Final
Year 4 Monitoring Report

UT to Uwharrie River Stream Restoration Project
Randolph County, North Carolina
DMS Project No. 847

Construction Completed: March 2011
Vegetation Data Collected: August 2015
Morphology Data Collected: November 2015
Submission Date: March 2016

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Owner

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APPENDICES

1.0 Executive Summary

The following report summarizes the vegetation establishment and stream stability for Year 4 monitoring for the UT to Uwharrie River Stream Restoration Project (Site) in Randolph County, North Carolina.

1.1 Goals and Objectives

Goals

- Improve the overall water quality by reducing the input of sediment and nutrients into the aquatic system.
- Improve the richness and diversity of the plant species within the riparian zone.
- Improve the overall wildlife habitat across the entire conservation easement,

Objectives

- Create a stable network of stream channels by altering either the dimension, pattern, or profile of each reach.
- Restore the riparian zone of each reach by reestablishing the appropriate plant community and eliminating the invasive plant species.
- Eliminate the feedlot runoff from entering the stream channels and degrading water quality.
- Protect the completed stream and habitat restoration at the Site through a perpetual conservation easement.

1.2 Project Background

The Site is located on a UT to the Uwharrie River approximately 5.0 miles southeast of the city of Thomasville and 3.2 miles southwest of the city of Trinity in Randolph County. The site is within the area bounded by Welborn Road (SR 1556) to the north, Hopewell Church Road (SR 3252) and Morris Road (SR 1557) to the east, Kennedy Road (SR 3106) to the south, and Finch Farm Road (SR 1547) to the west (Figure 1). The restoration project is located entirely on one private parcel owned by Mr. Donnie R. Sumner (Parcel ID No. 7706263620). The Division of Mitigation Services (DMS) purchased 32.76 acres and established a perpetual conservation easement to protect stream restoration activities.

The Site is located in the North Carolina Division of Water Quality (NCDWQ) Sub-basin 03-07-09 of the Yadkin-Pee Dee River Basin, USGS Hydrologic Unit Code 03040103 (8-digit HUC) and Local Watershed Unit 03040103050010 (14-digit HUC). The Uwharrie River is the closest named stream to the Site. The restoration project is located with the extent of DMS's Upper Uwharrie Local Watershed Plan.

1.3 Vegetation

<u>Stream Vegetation Success Criteria</u>
Vegetation monitoring will be considered successful for stream mitigation credit if at least 260 stems/acre (trees and shrubs), both, volunteer and planted, are surviving at the end of five years. The interim measure of vegetative success for the site will be the survival of at least 320 3-year

old stems per acre at the end of year three of the monitoring period and 280 4-year old stems per acre at the end of year four of the monitoring period (USACE et al. 2003).

Monitoring Results

Overall stem counts were based on an average of the evaluated vegetation plots. Based on the number of stems counted toward stream mitigation credit, average densities were measured at 345 planted stems per acre (excluding livestakes) surviving in Year 4 (2015). This planted stem density showed a very slight decline from Year 3, whereas the planted and volunteer stem (total) densities slightly increased (Table 9). For the fourth year, the dominant species identified at the Site were planted stems of American sycamore (*Platanus occidentalis*) and white oak (*Quercus alba*), as well as volunteers of American sycamore, loblolly pine (*Pinus taeda*), and sweetgum (*Liquidambar styraciflua*).

Nine of the seventeen individual vegetation plots met success criteria by greater than ten percent when counting planted stems alone. Seven plots (Plots 2, 4, 6, 11, 12, 13, and 16) did not meet the success criteria when counting only planted stems (Figure 2 and Tables 7 & 9). However, five of these plots (Plots 2, 4, 12, 13, and 16) did meet the success criteria by counting both planted and volunteer stems.

A visual assessment was conducted during May, August, and November of 2015 to assess the vegetation at the Site. Figure 2 represents areas of low planted and volunteer stem densities within the easement. These areas comprise approximately 4.9 acres or approximately 15% of the Site, slightly less than Year 3. Appropriate remedial action, if necessary, will be determined by DMS.

Two populations of kudzu (*Pueraria lobata*) are located just inside the easement boundary at the western and eastern ends of the Site. Based on visual assessment, the kudzu population at the eastern end of the project has expanded since Year 2. Additionally, three dense populations of Japanese honeysuckle (*Lonicera japonica*) were identified along Main West, SW-Trib, and Main East. Various other sporadic occurrences of invasive species were also identified within the easement. The locations of these populations/occurrences are mapped on the Current Condition Plan View (CCPV) (Figure 2). Invasive/exotic vegetation is not currently compromising the vegetative success of the site. Evidence of remedial action undertaken to address invasive species was observed during November 2015 field activities.

1.4 Stream Stability

Year 4 monitoring surveys along UT to Uwharrie occurred in November 2015. Four areas of instability were noted during longitudinal surveys and are documented on the CCPV (Figure 2). These areas of bank erosion were observed along the Main Center reach at Stations 17+50, 20+50, and between Stations 26+00 to 27+00. One rock vane has been compromised as a result of stream bank erosion around the vane arm. Additionally, one constructed riffle is stressed within this station range. Both of these structures were noted in previous years and do not appear to have worsened. No areas of instability were observed during longitudinal surveys of the SW-Trib, SE-UT or Main West.

Detailed as-built surveys were not conducted at the Site, so comparison of channel dimension and profile data between as-built and Year 1 conditions could not be conducted. The limited as-built surveys that were conducted allowed for comparison of channel pattern during the initial year. A comparison of Year 1 to Year 4 data shows no evidence of a significant change in the channel dimension, pattern or profile. The majority of stream banks and structures throughout the Site are stable and functioning as intended.

Based on an overall visual assessment of the channel, Main Center contains all of the major problem areas on the Site. All problem areas within the extents of longitudinal surveys are depicted on the CCPV (Figure 2). Appropriate remedial action, if necessary, will be determined by DMS.

Baseline monitoring features, including two crest gauges, were installed at the Site in August 2012. One bankfull event was noted on the Main East crest gauge (Year 2), and two bankfull events have been noted on the SW-Trib (both in Year 2). Additional visual evidence of bankfull events has been noted during Year 2 and Year 3 monitoring activities (Table 12).

1.5 Note

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

2.0 Methodology

The Year 4 Monitoring survey was completed using a Total Station. Fourteen cross-sections and 3,000 feet of longitudinal survey have been established to monitor stream conditions at the Site. Each cross-section and longitudinal survey section is marked with two rebar monuments at their beginning and ending points. The rebar has been located vertically and horizontally in NAD 83-State Plane to facilitate proper orientation and future comparison. The survey data was imported into MicroStation for verification. RIVERMorph was used to analyze the profile and cross section data. Tables and figures were created using Microsoft Excel. Reach-wide pebble counts were conducted at random riffle sections along the longitudinal survey sections of each reach. Crest gauges have been installed to monitor hydrologic success criteria at the site. In addition to longitudinal survey, project-wide stream monitoring was accomplished using visual assessment as well as photo documentation.

Vegetation monitoring was conducted according to the CVS-EEP Protocol for Recording Vegetation, Version 4.0 (Lee et al., 2008). Seventeen 100 square meter vegetation monitoring plots were established along the project reaches in September 2012. Eight plots measure ten meters by ten meters, and nine plots measure five meters by twenty meters. The four corners of each plot are marked with one-half inch steel rebar. Level 2 (planted and volunteer woody stems) data

collection was performed in all plots. Each planted woody stem location (x and y), height (cm), and live stem diameter (dbh) were recorded. All planted stems were identified with pink flagging and silver tree tags indicating tree species. Vegetation was identified using Weakley (2011). Photos were taken of each vegetation plot. A qualitative visual assessment of the reaches will be performed each year. Areas lacking cover, with low planted-stem density or vigor, or areas experiencing invasive species encroachment will be identified and mapped on the CCPV.

3.0 References

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

NCDENR-Ecosystem Enhancement Program. 2007. Final Restoration Plan, Unnamed Tributary to Uwharrie River Stream Restoration Project, Randolph County, North Carolina.

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Schafale, M.P., and A.S. Weakley. 1990. Classification of the natural communities of North Carolina, third approximation. N.C. Natural Heritage Program, Raleigh, NC.

USACE. 2003. *Stream Mitigation Guidelines*. USACOE, USEPA, NCWRC, NCDENR-DWQ.

Weakley, Alan S. 2011. Flora of the Southern and Mid-Atlantic States. University of North Carolina Herbarium, North Carolina Botanical Garden, UNC Chapel Hill. http://herbarium/unc/edu/FloraArchives/WeakleyFlora_2011-May-nav.pdf

APPENDIX A
Project Vicinity Map and Background Tables

The subject project site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with EEP.

Directions to the Project:
The project site is located approximately 5.0 miles southeast of the City of Thomasville and 3.2 miles southwest of the City of Trinity in Randolph County. The approximate center of the project site is located at 35.849838º N Latitude and 80.004514º W Longitude. From I-85 take Exit 108 and follow Hopewell Church Road (SR 3252) south for 1.7 miles. Turn right onto Morris Road (SR 1557) and follow for 0.8 miles. Turn right onto Kennedy Road (SR 3106) and follow for 600 feet to the Site entrance.

Access to the conservation easement during all phases of the project will be maintained through the landowner's gated entrance to the Site. This entrance is located at the end of landowner's private driveway off of Kennedy Road, approximately 600 ft west of Morris Road.

Environmental Quality

1 inch = 1,000 feet

GRAPHIC SCALE
0 500 1,000 Feet

PROJECT VICINITY MAP
UT TO UWHARRIE RIVER
STREAM RESTORATION PROJECT
EEP PROJECT #847
RANDOLPH COUNTY, NC

Legend
Project Boundary

FIGURE
1

Table 1. Project Components and Mitigation Credits
UT to Uwharrie River Stream Restoration Project (#847)

Mitigation Credits

	Stream[1]		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	6611	144		0.19					

Project Components

Project Component -or- Reach ID	Stationing/Location	Existing Footage/Acreage	Approach (PI, PII etc.)	Restoration -or- Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio
NW-UT	0+00 - 3+38	355'	P3	E1	338'	1.5:1
SW-UT	0+00 - 2+62	271'	P3	E1	262'	1.5:1
SW Tributary	0+00 - 2+71	1440'		P	271'	5:1
	2+71 - 15+09		P2	R	1238'	1:1
Main West	0+00 - 2+29	1235'	P3	E1	229'	1.5:1
	2+29 - 14+27		P2	R	1198'	1:1
Main Center	14+27 - 29+40	1330'	P2	R	1513'	1:1
SE-UT	-0+36 - 10+70	1020'	P2/P1	R	1106'	1:1
N-UT	0+30 - 1+02	206'	P3	E1	72'	1.5:1
	1+02 - 3+18		P2	R	216'	1:1
Main East	29+40 - 36+56	1163'	P2	R	716'	1:1
	36+56 - 41+32			P	476'	5:1
Tributary 1	Drains to Main East	129'	P3	E2	104'	2.5:1
Tributary 2	Drains to Main East	91'	P3	E2	59'	2.5:1
Wetland A	Top of SW-Trib	0.65		P	0.65	5:1
Wetland B	Adjacent to SW-Trib	0.02		P	0.02	5:1
Wetland C	Adjacent to SE-UT	0.26		P	0.26	5:1

Component Summation

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	5986					
Enhancement						
Enhancement I	901					
Enhancement II	163					
Creation						
Preservation	747		0.93			
High Quality Preservation						

BMP Elements

Element	Location	Purpose/Function	Notes

BMP Elements
BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer

1 - A total of 41 linear feet of restored stream and 25 linear feet of preserved stream was subtracted from the Mitigation Credit summation to account for the three permanent stream crossings at the Site.

Table 2. Project Activity and Reporting History UT to Uwharrie River Stream Restoration Project (#847)		
Activity or Deliverable	**Data Collection Complete**	**Completion or Delivery**
Environmental Resources Technical Report	Dec-06	Mar-07
Permanent Conservation Easement Executed & Recorded	N/A	Aug-2006
Restoration Plan	N/A	Jul-07
Final Design – Construction Plans	N/A	Aug-10
Construction	N/A	Mar-11
Planting	N/A	Feb-11
Baseline Monitoring Installation	Sep-12	Dec-12
Year 1 Monitoring	Nov-12	Mar-13
Year 2 Spring Assessment	Apr-13	May-13
Year 2 Monitoring	Nov-13	Dec-13
Year 3 Spring Assessment	May-14	May-14
Year 3 Monitoring	Nov-14	Feb-15
Year 4 Spring Assessment	May -15	Jun-15
Year 4 Monitoring	Nov -15	Dec-15

Table 3. Project Contacts Table UT to Uwharrie River Stream Enhancement Project (#847)	
Designer	Mulkey Engineers and Consultants, Inc. 6750 Tryon Road Cary, NC 27518
Primary project design POC	Tom Barrett, (919) 858-1817
Construction Contractor	Vaughn Contracting, Inc. Post Office Box 796 Wadesboro, NC 28170
Construction contractor POC	Tommy Vaughn, (704) 694-6450
Survey Contractor	Dixie Land Surveying, PLLC 4278 Country Club Road Wadesboro, NC 28170
Survey contractor POC	Michael R. Ingram, (704) 694-5810
Planting/Seeding Contractor	Vaughn Contracting, Inc. Post Office Box 796 Wadesboro, NC 28170
Planting contractor POC	Tommy Vaughn, (704) 694-6450
Seed Mix Sources	Evergreen Seed, (919) 567-1333 Southern States, (336) 625-3779
Nursery Stock Suppliers	NC Forest Service - Claridge Nursery, (919) 731-7988 Arborgen - (800) 222-1290
Monitoring Performers	Mulkey Engineers and Consultants, Inc. 6750 Tryon Road Cary, NC 27518
Stream/Vegetation Monitoring POC	Mark Mickley, (919) 858-1797

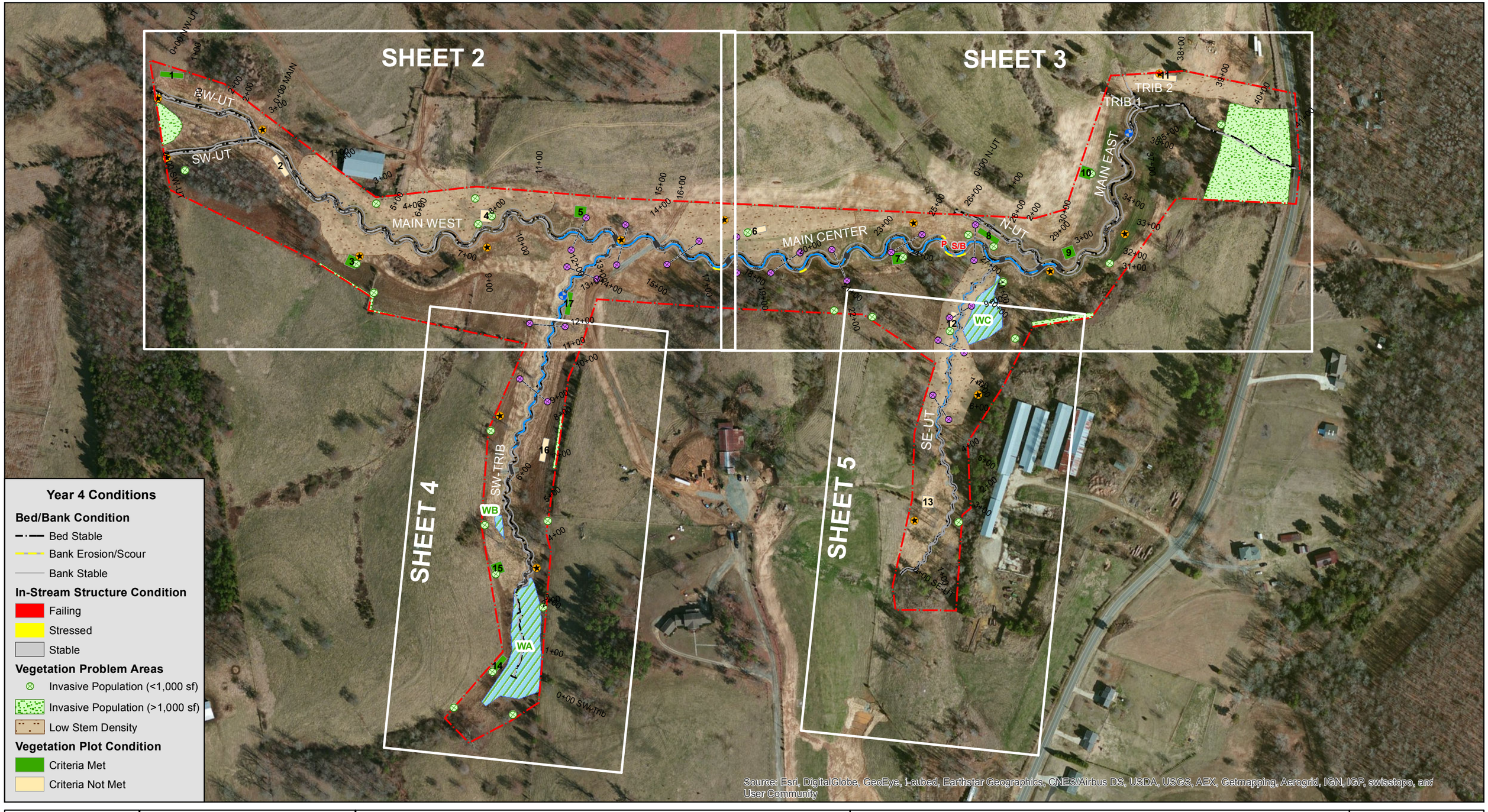
Table 4. Project Attribute Table - UT to Uwharrie River Stream Enhancement Project (#847)

