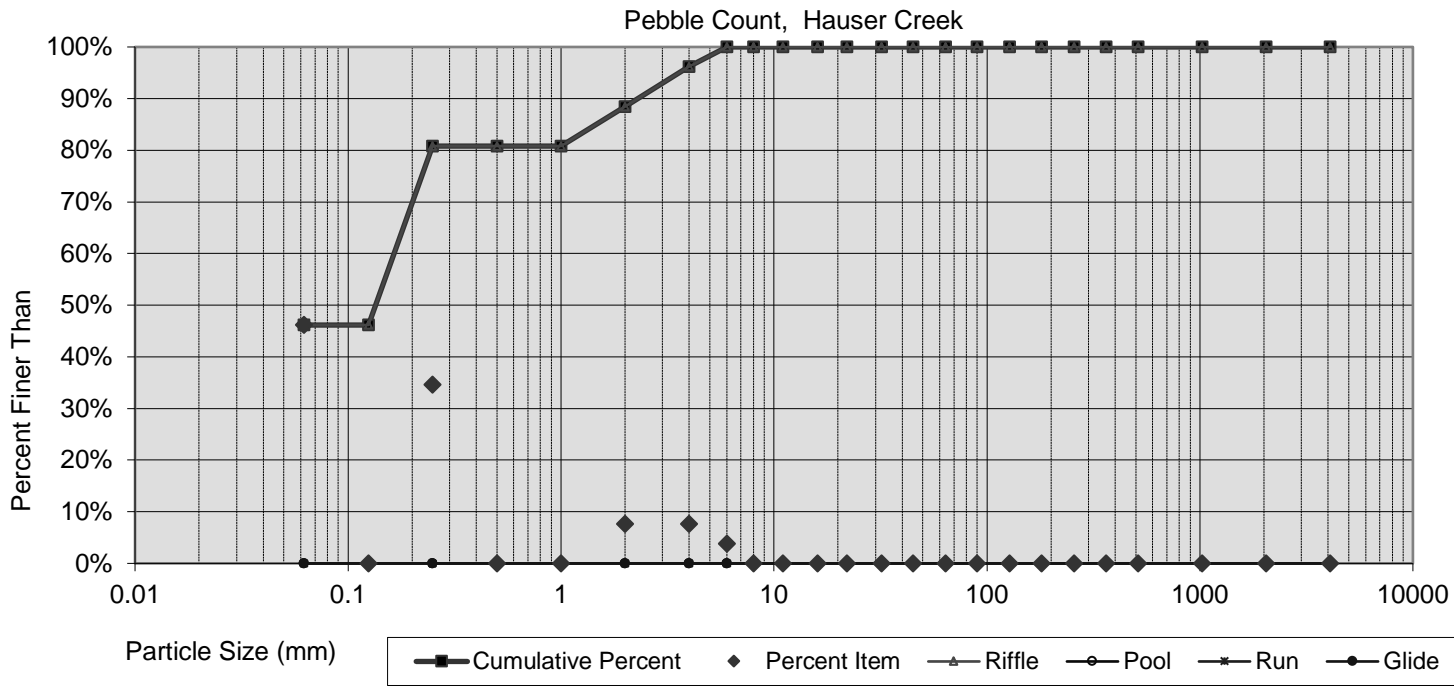


	Pebble Count,
	Hauser Creek
	Yadkin Pee Dee
	---
Note:	<b>Cross Section 3</b>



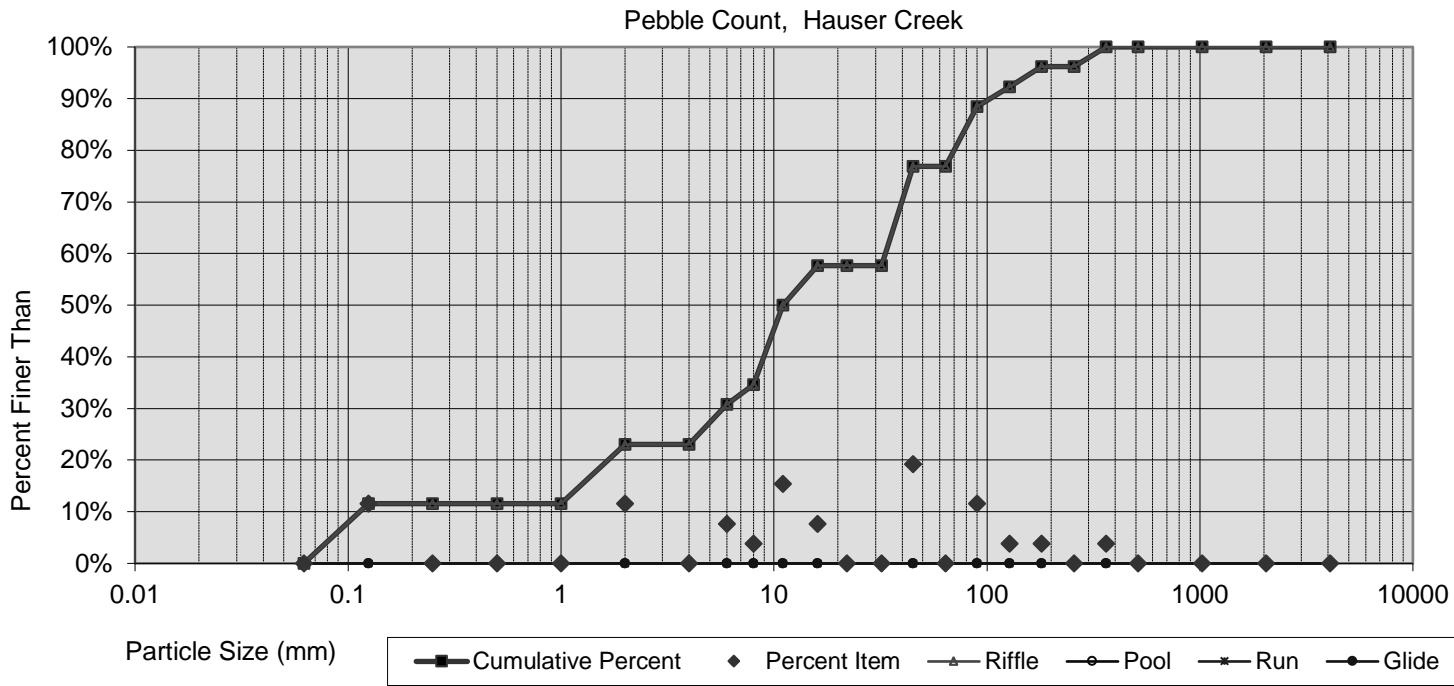
Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