Project County	Randolph									
Physiographic Region	Piedmont									
Ecoregion	Carolina Slate Belt									
Project River Basin	Yadkin-Pee Dee									
USGS HUC for Project (14 digit)	3040103050010									
NCDWQ Sub-basin for Project	03-07-09									
Within extent of EEP Watershed Plan?	Upper Uwharrie Local Watershed Plan									
WRC Hab Class (Warm, Cool, Cold)	Warm									
% of project easement fenced or demarcated	100%									
Beaver activity observed during design phase?	No									
Restoration Component Attribute Table										
Reach	NW-UT	SW-UT	Main West	Main Center	Main East	SW-Trib	SE-UT	N-UT	Trib 1	Trib 2
Drainage area (ac)	537.6	256.0	819.2	915.2	1267.2	51.2	25.6	307.2	19.2	19.2
Stream order	2nd	1st	2nd	2nd	2nd/3rd	1st	1st	2nd	1st	1st
Restored length (feet)	338.0	262.0	1427.0	1513.0	1192.0	1509.0	1106.0	288.0	104.0	59.0
Perennial or Intermittent	Per	Per	Per	Per	Per	Per	Per	Per	Int	Int
Watershed type (Rural, Urban, Developing etc.)	Rural									
Watershed LULC Distribution (e.g.)										
Residential	27%									
Ag-Row Crop	2%									
Ag-Livestock	30%									
Forested	39%									
Etc.	2%									
Watershed impervious cover (%)	1%									
NCDWQ AU/Index number	13-2-(0.5)									
NCDWQ classification	WS-III									
303d listed?	No									
Upstream of a 303d listed segment?	No									
Reasons for 303d listing or stressor	N/A									
Total acreage of easement	32.8									
Total vegetated acreage within the easement	32.8									
Total planted acreage as part of the restoration	32.76									
Rosgen classification of pre-existing	E3/1	E4b	E3/4	E4	E4	E4b	G5	E4	U	U
Rosgen classification of As-built[1]	-	-	E4/1	E4	-	B4	C5b	-	-	-
Valley type	VIII	VIII	VIII	VIII	VIII	II	II	VIII	U	U
Valley slope	0.01625	0.02366	0.0134	0.0071	0.009	0.0325	0.03068	0.01228	U	U
Valley side slope range (e.g. 2-3.%)	U	U	U	U	U	U	U	U	U	U
Valley toe slope range (e.g. 2-3.%)	U	U	U	U	U	U	U	U	U	U
Cowardin classification	R5UB1	R5UB1	R5UB1	R5UB1	R5UB1	R5UB1	R5UB2	R5UB1	R4	R4
Trout waters designation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Species of concern, endangered etc.? (Y/N)	N	N	N	N	N	N	N	N	N	N
Dominant soil series and characteristics										
Series	Mecklenburg Loam 8-15%	Mecklenburg Loam 8-15%	Mecklenburg Loam 8-15%	Riverview sandy loam 0-2%/Wilkes-poindexter-Wynott complex 15-45%	Mecklenburg Loam 8-15%	Mecklenburg Loam 8-15%	Mecklenburg Loam 8-15%/Wilkes-poindexter-Wynott complex 15-45%	Riverview sandy loam 0-2%/Mecklenburg Loam 8-15%	Mecklenburg Loam 8-15%	Mecklenburg Loam 8-15%
Depth (in)	61	61	61	42-60	61	61	42-61	60-61	61	61
Clay%	33.7	33.7	33.7	33.7	26.3	32.5	28.8	26.3	32.5	32.5
K	0.28	0.28	0.28	0.24-0.31	0.28	0.28	0.28-0.31	0.24-0.28	0.28	0.28
T	4	4	4	2-5	4	4	2-4	4-5	4	4

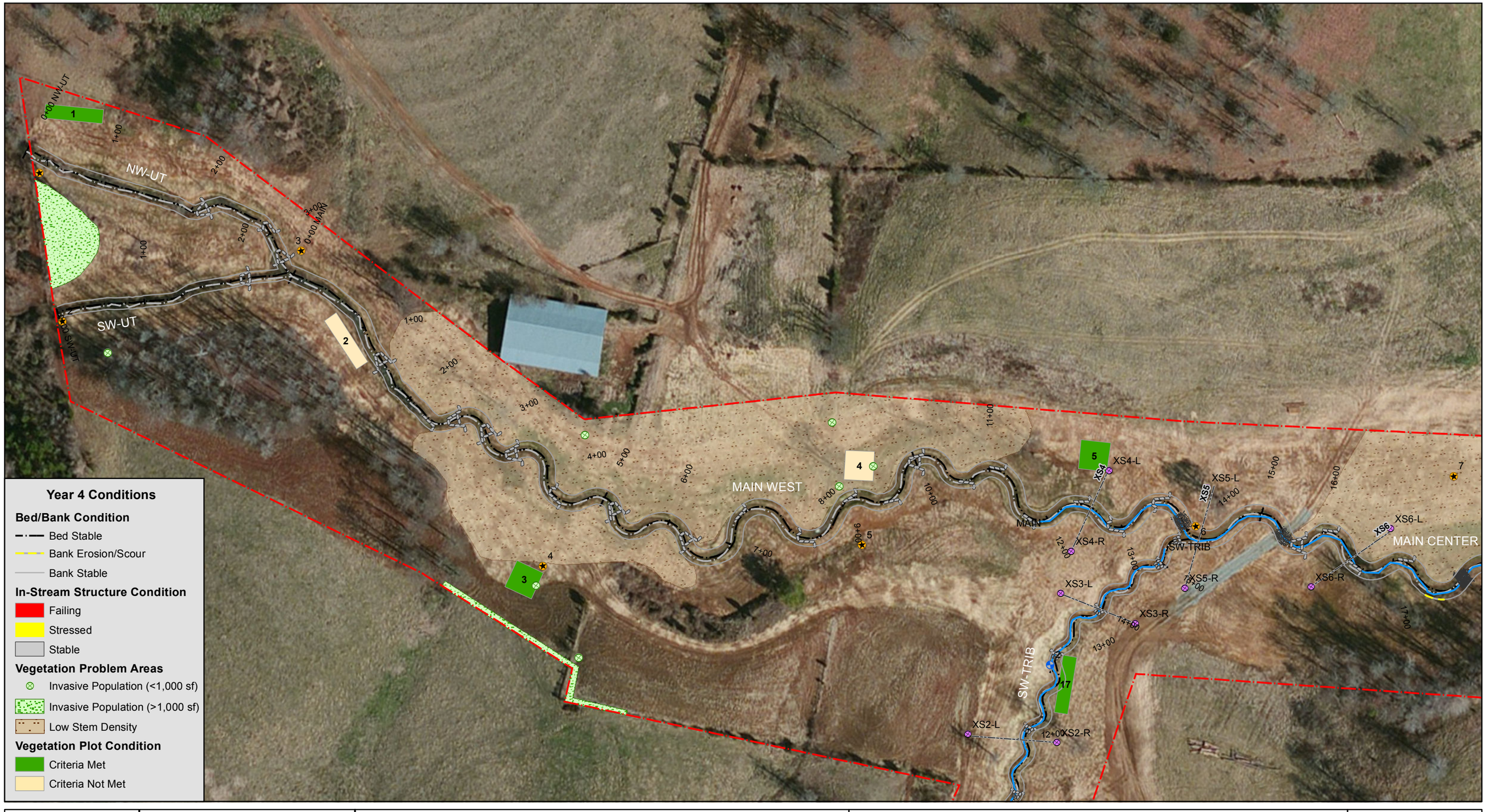
1 - Rosgen classifications based on MY1 survey data and are therefore not available for all reaches

N/A = Not Applicable, "-" = Unavailable, "U" = Unknown

APPENDIX B
Visual Assesment Data



PREPARED FOR	SHEET 1 OF 5	FIGURE 2. CURRENT CONDITION PLAN VIEW UT TO UWHARRIE RIVER STREAM RESTORATION PROJECT RANDOLPH COUNTY, NORTH CAROLINA	LEGEND	PREPARED BY
NC Environmental Quality	12/17/2015 DRAWN: MLM PROJECT NUMBER MEC: 2012057.00 NCDMS: 847	1 inch = 250 feet GRAPHIC SCALE 0 125 250 500 Feet	Easement Boundary Wetlands Designed Centerline As-built Centerline Year 4 Centerline Cross Section Crest Gauge Photo Point Cross Section Pin	MULKEY ENGINEERS & CONSULTANTS



PREPARED FOR		FIGURE 2. CURRENT CONDITION PLAN VIEW UT TO UWHARRIE RIVER STREAM RESTORATION PROJECT RANDOLPH COUNTY, NORTH CAROLINA	LEGEND	PREPARED BY
NC Environmental Quality	SHEET 2 OF 5 12/17/2015 DRAWN: MLM PROJECT NUMBER MEC: 2012057.00 NCDMS: 847	1 inch = 100 feet GRAPHIC SCALE 0 50 100 200 Feet	Easement Boundary Wetlands Designed Centerline As-built Centerline Year 4 Centerline Cross Section Crest Gauge Photo Point Cross Section Pin	MULKEY ENGINEERS & CONSULTANTS

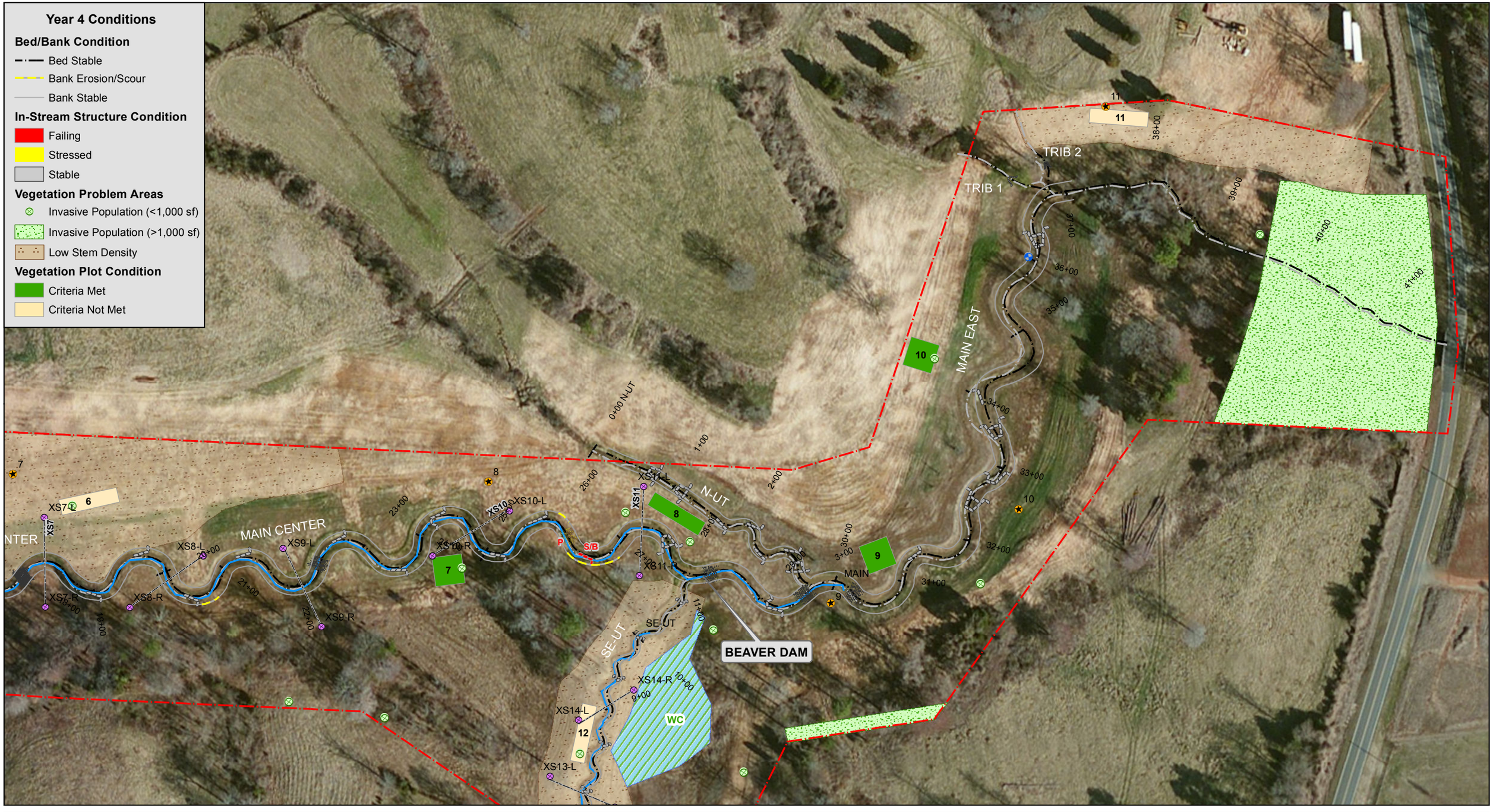
Year 4 Conditions

Bed/Bank Condition
- Bed Stable
- Bank Erosion/Scour
- Bank Stable

In-Stream Structure Condition
- Failing
- Stressed
- Stable

Vegetation Problem Areas
- Invasive Population (<1,000 sf)
- Invasive Population (>1,000 sf)
- Low Stem Density

Vegetation Plot Condition
- Criteria Met
- Criteria Not Met



PREPARED FOR			PREPARED BY
NC Environmental Quality	SHEET 3 OF 5 12/17/2015 DRAWN: MLM PROJECT NUMBER MEC: 2012057.00 NCDMS: 847	**FIGURE 2. CURRENT CONDITION PLAN VIEW** **UT TO UWHARRIE RIVER STREAM RESTORATION PROJECT** **RANDOLPH COUNTY, NORTH CAROLINA** 1 inch = 100 feet GRAPHIC SCALE 0 50 100 200 Feet	MULKEY ENGINEERS & CONSULTANTS

LEGEND

- Easement Boundary
- Wetlands
- Designed Centerline
- As-built Centerline
- Year 4 Centerline
- Cross Section
- Crest Gauge
- Photo Point
- Cross Section Pin

Year 4 Conditions

Bed/Bank Condition
- Bed Stable
- Bank Erosion/Scour
- Bank Stable

In-Stream Structure Condition
- Failing
- Stressed
- Stable

Vegetation Problem Areas
- Invasive Population (<1,000 sf)
- Invasive Population (>1,000 sf)
- Low Stem Density

Vegetation Plot Condition
- Criteria Met
- Criteria Not Met

PREPARED FOR		FIGURE 2. CURRENT CONDITION PLAN VIEW UT TO UWHARRIE RIVER STREAM RESTORATION PROJECT RANDOLPH COUNTY, NORTH CAROLINA	LEGEND	PREPARED BY
NC Environmental Quality	SHEET 4 OF 5 12/17/2015 DRAWN: MLM PROJECT NUMBER MEC: 2012057.00 NCDMS: 847	1 inch = 75 feet GRAPHIC SCALE 0 37.5 75 150 Feet	Easement Boundary Wetlands Designed Centerline As-built Centerline Year 4 Centerline Cross Section Crest Gauge Photo Point Cross Section Pin	MULKEY ENGINEERS & CONSULTANTS

Year 4 Conditions

Bed/Bank Condition
- Bed Stable
- Bank Erosion/Scour
- Bank Stable

In-Stream Structure Condition
- Failing
- Stressed
- Stable

Vegetation Problem Areas
- Invasive Population (<1,000 sf)
- Invasive Population (>1,000 sf)
- Low Stem Density

Vegetation Plot Condition
- Criteria Met
- Criteria Not Met

PREPARED FOR			PREPARED BY
NC Environmental Quality	SHEET 5 OF 5 12/17/2015 DRAWN: MLM PROJECT NUMBER MEC: 2012057.00 NCDMS: 847	**FIGURE 2. CURRENT CONDITION PLAN VIEW** **UT TO UWHARRIE RIVER STREAM RESTORATION PROJECT** **RANDOLPH COUNTY, NORTH CAROLINA** 1 inch = 75 feet GRAPHIC SCALE 0 37.5 75 150 Feet	MULKEY ENGINEERS & CONSULTANTS

LEGEND

- Easement Boundary
- Wetlands
- Designed Centerline
- As-built Centerline
- Year 4 Centerline
- Cross Section
- Crest Gauge
- Photo Point
- Cross Section Pin

Table 5. Visual Stream Morphology Stability Assessment - UT to Uwharrie River Stream Restoration Project (#847) - MY4 (2015)
Main West - 235 ft

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	4	4			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth > 1.6)	4	4			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	4	4			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	5	5			100%			
		2. Thalweg centering at downstream of meander (Glide)	5	5			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0.0	100%	n/a	n/a	n/a
	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%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	**0**	**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.	1	1			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)	3	3			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio > 1.6 Rootwads/logs providing some cover at base-flow.	2	2			100%			

Table 5. Visual Stream Morphology Stability Assessment - UT to Uwharrie River Stream Restoration Project (#847) - MY4 (2015)
Main Center/East - 1588 ft

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	24	24			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth > 1.6)	24	24			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	22	24			92%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	23	23			100%			
		2. Thalweg centering at downstream of meander (Glide)	23	23			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			4	124.0	92%	1	50	95%
	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%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0.0	100%	n/a	n/a	n/a
				Totals	**4**	**124**	**96%**	**n/a**	**n/a**	**n/a**
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	21	22			95%			
	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.	20	22			91%			
	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)	14	16			88%			
	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 5. Visual Stream Morphology Stability Assessment - UT to Uwharrie River Stream Restoration Project (#847) - MY4 (2015)
SW-Trib - 724 ft

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	31	31			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth > 1.6)	23	30			77%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	27	30			90%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	27	29			93%			
		2. Thalweg centering at downstream of meander (Glide)	29	29			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	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%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	**0**	**0**	**100%**	**n/a**	**n/a**	**n/a**
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	11	11			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	11	11			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	11	11			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)	11	11			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio > 1.6 Rootwads/logs providing some cover at base-flow.	7	11			64%			

Table 5. Visual Stream Morphology Stability Assessment - UT to Uwharrie River Stream Restoration Project (#847) - MY4 (2015)

SE-UT - 517 ft

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	20	22			91%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth > 1.6)	21	21			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	19	21			90%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	24	25			96%			
		2. Thalweg centering at downstream of meander (Glide)	25	25			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	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%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	**0**	**0**	**100%**	**n/a**	**n/a**	**n/a**
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	10	10			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	10	10			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	10	10			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)	10	10			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio > 1.6 Rootwads/logs providing some cover at base-flow.	10	10			100%			

Table 6. Vegetation Condition Assessment - UT to Uwharrie River Stream Restoration Project (#847) - MY4 (2015)

Planted Acreage[1]	28.1

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	Pattern and Color	0	0	0
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	Pattern and Color	5	4.91	17%
			Total			
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	Pattern and Color	0	0	0
			Cumulative Total			

Easement Acreage[2]	32.76

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[3]	Areas or points (if too small to render as polygons at map scale).	1000 sf	Pattern and Color	5	1.48	5%
5. Easement Encroachment Areas[4]	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0	0

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

2 = The acreage within the easement boundaries.

3 = 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.

4 = 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.

PHOTO POINT PHOTOGRAPHS

Photo Point 1; Looking Downstream on Northwest Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 2; Looking Downstream on Southwest Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 3; Looking Upstream on Northwest Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 3; Looking Across NW Trib stream on southwest tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 3; Looking Downstream Northwest Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 4; Looking Upstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

Photo Point 4; Looking Across Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 4; Looking Downstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 5; Looking Upstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

Photo Point 5; Looking Across Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 5; Looking Downstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 6; Looking Upstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 6; Looking Upstream Southwest Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 6; Looking Downstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 7; Looking Upstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 7; Looking Downstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 8; Looking Upstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 8; Looking Downstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 9; Looking Upstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 9; Looking Downstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 9; Looking Upstream Along North UT

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 10; Looking Upstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 2 Monitoring: November 2009

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 10; Looking Downstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 11; Looking Upstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

Photo Point 11; Looking Downstream Along Main

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 12; Looking Upstream Along Southeast Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 12; Looking Across Southeast Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 12; Looking Downstream Southeast Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 13; Looking Upstream Along Southeast Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 13; Looking Across Southeast Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

Photo Point 13; Looking Downstream Along Southeast Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 14; Looking Upstream Along Southwest Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 14; Looking Downstream Along Southwest Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 15; Looking Upstream Along Southwest Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

PHOTO POINT PHOTOGRAPHS

Photo Point 15; Looking Downstream Along Southwest Tributary

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

APPENDIX C
Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment
Table 8. CVS Vegetation Metadata Table
Table 9. Planted and Total Stem Counts (Species by Plot with Annual Means)
Vegetation Plot Photographs

Table 7. Vegetation Plot Criteria Attainment - MY4 (2015) UT to Uwharrie River Stream Restoration Project (#847)					
Vegetation Plot ID	**Reach ID**	**Method**	**CVS Level**	**Survival Threshold Met?**	**Tract Mean**
1	NW-UT	CVS	I&II	Yes	100%
2	Main West	CVS	I&II	No	50%
3	Main West	CVS	I&II	Yes	
4	Main West	CVS	I&II	No	
5	Main West	CVS	I&II	Yes	
6	Main Center	CVS	I&II	No	67%
7	Main Center	CVS	I&II	Yes	
8	Main Center	CVS	I&II	Yes	
9	Main East	CVS	I&II	Yes	67%
10	Main East	CVS	I&II	Yes	
11	Main East	CVS	I&II	No	
12	SE-UT	CVS	I&II	No	0%
13	SE-UT	CVS	I&II	No	
14	SW-Trib	CVS	I&II	Yes	75%
15	SW-Trib	CVS	I&II	Yes	
16	SW-Trib	CVS	I&II	No	
17	SW-Trib	CVS	I&II	Yes	

Table 8. CVS Vegetation Metadata Table - UT to Uwharrie River Stream Restoration Project (#847) MY4 (2015)	
Report Prepared By	Brian Dustin
Date Prepared	12/2/2015 15:49
Database name	2015 MY4_cvs-eep-entrytool-v2.3.1.mdb
Database location	G:\Project\2012\2012057.00\ENV\Monitoring\Monitoring Year 4\CVS
Computer name	HWALLACE-7
File size	38043648
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.
ALL Stems by Plot and spp	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.
PROJECT SUMMARY----------	
Project Code	847
Project Name	UT to Uwharrie River
Description	The Unnamed Tributary (UT) to Uwharrie River Stream Restoration Site (Site) is situated in the northwest corner of Randolph County, North Carolina. Specifically, the project site is located on a UT to the Uwharrie River approximately 5.0 miles southeast of Thomasville
River Basin	Yadkin-Pee Dee
Length(ft)	
Stream-to-edge width (ft)	
Area (sq m)	132736.89
Required Plots (calculated)	22
Sampled Plots	17

Table 9. Planted and Total Stem Counts (Species by Plot with Annual Means) - UT to Uwharrie River Stream Enhancement Project (#847)

Current Plot Data (MY4 2015)

Scientific Name	Common Name	Species Type	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7		Plot 8		Plot 9		Plot 10		Plot 11		Plot 12		Plot 13		Plot 14		Plot 15		Plot 16		Plot 17	
			P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Aesculus sylvatica	painted buckeye	Shrub																																
	red maple	Tree																										8						
Alnus serrulata	hazel alder	Shrub				2																												
Betula nigra	river birch	Tree							1	1					6	8	3	3															1	1
Carya glabra var. glabra	pignut hickory	Tree																																
Cephalanthus occidentalis	common buttonbush	Shrub			1	1			1	1																								
Cercis canadensis	eastern redbud	Tree	2	2																														
Cornus amomum	silky dogwood	Shrub																																
Diospyros virginiana	common persimmon	Tree											1	1	1	1										5								
Fraxinus americana	white ash	Tree																																
Fraxinus pennsylvanica	green ash	Tree							1	3	1	1			5	5	1	1															1	1
Juglans nigra	black walnut	Tree																																
Juniperus virginiana	eastern red cedar	Tree																			1	1												
Liquidambar styraciflua	sweetgum	Tree		3												11		5		10					4									
Liriodendron tulipifera	tuliptree	Tree																								2								
Malus angustifolia	southern crabapple	Tree																																
Pinus echinata	shortleaf pine	Tree					4	4					1	1							1	1												
Pinus strobus	eastern white pine	Tree	1	1																							1	1	3	3				
Pinus taeda	loblolly pine	Tree														5		10		13									1	2		1	1	2
Pinus virginiana	Virginia pine	Tree																			2	2					1	1	1	1	1	1	3	3
Platanus occidentalis	American sycamore	Tree			4	7			2	2	4	4			3	11	5	7	3	6					1	4							2	7
Prunus serotina	black cherry	Tree																			1	1					1	1			1	1	2	2
Pyrus calleryana	Callery pear	Exotic																																
Quercus alba	white oak	Tree	4	4			4	4					3	3							2	2	4	4			2	2	4	4	5	5	1	2
Quercus falcata	southern red oak	Tree	3	3																			2	2	1	1	1	1			2	2		
Quercus michauxii	swamp chestnut oak	Tree									3	3			1	1	1	1	5	5					3	3							2	2
Quercus nigra	water oak	Tree					1	1									2	2	3	3													1	1
Quercus phellos	willow oak	Tree			1	1					2	3																					1	1
Quercus rubra	northern red oak	Tree											1	1							3	3												
Salix nigra	black willow	Tree								4																								
Sambucus canadensis	common elderberry	Shrub																																
Ulmus alata	winged elm	Tree		10																														
		Stem count	10	23	6	11	9	9	5	11	10	11	6	6	16	42	12	29	11	37	10	10	6	6	5	12	6	13	9	18	9	10	7	9	8	13
		Size (ares)	1		1		1		1		1		1		1		1		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		0.02		0.02		0.02		0.02		0.02		0.02		0.02		0.02	
		Species count	4	6	3	4	3	3	4	5	4	4	4	4	5	7	5	7	3	5	6	6	2	2	3	4	5	7	4	4	4	5	4	4	6	6
		Stems per acre	404.7	930.8	242.8	445.2	364.2	364.2	202.3	445.2	404.7	445.2	242.8	242.8	647.5	1699.7	485.6	1173.6	445.2	1497.3	404.7	404.7	242.8	242.8	202.3	485.6	242.8	526.1	364.2	728.4	364.2	404.7	283.3	364.2	323.7	526.1

Exceeds requirements by 10%
Exceeds requirements by less than 10%
Fails to meet requirements by more than 10%

Annual Means

Scientific Name	Common Name	Species Type	MY1 (2012)		MY2 (2013)		MY3 (2014)		MY4 (2015)	
			P	T	P	T	P	T	P	T
Aesculus sylvatica	painted buckeye	Shrub		2				2		
	red maple	Tree								8
Alnus serrulata	hazel alder	Shrub				1		1		2
Betula nigra	river birch	Tree	11	11	11	11	11	11	11	13
Carya glabra var. glabra	pignut hickory	Tree				1				
Cephalanthus occidentalis	common buttonbush	Shrub	3	3	2	2	2	2	2	2
Cercis canadensis	eastern redbud	Tree	2	2	2	2	1	1	2	2
Cornus amomum	silky dogwood	Shrub				1		1		
Diospyros virginiana	common persimmon	Tree	2	2	2	5	2	2	2	7
Fraxinus americana	white ash	Tree				1				
Fraxinus pennsylvanica	green ash	Tree	9	9	9	9	9	9	9	11
Juglans nigra	black walnut	Tree		4		6		13		
Juniperus virginiana	eastern red cedar	Tree	2	2	2	3	1	1	1	1
Liquidambar styraciflua	sweetgum	Tree				14		12		33
Liriodendron tulipifera	tuliptree	Tree				1		1		2
Malus angustifolia	southern crabapple	Tree		1						
Pinus echinata	shortleaf pine	Tree	6	6	6	6	6	6	6	6
Pinus strobus	eastern white pine	Tree	6	6	6	6	5	5	5	5
Pinus taeda	loblolly pine	Tree	2	9	2	27	2	34	2	33
Pinus virginiana	Virginia pine	Tree	7	7	7	7	8	8	8	8
Platanus occidentalis	American sycamore	Tree	24	27	24	61	24	63	24	48
Prunus serotina	black cherry	Tree	5	5	5	5	5	5		
Pyrus calleryana	Callery pear	Exotic				1			5	5
Quercus alba	white oak	Tree	33	33	33	33	33	33	29	30
Quercus falcata	southern red oak	Tree	13	13	12	12	9	9	9	9
Quercus michauxii	swamp chestnut oak	Tree	15	15	15	15	14	14	15	15
Quercus nigra	water oak	Tree	10	10	8	8	7	7	7	7
Quercus phellos	willow oak	Tree	7	7	6	6	4	4	4	5
Quercus rubra	northern red oak	Tree	4	4	4	4	4	4	4	4
Salix nigra	black willow	Tree		4		3		8		4
Sambucus canadensis	common elderberry	Shrub	1	1	1	3				10
Ulmus alata	winged elm	Tree		22		7		5		
		Stem count	162	205	157	261	147	261	145	270
		Size (ares)	17		17		17		17	
		Size (acres)	0.42		0.42		0.42		0.42	
		Species count	19	24	19	29	18	26	18	24
		Stems per acre	385.6	488.0	373.7	621.3	349.9	621.3	345.2	642.7

VEGETATION PLOT PHOTOGRAPHS

Vegetation Plot 1

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

VEGETATION PLOT PHOTOGRAPHS

Vegetation Plot 2

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

VEGETATION PLOT PHOTOGRAPHS

Vegetation Plot 3

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

Vegetation Plot 4

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

VEGETATION PLOT PHOTOGRAPHS

Vegetation Plot 5

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

VEGETATION PLOT PHOTOGRAPHS

Vegetation Plot 6

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

Vegetation Plot 7

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

VEGETATION PLOT PHOTOGRAPHS

Vegetation Plot 8

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

VEGETATION PLOT PHOTOGRAPHS

Vegetation Plot 9

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

Vegetation Plot 10

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

VEGETATION PLOT PHOTOGRAPHS

Vegetation Plot 11

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

VEGETATION PLOT PHOTOGRAPHS

Vegetation Plot 12

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

VEGETATION PLOT PHOTOGRAPHS

Vegetation Plot 13

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

VEGETATION PLOT PHOTOGRAPHS

Vegetation Plot 14

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

Vegetation Plot 15

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

VEGETATION PLOT PHOTOGRAPHS

Vegetation Plot 16

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

VEGETATION PLOT PHOTOGRAPHS

Vegetation Plot 17

Year 1 Monitoring: September 2012

Year 2 Monitoring: September 2013

Year 3 Monitoring: August 2014

Year 4 Monitoring: August 2015

Year 5 Monitoring:

APPENDIX D
Stream Survey Data

Cross-sections with Annual Overlays
Longitudinal Profiles with Annual Overlays
Pebble Count Plots with Annual Overlays