0.412	12.62	18.8	74	110	4%	27%	50%	19%	0%	0%

	Pebble Count,
	Hauser Creek
	Yadkin Pee Dee
	---
Note:	<b>Cross Section 5</b>



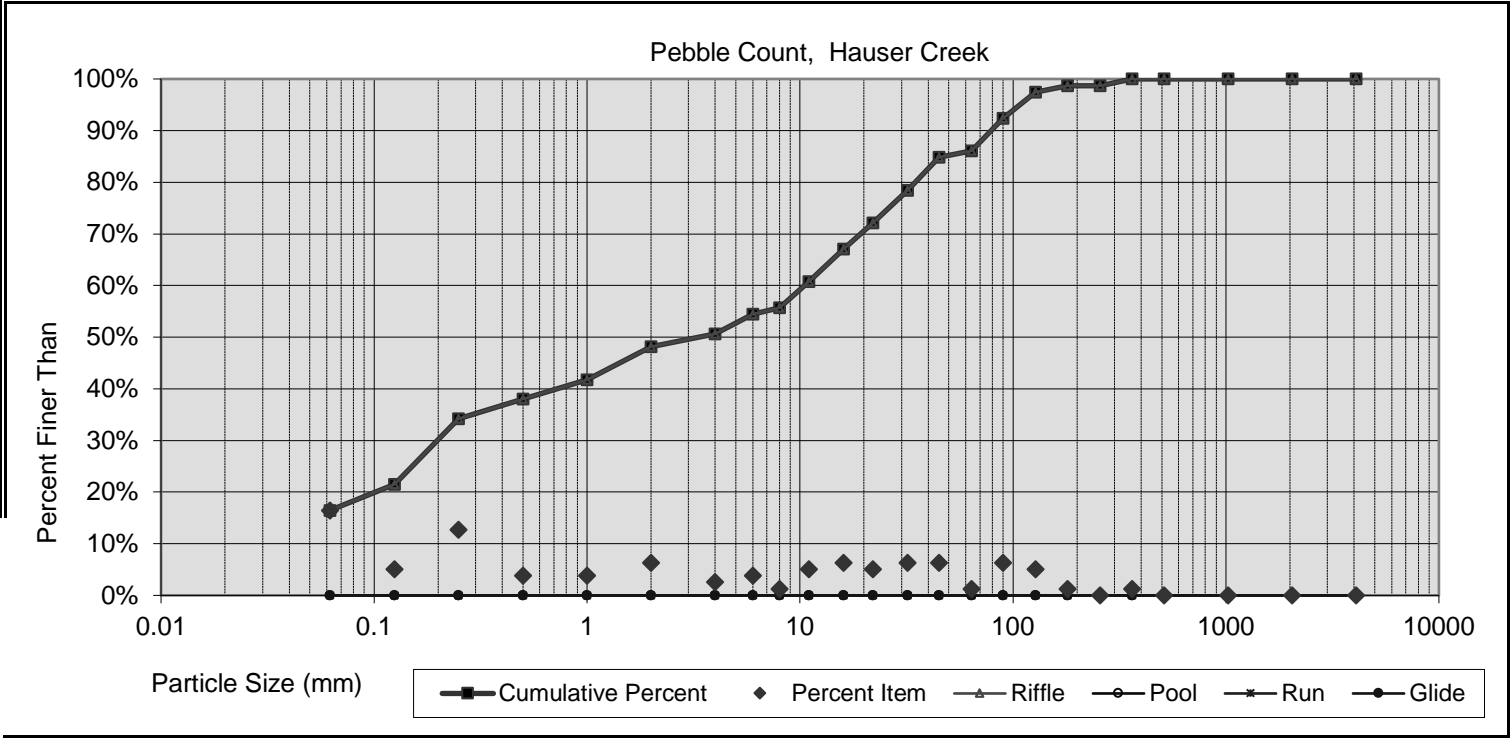
Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
#N/A	#N/A	0.1	1	4	46%	42%	12%	0%	0%	0%