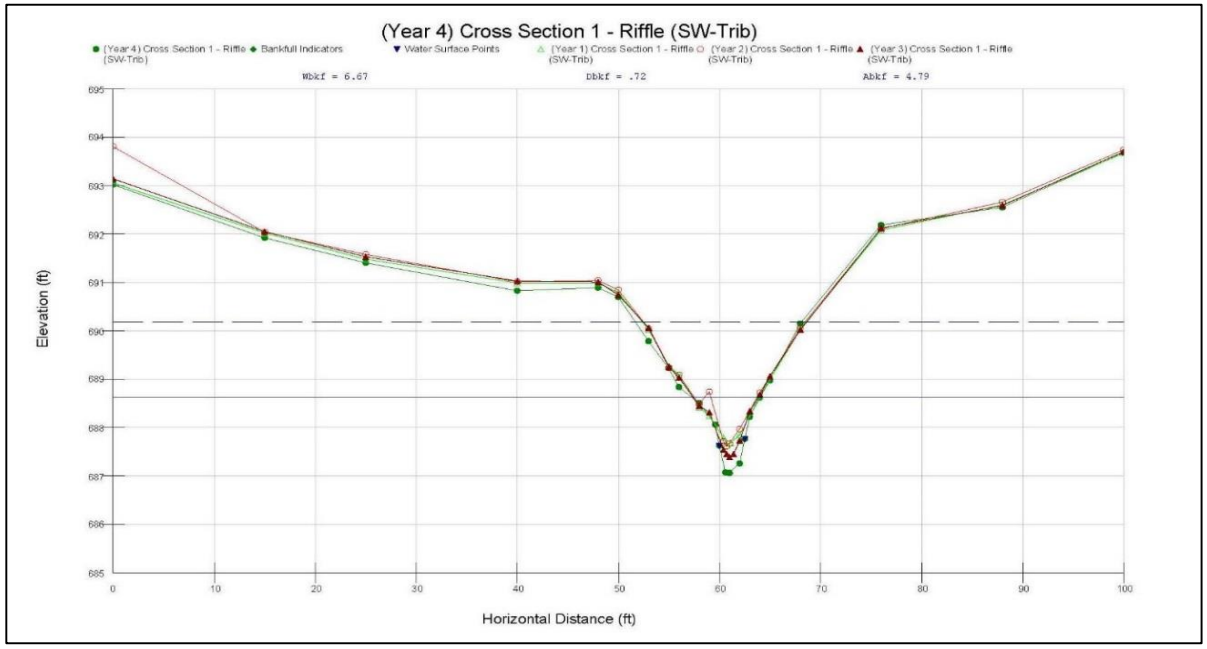
Table 10a.	Baseline Stream Data Summary
Table 10b.	Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydraulic Containment Parameter Distributions)
Table 11a.	Monitoring Data – Dimension Morphology Summary (Dimensional Parameters – Cross-Sections)
Table 11b.	Monitoring Data – Stream Reach Data Summary

River Basin:	Yadkin - Pee Dee
Watershed:	Uwharrie River
XS ID:	XS-1, Riffle, SW-Trib, 9+65
Drainage Area (sq mi):	0.08 (51.2 ac)
Date:	11/10/2015
Field Crew:	M. Mickley, B. Dustin, S. Beavans

SUMMARY DATA	
Bankfull Elevation:	688.62
Bankfull Cross-Sectional Area:	4.79
Bankfull Width:	6.67
Floodprone Area Elevation:	690.18
Floodprone Width:	16.41
Max Depth at Bankfull:	1.56
Mean Depth at Bankfull:	0.72
W/D Ratio:	9.26
Entrenchment Ratio:	2.46
Bank Height Ratio:	1.0

Stream Type
B5

Station	Elevation	Station	Elevation
0	693.02	76	692.19
15	691.92	88	692.55
25	691.41	100	693.68
40	690.83		
48	690.89		
50	690.70		
53	689.79		
55	689.23		
56	688.84		
58	688.51		
59.6	688.06		
60	687.63		
60.6	687.07		
61	687.06		
62	687.23		
62.5	687.77		
63	388.22		
64	688.97		
65	690.15		
68	692.19		

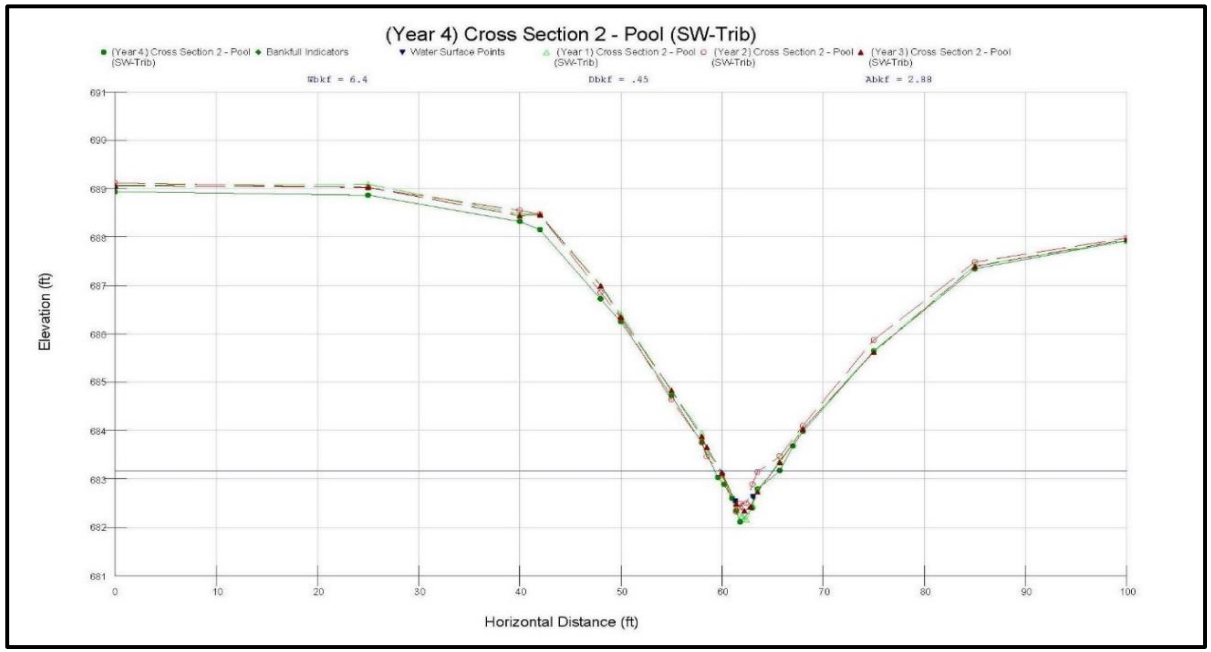


River Basin:	Yadkin - Pee Dee
Watershed:	Uwharrie River
XS ID:	XS-2, Pool, SW-Trib, 11+81
Drainage Area (sq mi):	0.08 (51.2 ac)
Date:	11/10/2015
Field Crew:	M. Mickley, B. Dustin, S. Beavans

SUMMARY DATA	
Bankfull Elevation:	683.17
Bankfull Cross-Sectional Area:	2.88
Bankfull Width:	6.4
Floodprone Area Elevation:	684.23
Floodprone Width:	12.49
Max Depth at Bankfull:	1.06
Mean Depth at Bankfull:	0.45
W/D Ratio:	14.22
Entrenchment Ratio:	1.95
Bank Height Ratio:	N/A

Stream Type
B5

Station	Elevation	Station	Elevation
0	688.94		
25	688.86		
40	688.32		
42	688.15		
48	686.722		
50	686.25		
55	686.72		
58	683.75		
59.6	683.03		
60.2	682.89		
61	682.6		
61.3	682.53		
61.4	682.35		
63.5	682.35		
65.7	683.17		
67	683.68		
68	683.99		
75	685.64		
85	687.34		
100	687.93		

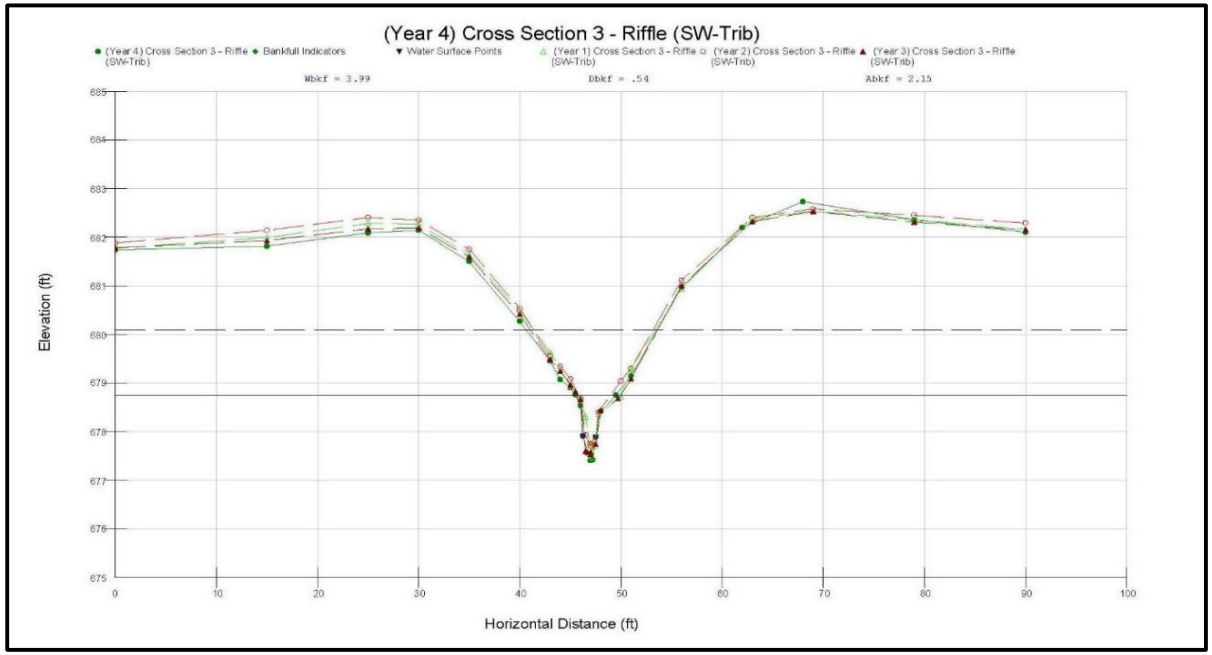


River Basin:	Yadkin - Pee Dee
Watershed:	Uwharrie River
XS ID:	XS-3, Riffle, SW-Trib, 13+83
Drainage Area (sq mi):	0.08 (51.2 ac)
Date:	11/10/2015
Field Crew:	M. Mickley, B. Dustin, S. Beavans

SUMMARY DATA	
Bankfull Elevation:	678.75
Bankfull Cross-Sectional Area:	2.15
Bankfull Width:	3.99
Floodprone Area Elevation:	680.09
Floodprone Width:	12.94
Max Depth at Bankfull:	1.64
Mean Depth at Bankfull:	0.54
W/D Ratio:	7.39
Entrenchment Ratio:	3.24
Bank Height Ratio:	1.0

Stream Type
E5b

Station	Elevation	Station	Elevation
0	681.74	62	682.2
15	681.81	68	682.73
25	682.09	79	682.34
30	682.14	90	682.2
35	681.5		
40	680.27		
43	679.46		
44	679.07		
45	678.91		
45.5	678.76		
46	678.54		
46.25	677.91		
47	677.41		
47.2	677.42		
47.5	677.89		
48	678.41		
49.5	678.75		
51	679.15		
56	680.97		

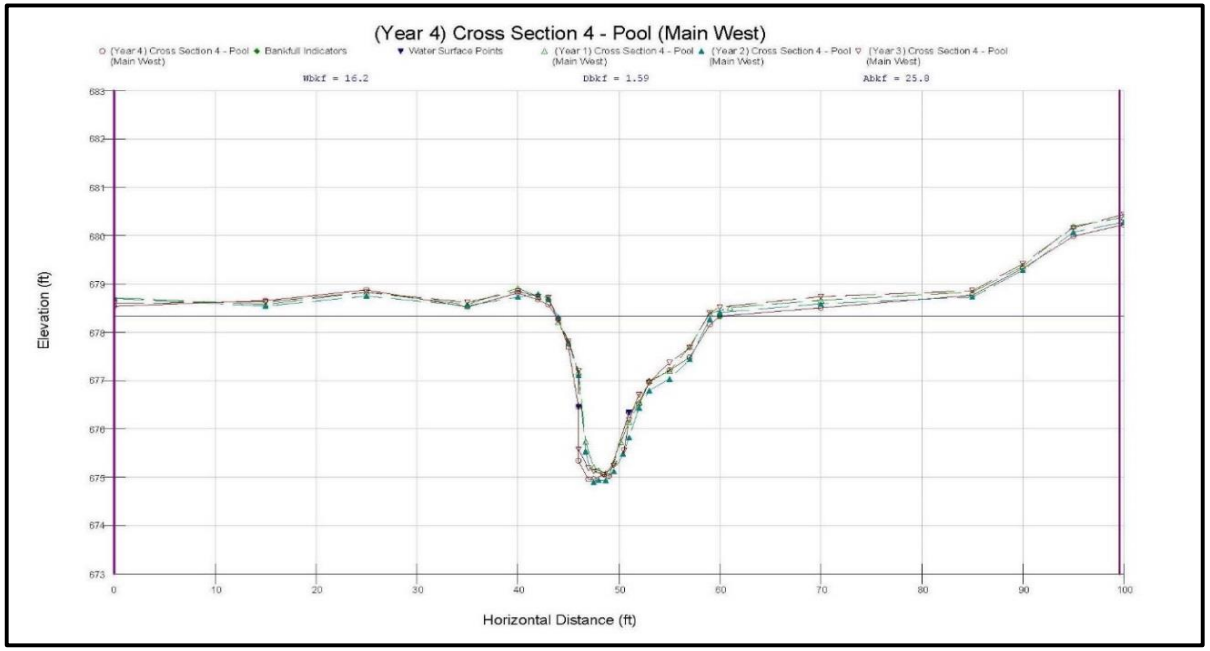


River Basin:	Yadkin - Pee Dee
Watershed:	Uwharrie River
XS ID:	XS-4, Pool, Main West, 12+54
Drainage Area (sq mi):	1.28 (819.2 ac)
Date:	11/10/2015
Field Crew:	M. Mickley, B. Dustin, S. Beavans

SUMMARY DATA	
Bankfull Elevation:	678.33
Bankfull Cross-Sectional Area:	25.77
Bankfull Width:	16.16
Floodprone Area Elevation:	681.7
Floodprone Width:	100.0
Max Depth at Bankfull:	3.37
Mean Depth at Bankfull:	1.59
W/D Ratio:	10.16
Entrenchment Ratio:	6.19
Bank Height Ratio:	N/A

Stream Type
E4/1

Station	Elevation	Station	Elevation
0	678.54	59	678.16
15	678.66	60	678.33
25	678.89	70	678.51
35	678.53	85	678.77
40	678.82	90	679.33
42	678.68	95	679.99
43	678.56	100	680.23
44	678.28		
45	677.69		
46	676.46		
46	675.34		
47	674.96		
47.5	674.96		
48.5	675.06		
49	675.02		
51	676.34		
52	676.51		
53	676.97		
55	677.22		
57	677.48		

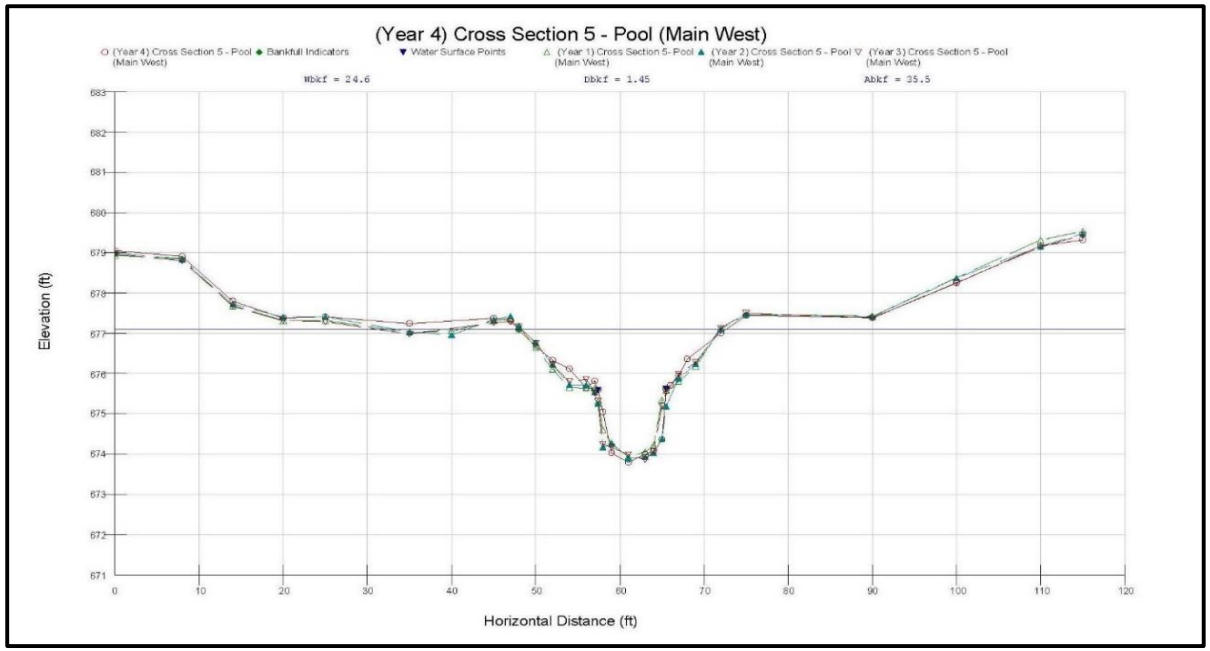


River Basin:	Yadkin - Pee Dee
Watershed:	Uwharrie River
XS ID:	XS-5, Pool, Main West, 14+12
Drainage Area (sq mi):	1.28 (819.2 ac)
Date:	11/10/2015
Field Crew:	M. Mickley, B. Dustin, S. Beavans

SUMMARY DATA	
Bankfull Elevation:	677.09
Bankfull Cross-Sectional Area:	35.48
Bankfull Width:	24.56
Floodprone Area Elevation:	380.39
Floodprone Width:	115.0
Max Depth at Bankfull:	3.30
Mean Depth at Bankfull:	1.45
W/D Ratio:	16.94
Entrenchment Ratio:	4.68
Bank Height Ratio:	N/A

Stream Type
C4/1

Station	Elevation	Station	Elevation
0	679.06	65	674.36
8	678.91	65.5	675.62
14	677.80	66	675.71
20	677.38	67	675.95
25	677.41	69	675.95
35	677.24	72	677.01
45	677.37	75	677.45
47	677.31	90	677.39
48	677.09	100	678.25
50	676.69	110	679.12
52	676.33	115	679.32
54	676.12		
56	675.65		
57	675.82		
57.4	675.59		
58	675.05		
59	674.04		
61	673.80		
63	674.00		
64	674.06		

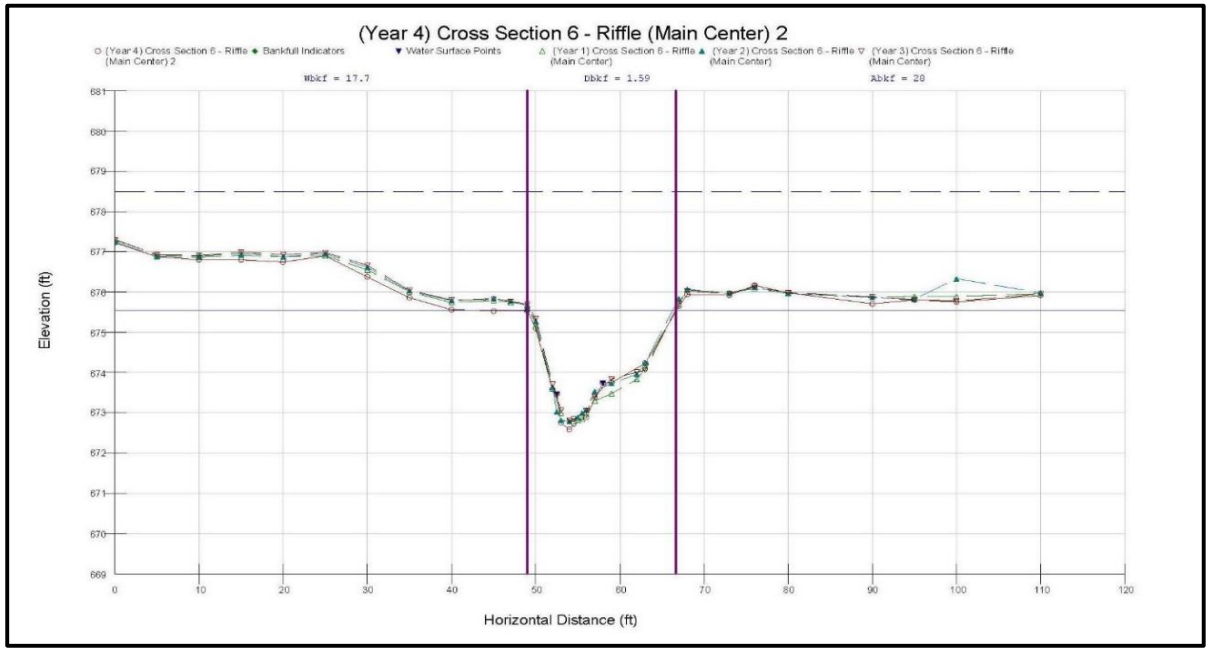


River Basin:	Yadkin - Pee Dee
Watershed:	Uwharrie River
XS ID:	XS-6, Riffle, Main Center, 16+30
Drainage Area (sq mi):	1.43 (915.2 ac)
Date:	11/10/2015
Field Crew:	M. Mickley, B. Dustin, S. Beavans

SUMMARY DATA	
Bankfull Elevation:	675.54
Bankfull Cross-Sectional Area:	28.04
Bankfull Width:	17.65
Floodprone Area Elevation:	678.49
Floodprone Width:	110.0
Max Depth at Bankfull:	2.95
Mean Depth at Bankfull:	1.59
W/D Ratio:	11.1
Entrenchment Ratio:	6.23
Bank Height Ratio:	1.0

Stream Type
E4

Station	Elevation	Station	Elevation
0	677.23	59	673.75
5	676.88	63	674.23
10	676.80	67	675.65
15	676.80	68	675.94
20	676.75	73	675.93
25	676.90	76	676.17
30	676.38	80	675.99
35	675.86	90	675.71
40	675.56	95	675.81
45	675.53	100	675.76
49	675.54	110	675.92
50	675.10		
52	67..58		
52.5	673.46		
53	672.76		
54	672.59		
54.5	672.73		
56	672.89		
57	673.36		
58	673.74		

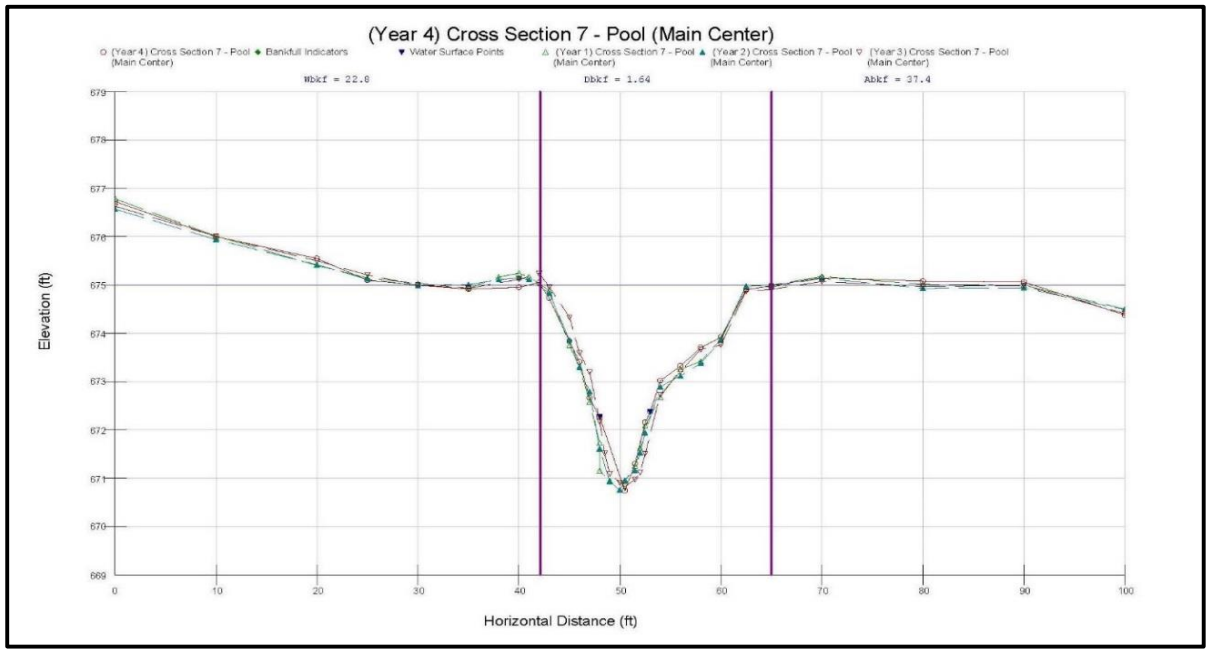


River Basin:	Yadkin - Pee Dee
Watershed:	Uwharrie River
XS ID:	XS-7, Pool, Main Center, 18+20
Drainage Area (sq mi):	1.43 (915.2 ac)
Date:	11/10/2015
Field Crew:	M. Mickley, B. Dustin, S. Beavans

SUMMARY DATA	
Bankfull Elevation:	674.99
Bankfull Cross-Sectional Area:	37.45
Bankfull Width:	22.81
Floodprone Area Elevation:	674.99
Floodprone Width:	100.0
Max Depth at Bankfull:	4.25
Mean Depth at Bankfull:	1.6
W/D Ratio:	13.91
Entrenchment Ratio:	4.38
Bank Height Ratio:	N/A

Stream Type
C4

Station	Elevation	Station	Elevation
0	676.73	58	673.71
10	676.00	60	673.92
20	675.53	62.5	674.90
25	675.10	65	674.00
30	674.99	70	675.15
35	674.92	80	675.08
40	674.95	90	675.06
42	675.05	100	674.38
43	674.73		
45	673.84		
46	673.41		
47	672.67		
48	672.27		
50.5	670.74		
51.5	371.30		
52	672.38		
52.5	673.02		
53	672.38		
54	673.02		
56	673.33		

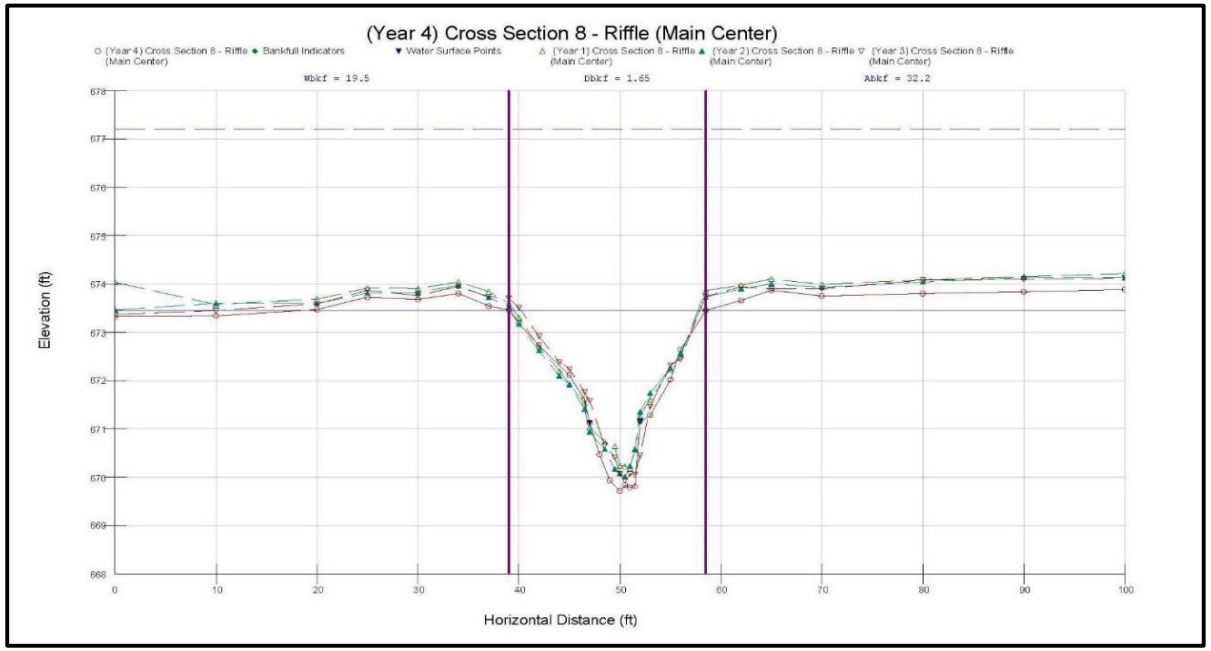


River Basin:	Yadkin - Pee Dee
Watershed:	Uwharrie River
XS ID:	XS-8, Riffle, Main Center, 20+04
Drainage Area (sq mi):	1.43 (915.2 ac)
Date:	11/10/2015
Field Crew:	M. Mickley, B. Dustin, S. Beavans

SUMMARY DATA	
Bankfull Elevation:	673.46
Bankfull Cross-Sectional Area:	32.25
Bankfull Width:	19.49
Floodprone Area Elevation:	677.2
Floodprone Width:	100.0
Max Depth at Bankfull:	3.74
Mean Depth at Bankfull:	1.65
W/D Ratio:	11.81
Entrenchment Ratio:	5.13
Bank Height Ratio:	1.0

Stream Type
C4

Station	Elevation	Station	Elevation
0	673.32	53	671.29
10	673.34	55	672.02
20	673.47	56	672.65
25	673.73	58.5	673.46
30	673.59	62	673.66
34	673.80	65	673.87
37	673.54	70	673.75
39	673.46	80	673.80
40	673.19	90	673.84
42	672.73	100	673.86
45	672.11		
46.5	671.62		
47	671.13		
48	670.47		
49	669.93		
50	669.72		
50.5	669.83		
51	669.79		
51.5	669.81		
52	671.15		

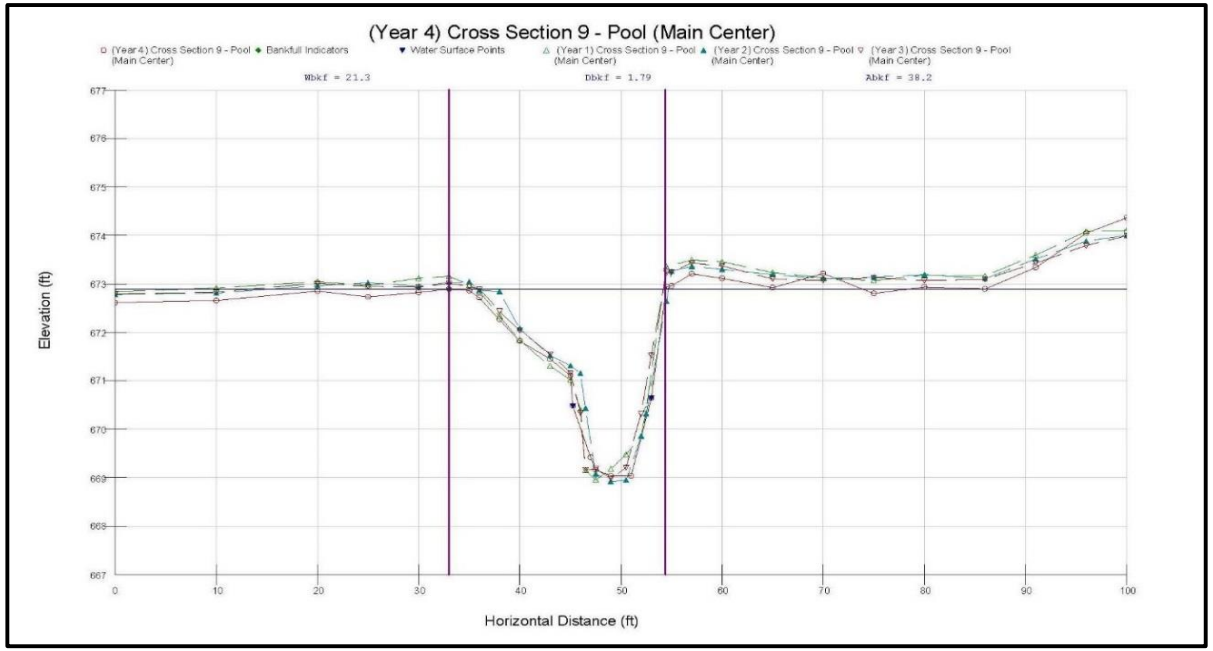


River Basin:	Yadkin - Pee Dee
Watershed:	Uwharrie River
XS ID:	XS-9, Pool, Main Center, 21+96
Drainage Area (sq mi):	1.43 (915.2 ac)
Date:	11/10/2015
Field Crew:	M. Mickley, B. Dustin, S. Beavans