	Pebble Count,
	Hauser Creek
	Yadkin Pee Dee
	---
Note:	<b>Cross Section 7</b>



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
1.307	8.06	11.0	79	163	0%	23%	54%	19%	4%	0%

	Pebble Count,
	Hauser Creek
	Yadkin Pee Dee
	---
Note:	<b>Reach Total</b>



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	silt/clay	sand	gravel	cobble	boulder	bedrock
#N/A	0.29	3.4	43	108	16%	32%	38%	13%	1%	0%

Table 10. Baseline Stream Data Summary  
Hauser Stream Restoration Site-Project No. 92471

Parameter	Gauge <sup>2</sup>	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design		
		LL	UL	Eq.	Min	Mean	Med	Max	SD <sup>5</sup>	n	Min	Mean	Med	Max	SD <sup>5</sup>	n	Min	Med	Max
<b>Dimension and Substrate - Riffle Only</b>																			
Bankfull Width (ft)	-	-	-	-	17.2		20.8	27.7			21.5		26.5	30.9				33	
Floodprone Width (ft)					176.8		275.2	333.4			306		415	530			210	268	330
Bankfull Mean Depth (ft)	-	-	-	-	2		2.6	3.1			1.6		2.2	3.4				2.5	
<sup>1</sup> Bankfull Max Depth (ft)	-				3.9		4.3	4.8			3.3		3.8	4.2			3.3	3.8	4.2
Bankfull Cross Sectional Area (ft <sup>2</sup> )	-	-	-	-	38		54.7	71.2			43		60	80				83.2	
Width/Depth Ratio	-				5.5		8	10.8			7		12	19				13	
Entrenchment Ratio	-				10		13.5	19.3			8.3		16	22.4			6.4	8.1	10
<sup>1</sup> Bank Height Ratio	-				0.8		1.26	1.65			0.7		0.86	1.07			0.9	1	1.1
<b>Profile</b>																			
Riffle Length (ft)					----		----	----			----		----	----			----	----	----
Riffle Slope (ft/ft)					----		----	----			----		----	----			----	----	----
Pool Length (ft)					----		----	----			----		----	----			----	----	----
Pool Max depth (ft)					4.6		5.4	7.2			3.8		4.5	5.2			3.5	4	4.7
Pool Spacing (ft)					12.3		83.2	308			30		64	106			65	89	110
<b>Pattern</b>																			
Channel Beltwidth (ft)					35		46.6	56			26		30	36			43	61.5	107
Radius of Curvature (ft)					23		92.1	273			13		85	275			50	80	155
Rc:Bankfull width (ft/ft)					1.2		4.5	14.4			0.53		3.58	11.2			1.5	2.4	4.7
Meander Wavelength (ft)					55		118	245			60		90	160			128	164	194
Meander Width Ratio					2.9		5.8	12.9			1.1		1.3	1.6			1.3	1.9	3.3
<b>Transport parameters</b>																			
Reach Shear Stress (competency) lb/ft <sup>2</sup>																			
Max part size (mm) mobilized at bankfull																			
Stream Power (transport capacity) W/m <sup>2</sup>																			
<b>Additional Reach Parameters</b>																			
Rosgen Classification	----							C5/E5						C5/E5					C5
Bankfull Velocity (fps)	----	----	----	----				5.24											5
Bankfull Discharge (cfs)	----	----	----	----				416											
Valley length (ft)								2156						----					
Channel Thalweg length (ft)								2242						----					2463
Sinuosity (ft)								1.04						1.1					1.17
Water Surface Slope (Channel) (ft/ft)	-							0.0024						0.0028					0.0025
BF slope (ft/ft)	-							----						----					----
<sup>3</sup> Bankfull Floodplain Area (acres)								----						----					----
<sup>4</sup> % 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 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)**