SUMMARY DATA	
Bankfull Elevation:	672.89
Bankfull Cross-Sectional Area:	38.16
Bankfull Width:	21.27
Floodprone Area Elevation:	676.74
Floodprone Width:	100.0
Max Depth at Bankfull:	3.85
Mean Depth at Bankfull:	1.79
W/D Ratio:	11.88
Entrenchment Ratio:	4.7
Bank Height Ratio:	N/A

Stream Type
C4

Station	Elevation	Station	Elevation
0	672.61	57	672.21
10	672.65	60	673.11
20	672.85	65	672.92
25	672.73	70	673.21
30	672.82	75	672.80
33	672.89	80	672.93
35	672.86	86	672.86
36	672.72	91	673.34
38	672.27	96	674.05
40	672.82	100	674.36
43	671.46		
45	671.11		
45.25	670.48		
47	669.42		
47.5	669.16		
49	669.04		
51	669.04		
53	670.64		
54.5	672.94		
55	672.96		

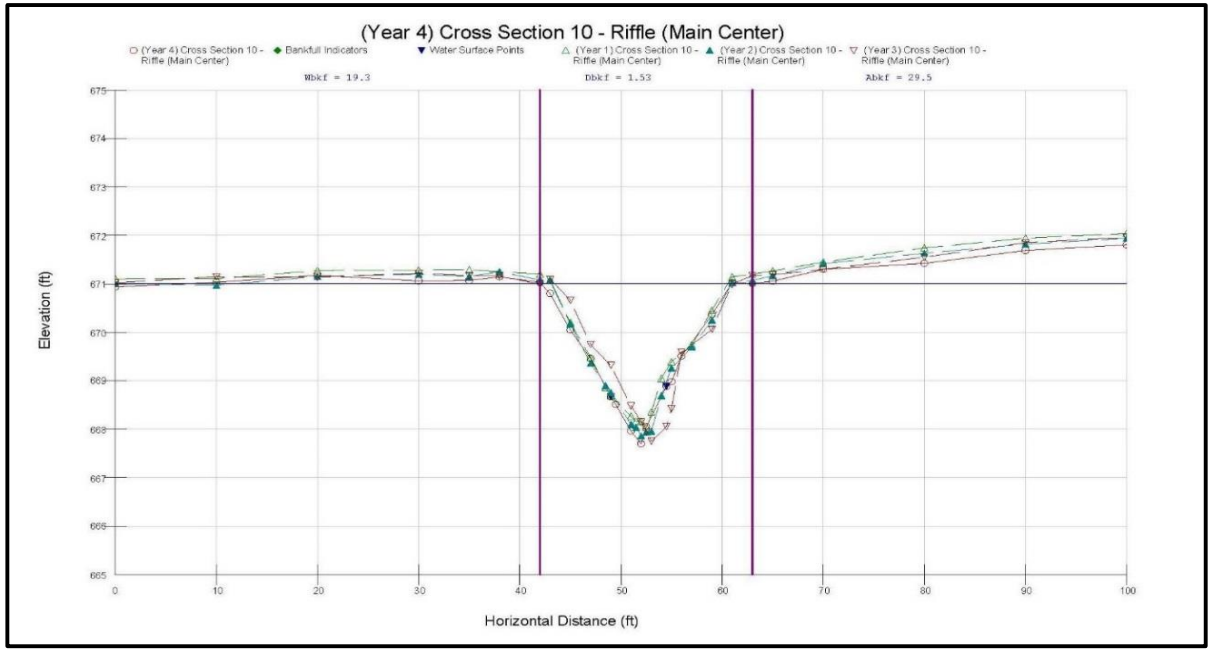


River Basin:	Yadkin - Pee Dee
Watershed:	Uwharrie River
XS ID:	XS-10, Riffle, Main Center, 24+66
Drainage Area (sq mi):	1.43 (915.2 ac)
Date:	11/10/2015
Field Crew:	M. Mickley, B. Dustin, S. Beavans

SUMMARY DATA	
Bankfull Elevation:	671.01
Bankfull Cross-Sectional Area:	29.47
Bankfull Width:	19.26
Floodprone Area Elevation:	671.01
Floodprone Width:	100.0
Max Depth at Bankfull:	3.31
Mean Depth at Bankfull:	1.53
W/D Ratio:	12.59
Entrenchment Ratio:	5.19
Bank Height Ratio:	1.0

Stream Type
E4

Station	Elevation	Station	Elevation
0	670.94	63	671.01
10	671.03	65	671.6
20	671.76	70	671.30
30	671.06	80	671.43
35	671.07	90	671.69
38	671.14	100	671.81
42	671.03		
43	670.8		
45	670.05		
47	669.46		
49	668.68		
49.5	668.51		
51	667.96		
52	667.7		
52.5	668.06		
54.5	668.89		
55	668.98		
56	668.51		
59	670.37		
61	671.03		

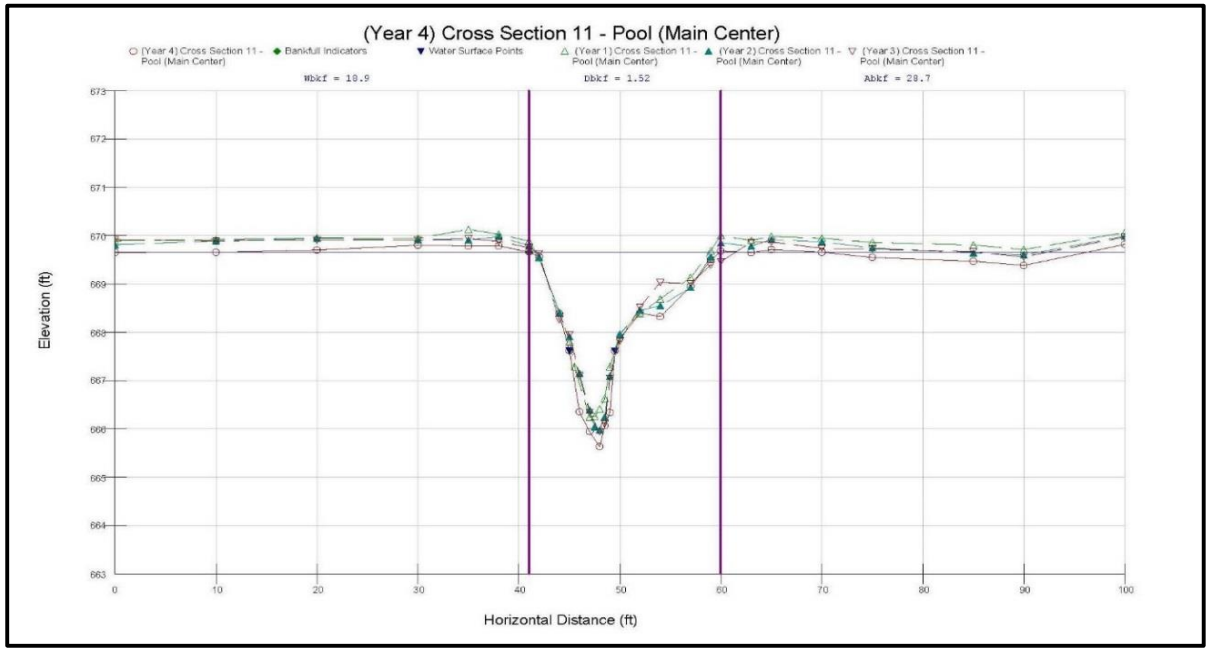


River Basin:	Yadkin - Pee Dee
Watershed:	Uwharrie River
XS ID:	XS-11, Pool, Main Center, 27+24
Drainage Area (sq mi):	1.43 (915.2 ac)
Date:	11/10/2015
Field Crew:	M. Mickley, B. Dustin, S. Beavans

SUMMARY DATA	
Bankfull Elevation:	669.66
Bankfull Cross-Sectional Area:	28.68
Bankfull Width:	18.9
Floodprone Area Elevation:	669.66
Floodprone Width:	100.0
Max Depth at Bankfull:	4.02
Mean Depth at Bankfull:	1.52
W/D Ratio:	12.41
Entrenchment Ratio:	5.3
Bank Height Ratio:	N/A

Stream Type
C4

Station	Elevation	Station	Elevation
0	669.65	59	669.5
10	669.66	60	669.68
20	669.70	63	669.65
30	669.80	65	669.71
35	669.79	70	669.66
38	669.89	75	669.55
41	669.66	85	669.47
42	669.57	90	669.39
44	668.39	100	669382
45	667.62		
46	666.35		
47	665.95		
48	665.64		
48.5	666.07		
49	666.34		
49.5	668.62		
50	668.88		
52	668.40		
54	668.33		
57	668.95		

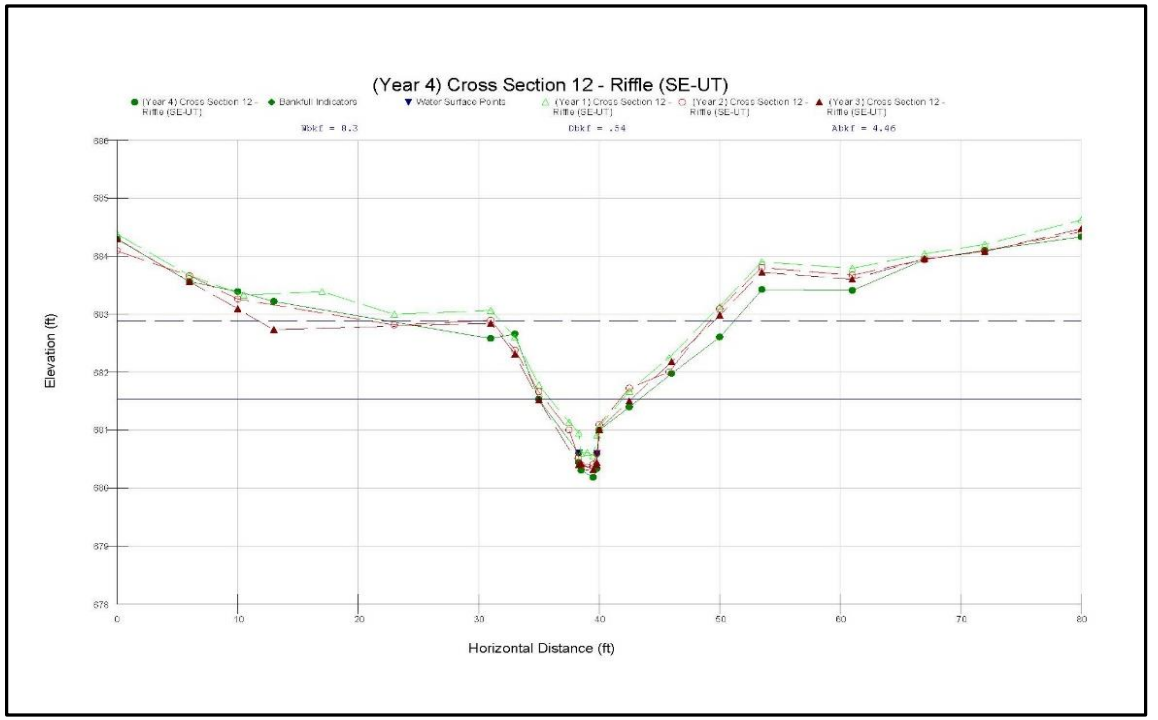


River Basin:	Yadkin - Pee Dee
Watershed:	Uwharrie River
XS ID:	XS-12, Riffle, SE-UT, 5+76
Drainage Area (sq mi):	0.04 (25.6 ac)
Date:	11/10/2015
Field Crew:	M. Mickley, B. Dustin, S. Beavans

SUMMARY DATA	
Bankfull Elevation:	681.52
Bankfull Cross-Sectional Area:	4.39
Bankfull Width:	7.60
Floodprone Area Elevation:	682.72
Floodprone Width:	17.25
Max Depth at Bankfull:	1.20
Mean Depth at Bankfull:	0.58
W/D Ratio:	13.10
Entrenchment Ratio:	2.27
Bank Height Ratio:	1.0

Stream Type
C5b

Station	**Elevation**	**Station**	**Elevation**
0		80	
6			
10			
13			
31			
33			
35			
38.3			
38.5			
39.5			
39.8			
39.8			
40			
42.5			
46			
50			
53.5			
61			
67			
72			

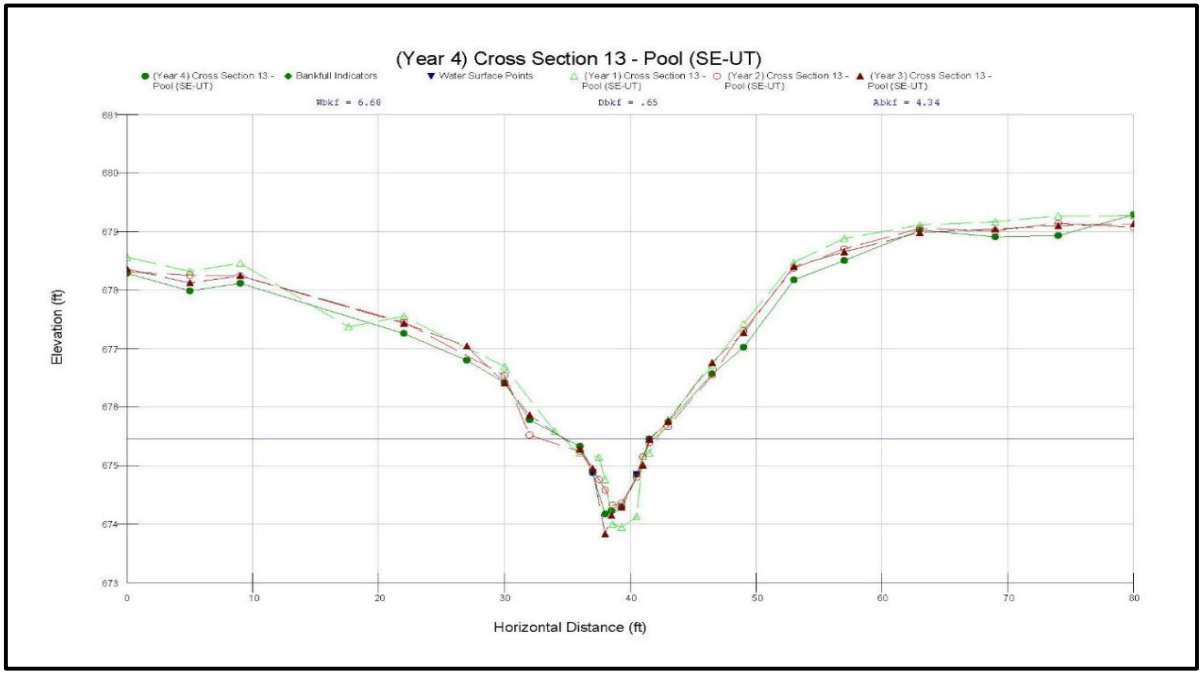


River Basin:	Yadkin - Pee Dee
Watershed:	Uwharrie River
XS ID:	XS-13, Pool, SE-UT, 7+70
Drainage Area (sq mi):	0.04 (25.6 ac)
Date:	11/10/2015
Field Crew:	M. Mickley, B. Dustin, S. Beavans

SUMMARY DATA	
Bankfull Elevation:	675.45
Bankfull Cross-Sectional Area:	4.68
Bankfull Width:	6.67
Floodprone Area Elevation:	677.07
Floodprone Width:	21.40
Max Depth at Bankfull:	1.62
Mean Depth at Bankfull:	0.70
W/D Ratio:	9.53
Entrenchment Ratio:	3.21
Bank Height Ratio:	N/A

Stream Type
E5b

Station	Elevation	Station	Elevation
0		69	
5		74	
9		80	
22			
27			
30			
32			
36			
37			
38			
38.5			
39.3			
41			
41.5			
43			
46.5			
49			
53			
57			
63			

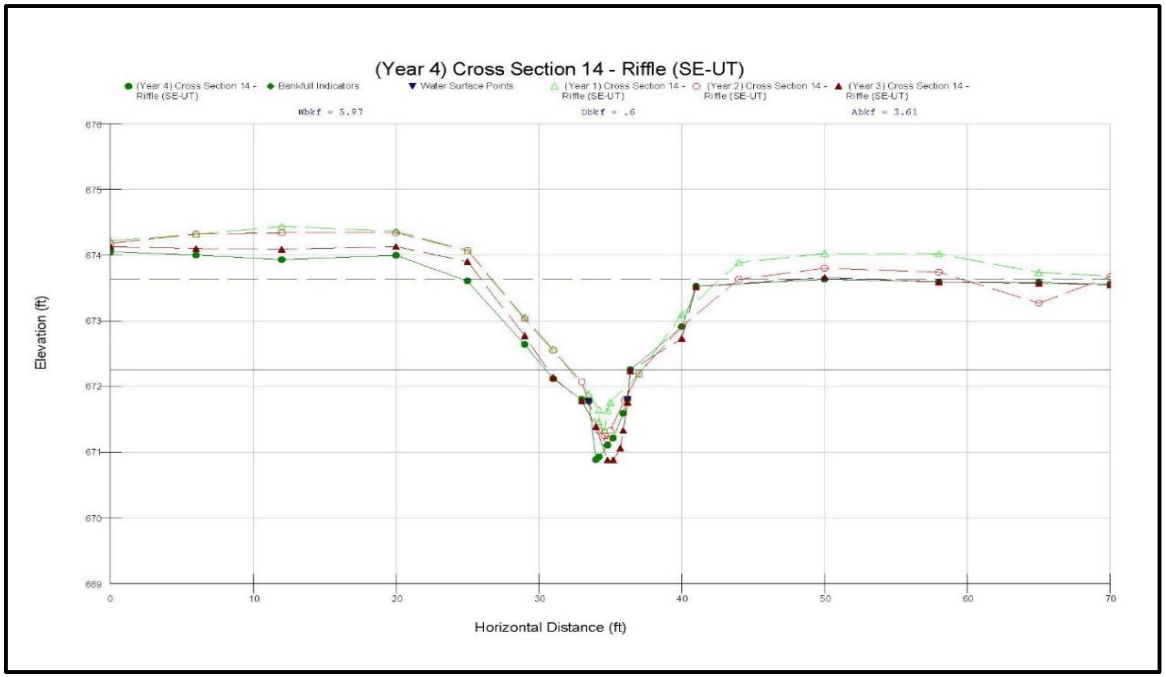


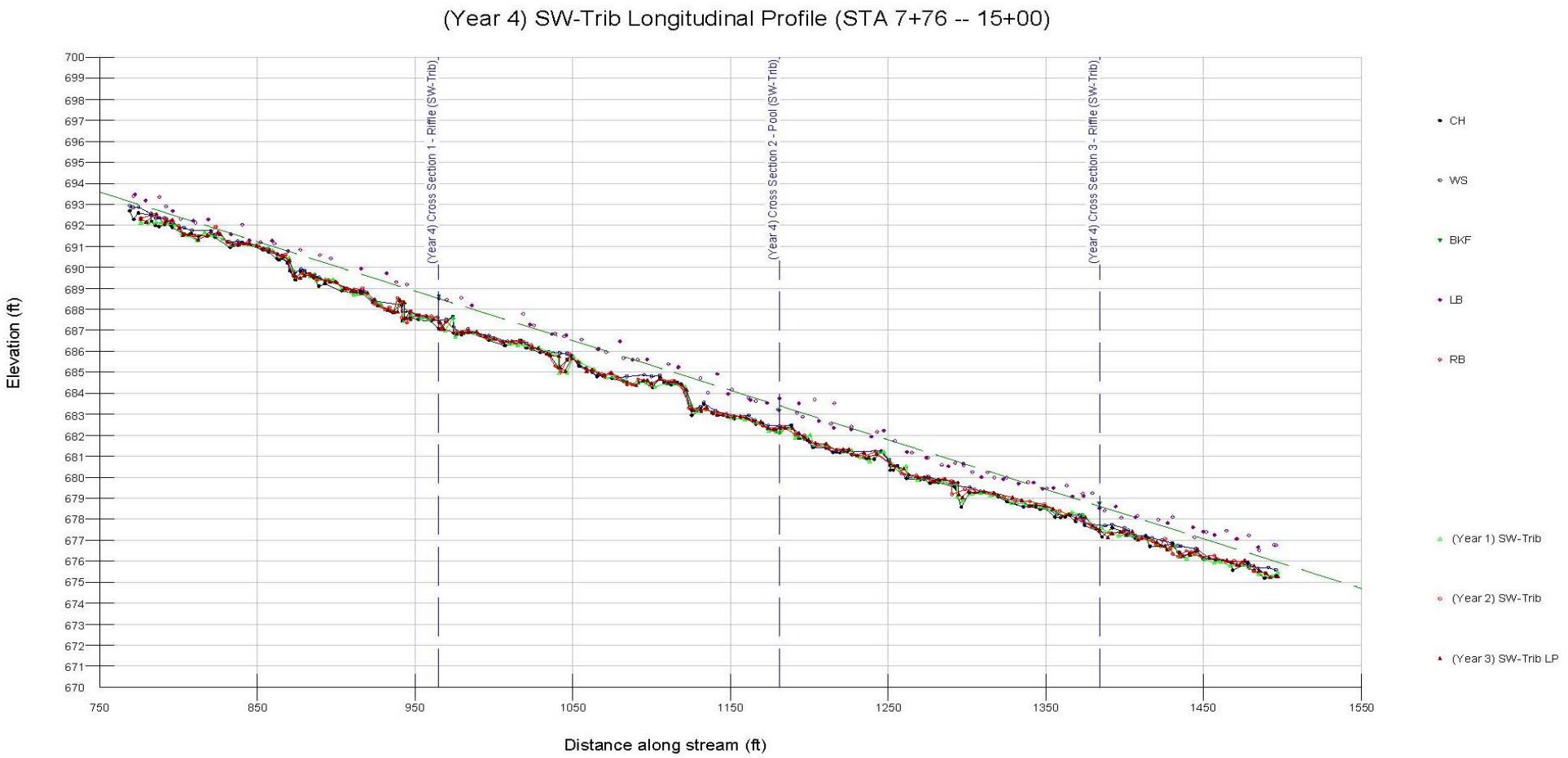
River Basin:	Yadkin - Pee Dee
Watershed:	Uwharrie River
XS ID:	XS-14, Riffle, SE-UT, 8+84
Drainage Area (sq mi):	0.04 (25.6 ac)
Date:	11/10/2015
Field Crew:	M. Mickley, B. Dustin, S. Beavans

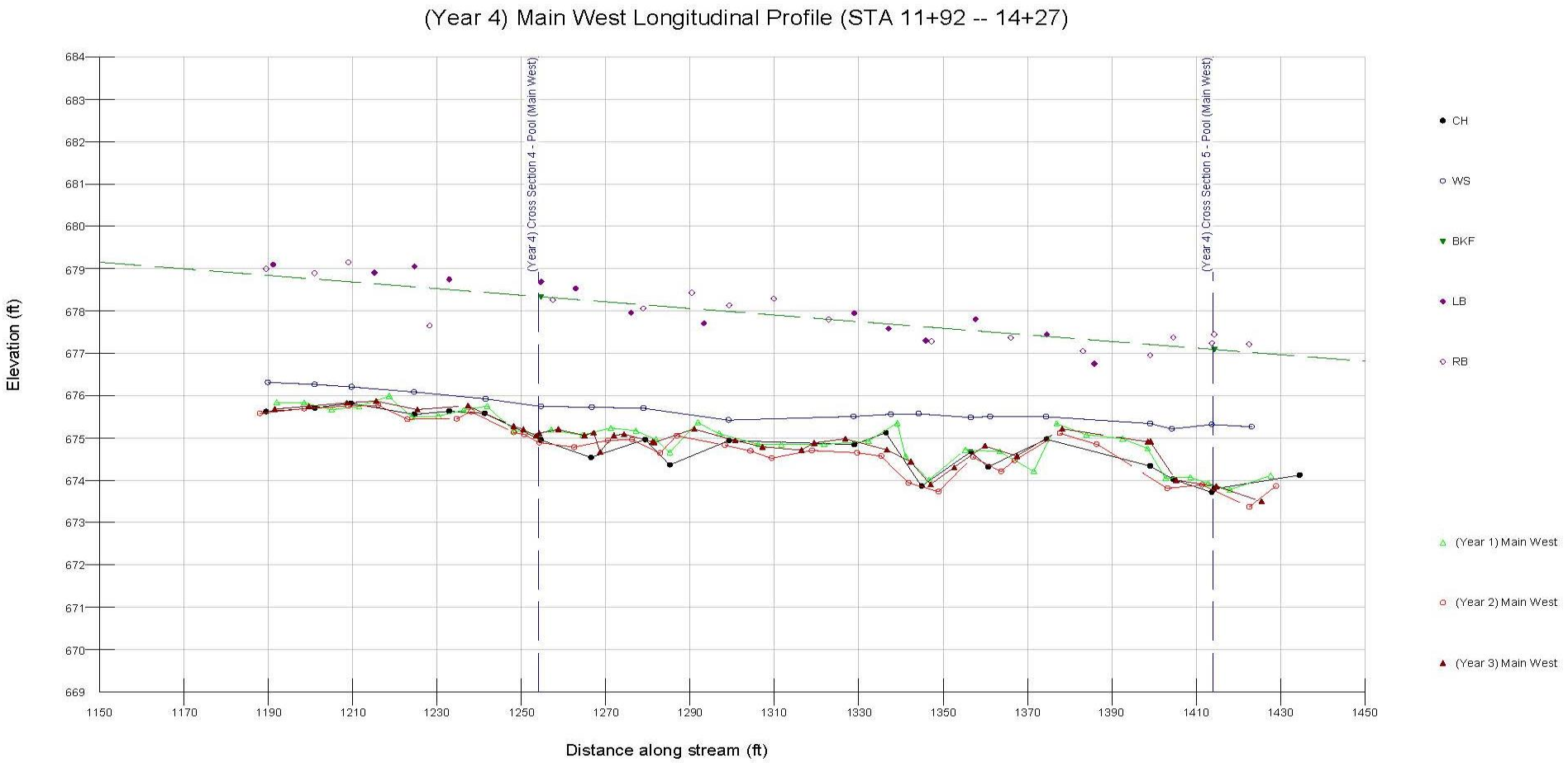
SUMMARY DATA	
Bankfull Elevation:	672.24
Bankfull Cross-Sectional Area:	3.76
Bankfull Width:	5.72
Floodprone Area Elevation:	673.60
Floodprone Width:	33.22
Max Depth at Bankfull:	1.36
Mean Depth at Bankfull:	0.66
W/D Ratio:	8.67
Entrenchment Ratio:	5.81
Bank Height Ratio:	1.0

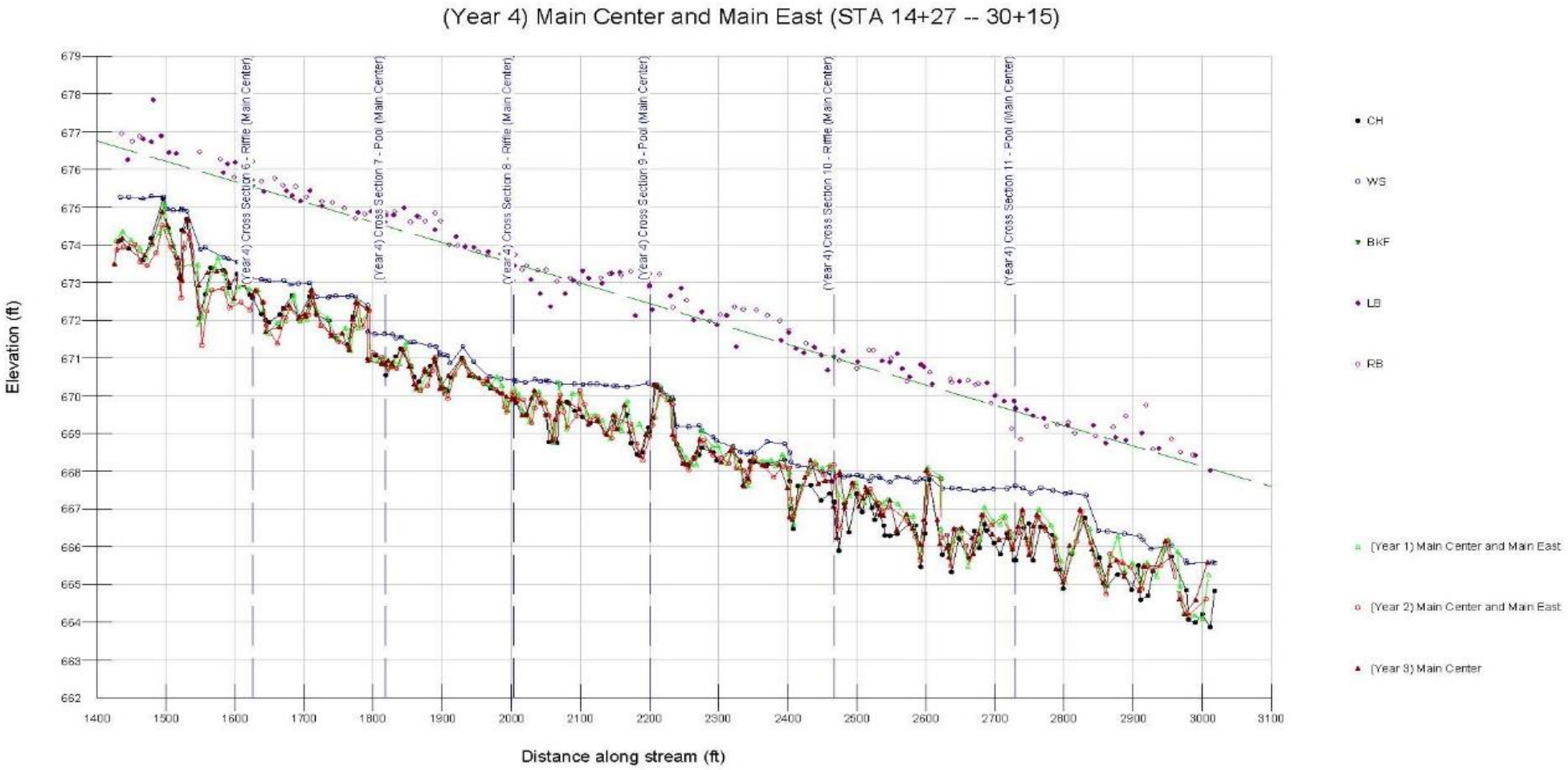
Stream Type
E5b

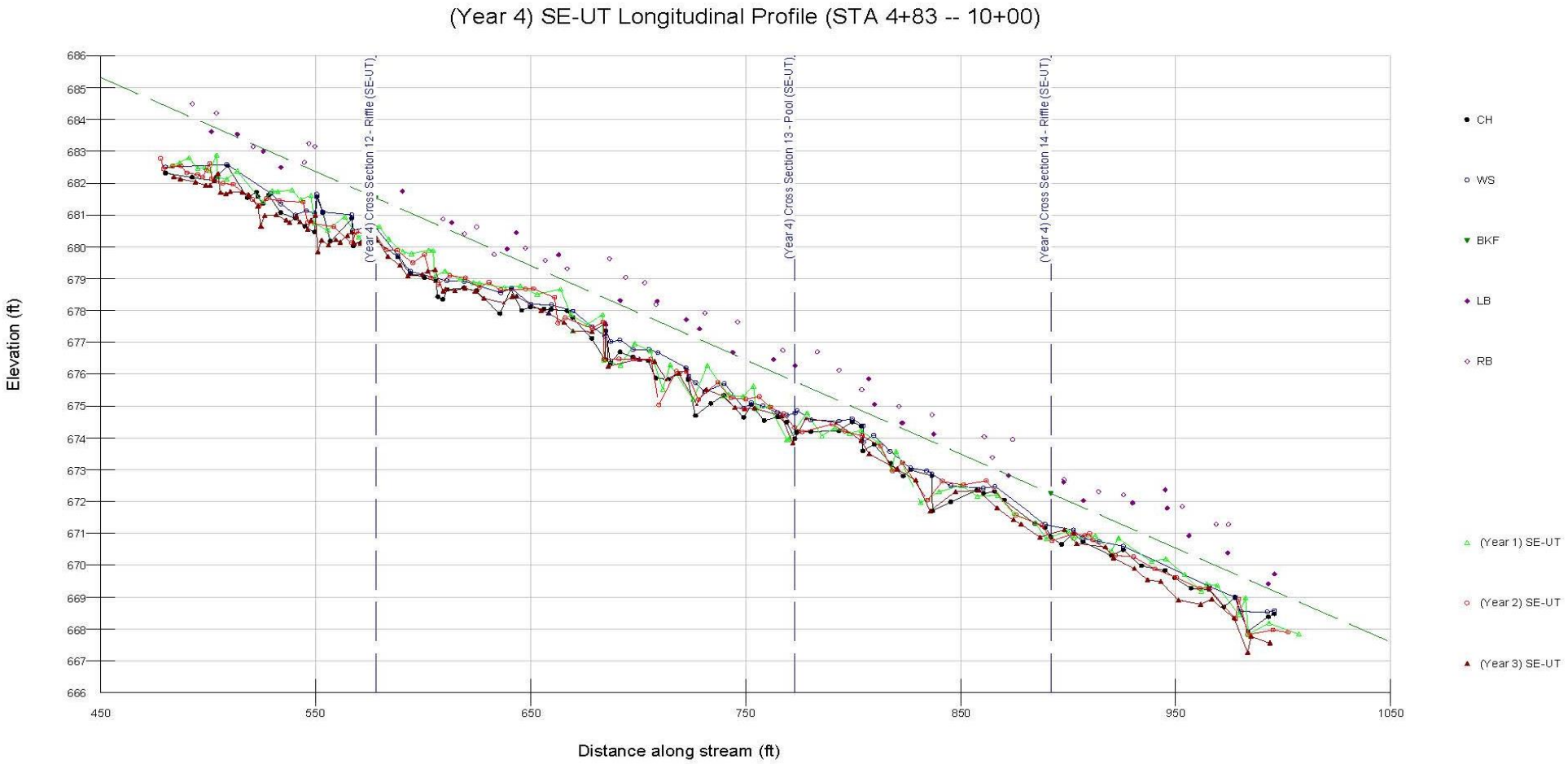
Station	Elevation	Station	Elevation
0		70	
6			
12			
20			
25			
29			
31			
33			
34			
34.8			
35.2			
35.7			
35.9			
36.2			
36.4			
40			
41			
50			
58			
65			