	Cross Section 1 (Riffle)						Cross Section 2 (Riffle)						Cross Section 3 (Riffle)						Cross Section 4 (Pool)					
<b>Based on fixed baseline bankfull elevation<sup>1</sup></b>	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
<b>Record elevation (datum) used</b>	98.8	98.8					99.3	99.3					101.3	101.2					101.3	101.4				
Bankfull Width (ft)	29.2	29.0					27.6	26.8					32.4	31.3					28.9	30.0				
Floodprone Width (ft)	150.0	150.0					150.0	150.0					150.0	150.0					NA	NA				
Bankfull Mean Depth (ft)	2.1	2.0					1.8	1.9					2.4	2.2					3.1	3.0				
Bankfull Max Depth (ft)	3.6	3.5					3.7	3.8					3.6	3.7					5.9	6.1				
Bankfull Cross Sectional Area (ft <sup>2</sup> )	61.8	59.2					49.5	49.6					76.3	70.2					88.3	91.3				
Bankfull Width/Depth Ratio	13.8	14.2					15.4	14.5					13.8	14.0					NA	NA				
Bankfull Entrenchment Ratio	5.1	5.2					5.4	5.6					4.6	4.8					NA	NA				
Bankfull Bank Height Ratio	1.0	1.0					1.0	1.0					1.0	1.0					1.0	1.0				
Cross Sectional Area between end pins (ft <sup>2</sup> )	----	----					----	----					----	----					----	----				
d50 (mm)	NA	NA					NA	NA					23.1	18.8					NA	NA				
	Cross Section 5 (Riffle)						Cross Section 6 (Pool)						Cross Section 7 (Riffle)											
<b>Based on fixed baseline bankfull elevation<sup>1</sup></b>	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+						
<b>Record elevation (datum) used</b>	101.9	101.8					103.1	103.1					102.7	102.7										
Bankfull Width (ft)	33.6	32.6					39.7	41.5					33.0	31.3										
Floodprone Width (ft)	150.0	150.0					NA	NA					150.0	150.0										
Bankfull Mean Depth (ft)	2.6	2.5					2.8	2.7					2.6	2.4										
Bankfull Max Depth (ft)	4.3	4.5					5.6	5.7					4.4	4.2										
Bankfull Cross Sectional Area (ft <sup>2</sup> )	85.8	82.5					109.9	110.6					85.5	74.8										
Bankfull Width/Depth Ratio	13.2	12.9					NA	NA					12.7	13.1										
Bankfull Entrenchment Ratio	4.5	4.6					NA	NA					4.5	4.8										
Bankfull Bank Height Ratio	1.0	1.0					1.0	1.0					1.0	1.0										
Cross Sectional Area between end pins (ft <sup>2</sup> )	----	----					----	----					----	----										
d50 (mm)	0.1	0.1					NA	NA					22.0	11.0										

<sup>1</sup> = 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. Monitoring Data - Stream Reach Data Summary  
Hauser Stream Restoration-Project No. 92471 (2463 feet)**

Parameter	MY-1						MY-2						MY-3						MY-4						MY-5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n
Bankfull Width (ft)	27.6		32.4	33.6			26.8		31.3	32.6																				
Floodprone Width (ft)			150						150																					
Bankfull Mean Depth (ft)	1.8		2.4	2.6			1.9		2.2	2.5																				
<sup>1</sup> Bankfull Max Depth (ft)	3.6		3.7	4.4			3.5		3.8	4.5																				
Bankfull Cross Sectional Area (ft <sup>2</sup> )	49.5		76.3	85.8			49.6		70.2	82.5																				
Width/Depth Ratio	12.7		13.5	15.3			13		14.1	14.5																				
Entrenchment Ratio	4.5		4.6	5.4			4.6		4.8	5.6																				
<sup>1</sup> Bank Height Ratio			1						1																					
<b>Profile</b>																														
Riffle Length (ft)	28	48	48	74	12.5	27	8	56	52	154	25	27																		
Riffle Slope (ft/ft)	0.0%	0.5%	0.3%	2.8%	0.6%	25	0.0%	0.4%	0.2%	3.4%	0.7%	26																		
Pool Length (ft)	3	16	12	49	11	31	4	18	16	58	11	32																		
Pool Max depth (ft)	5.6		5.8	5.9			5.7		5.9	6.1																				
Pool Spacing (ft)	8	77	85	118	27	31	8	75	86	154	35	33																		
<b>Pattern</b>																														
Channel Beltwidth (ft)																														
Radius of Curvature (ft)																														
Rc:Bankfull width (ft/ft)																														
Meander Wavelength (ft)																														
Meander Width Ratio																														
<b>Additional Reach Parameters</b>																														
Rosgen Classification	C4						C4																							
Channel Thalweg length (ft)	2468						2468																							
Sinuosity (ft)	1.17						1.17																							
Water Surface Slope (Channel) (ft/ft)	0.0022						0.0022																							
BF slope (ft/ft)	----						----																							
<sup>3</sup> Ri% / Ru% / P% / G% / S%	52%	16%	20%	12%			29%	8%	11%	52%																				
<sup>3</sup> SC% / Sa% / G% / C% / B% / Be%	19%	28%	32%	21%	0%	0%	17%	31%	38%	13%	1%	0%																		
<sup>3</sup> d16 / d35 / d50 / d84 / d95 /	NA	0.26	6.9	73	130		NA	0.34	4	44	108																			
<sup>2</sup> % of Reach with Eroding Banks	<5%						<5%																							
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



APPENDIX E  
HYDROLOGY DATA

Table 12. Verification of Bankfull Events

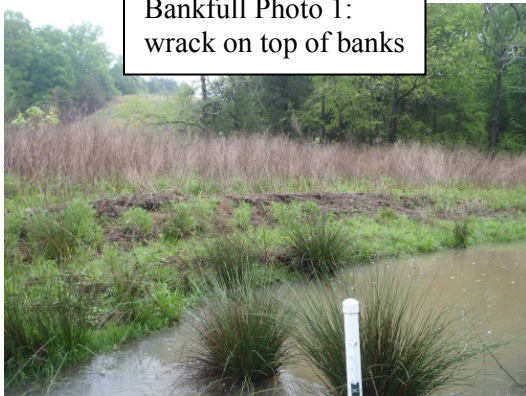
**Table 12. Verification of Bankfull Events**

**Hauser Creek Restoration Site (EEP Project Number 92741)**

<b>Date of Data Collection</b>	<b>Date of Occurrence</b>	<b>Method</b>	<b>Photo (if available)</b>
June 3, 2013	December 26, 2012	Approximately 1.16 inches of rain documented to occur after two 0.5-inch events within the previous week at a nearby rain station*.	--
April 29, 2013	January 17, 2013	Approximately 4.6 inches of rain documented to occur from January 13-17, 2013 at a nearby rain station*.	--
April 29, 2013/ June 3, 2013	April 28, 2013	Approximately 1.25 inches of rain documented at a nearby rain station*, in addition to crest gauge observations and visual signs of overbank including wrack and sediment deposition adjacent to the channel, and receding water.	1-3
November 25, 2013	June 7, 2013	Approximately 2.76 inches of rain documented to occur between June 5-7, 2013 at a nearby rain station*.	--
November 25, 2013	July 27, 2013	Approximately 1.89 inches of rain documented to occur on July 27, 2013 at a nearby rain station*.	--
November 25, 2013	August 12, 2013	Approximately 2.60 inches of rain documented to occur on between August 10-13, 2013 at a nearby rain station*.	--

\*Reported at the Winston Salem Airport (KINT) (Weatherunderground 2013)

Bankfull Photo 1:  
wrack on top of banks



Bankfull Photo 2:  
sediment deposition



Bankfull Photo 3:  
crest gauge