(Year 4) SW-Trib Longitudinal Profile (STA 7+76 -- 15+00)
Elevation (ft)
Distance along stream (ft)
(Year 4) Cross Section 1 - Riffle (SW-Trib)
(Year 4) Cross Section 2 - Pool (SW-Trib)
(Year 4) Cross Section 3 - Riffle (SW-Trib)
CH
WS
BKF
LB
RB
(Year 1) SW-Trib
(Year 2) SW-Trib
(Year 3) SW-Trib LP

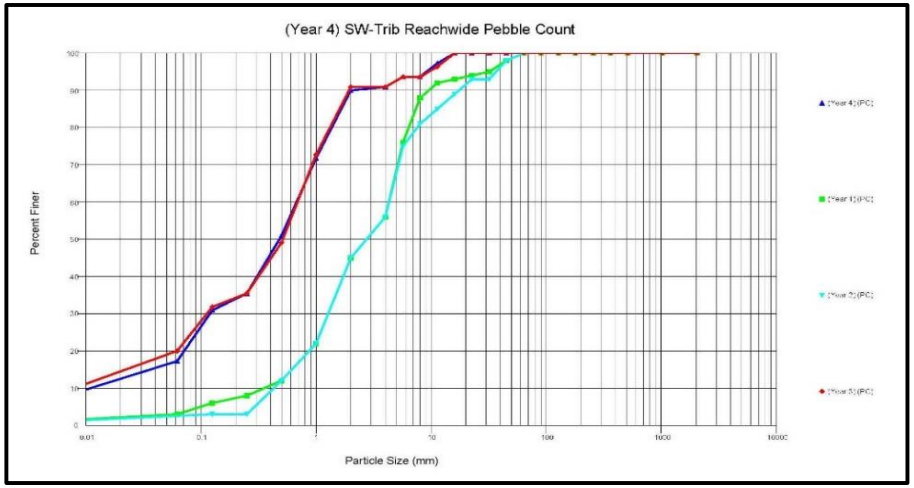

(Year 4) Main West Longitudinal Profile (STA 11+92 -- 14+27)
Elevation (ft)
Distance along stream (ft)
(Year 4) Cross Section 4 - Pool (Main West)
(Year 4) Cross Section 5 - Pool (Main West)
CH
WS
BKF
LB
RB
(Year 1) Main West
(Year 2) Main West
(Year 3) Main West

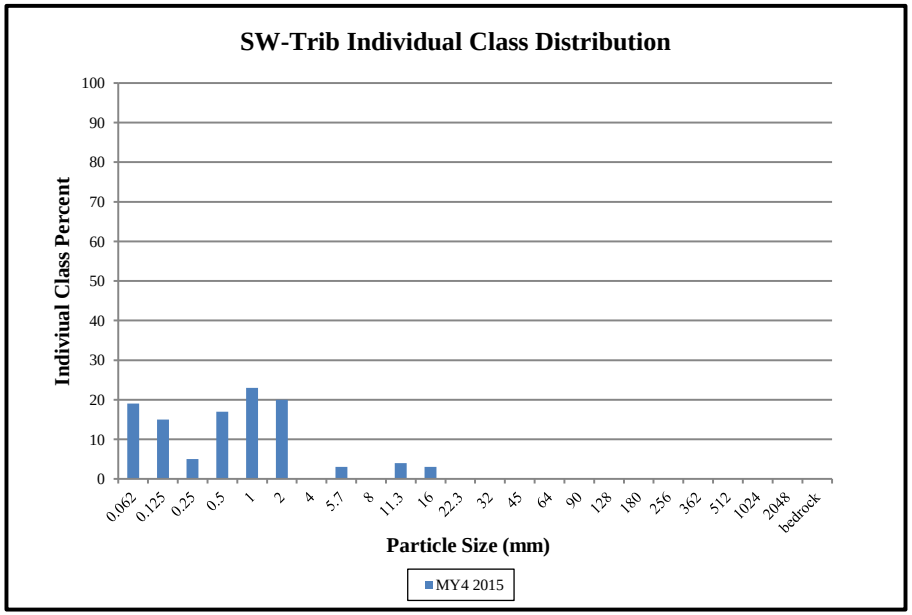

(Year 4) Main Center and Main East (STA 14+27 -- 30+15)
Elevation (ft)
Distance along stream (ft)
(Year 4) Cross Section 6 - Riffle (Main Center)
(Year 4) Cross Section 7 - Pool (Main Center)
(Year 4) Cross Section 8 - Riffle (Main Center)
(Year 4) Cross Section 9 - Pool (Main Center)
(Year 4) Cross Section 10 - Riffle (Main Center)
(Year 4) Cross Section 11 - Pool (Main Center)
CH
WS
BKF
LB
RB
(Year 1) Main Center and Main East
(Year 2) Main Center and Main East
(Year 3) Main Center


(Year 4) SE-UT Longitudinal Profile (STA 4+83 -- 10+00)
Elevation (ft)
Distance along stream (ft)
(Year 4) Cross Section 12 - Riffle (SE-UT)
(Year 4) Cross Section 13 - Pool (SE-UT)
(Year 4) Cross Section 14 - Riffle (SE-UT)
CH
WS
BKF
LB
RB
(Year 1) SE-UT
(Year 2) SE-UT
(Year 3) SE-UT

UT to Uwharrie River Stream Restoration Project (#847)					
Reachwide Riffle Pebble Count					
SW-Trib					
			MY4 2015		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	19	17%	17%
Sand	very fine sand	0.125	15	14%	31%
	fine sand	0.25	5	5%	36%
	medium sand	0.5	17	16%	51%
	coarse sand	1	23	21%	72%
	very coarse sand	2	20	18%	91%
Gravel	very fine gravel	4	0.1	0%	91%
	fine gravel	5.7	3	3%	94%
	fine gravel	8	0	0%	94%
	medium gravel	11.3	4	4%	97%
	medium gravel	16	3	3%	100%
	coarse gravel	22.3	0	0%	100%
	coarse gravel	32	0	0%	100%
	very coarse gravel	45	0	0%	100%
	very coarse gravel	64	0	0%	100%
Cobble	small cobble	90	0	0%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	bedrock	0	0%	100%
		Total % of whole count	109.1		

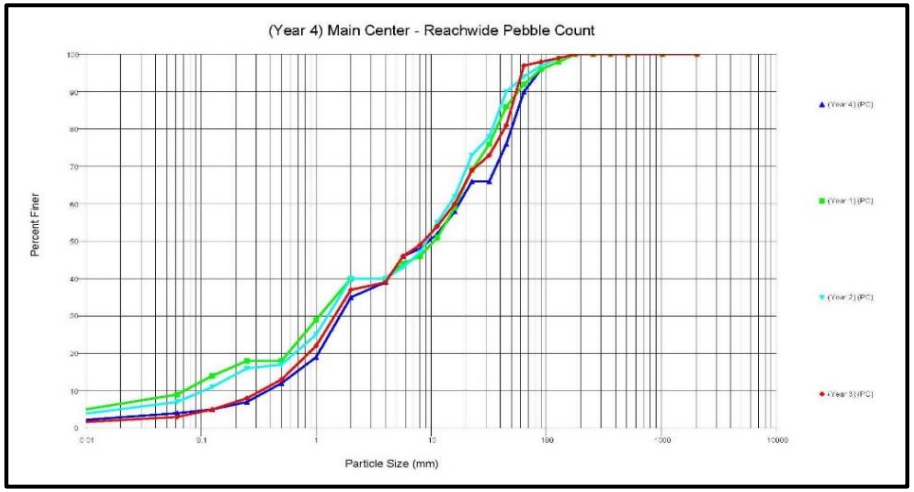
Summary Data	
D50	0.49
D84	1.67
D95	9.24

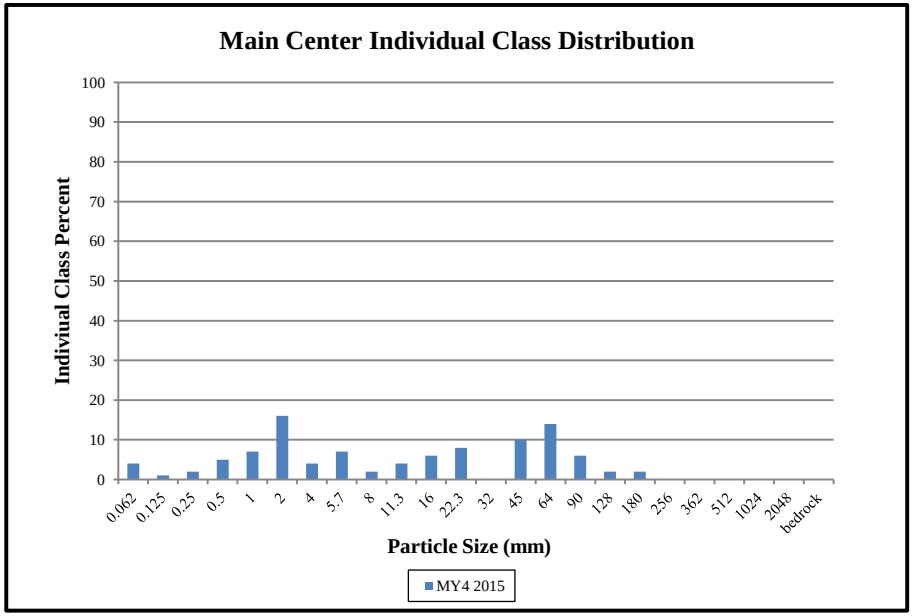




UT to Uwharrie River Stream Restoration Project (#847)					
Reachwide Riffle Pebble Count					
Main Center					
			MY4 2015		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	4	4%	4%
Sand	very fine sand	0.125	1	1%	5%
	fine sand	0.25	2	2%	7%
	medium sand	0.5	5	5%	12%
	coarse sand	1	7	7%	19%
	very coarse sand	2	16	16%	35%
Gravel	very fine gravel	4	4	4%	39%
	fine gravel	5.7	7	7%	46%
	fine gravel	8	2	2%	48%
	medium gravel	11.3	4	4%	52%
	medium gravel	16	6	6%	58%
	coarse gravel	22.3	8	8%	66%
	coarse gravel	32	0	0%	66%
	very coarse gravel	45	10	10%	76%
	very coarse gravel	64	14	14%	90%
Cobble	small cobble	90	6	6%	96%
	medium cobble	128	2	2%	98%
	large cobble	180	2	2%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	bedrock	0	0%	100%
Total % of whole count			100		

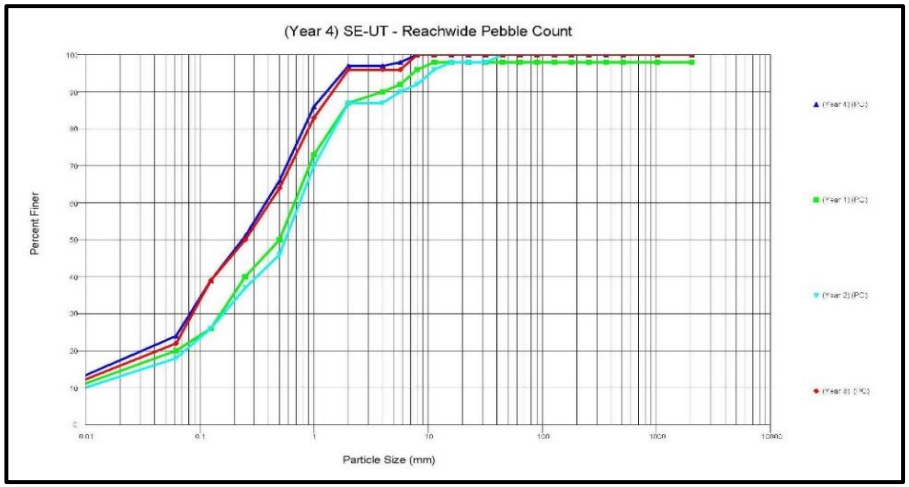
Summary Data	
D50	9.65
D84	55.86
D95	85.67





UT to Uwharrie River Stream Restoration Project (#847)					
Reachwide Riffle Pebble Count					
SE-UT					
			MY4 2015		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	24	24%	24%
Sand	very fine sand	0.125	15	15%	39%
	fine sand	0.25	12	12%	51%
	medium sand	0.5	15	15%	66%
	coarse sand	1	20	20%	86%
	very coarse sand	2	11	11%	97%
Gravel	very fine gravel	4	0	0%	97%
	fine gravel	5.7	1	1%	98%
	fine gravel	8	2	2%	100%
	medium gravel	11.3	0	0%	100%
	medium gravel	16	0	0%	100%
	coarse gravel	22.3	0	0%	100%
	coarse gravel	32	0	0%	100%
	very coarse gravel	45	0	0%	100%
	very coarse gravel	64	0	0%	100%
Cobble	small cobble	90	0	0%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	bedrock	0	0%	100%
Total % of whole count			100		

Summary Data	
D50	0.24
D84	0.95
D95	1.82



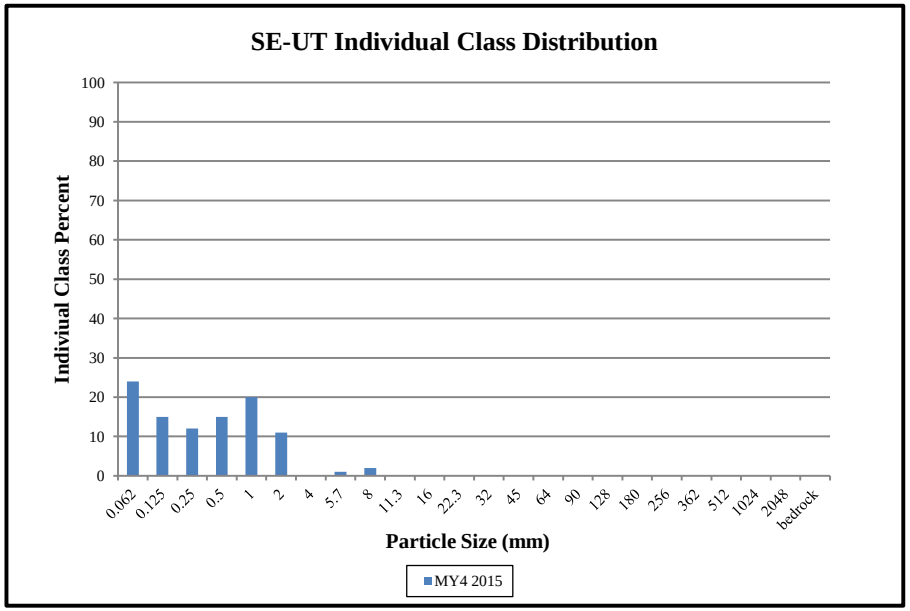


Table 10a. Baseline Stream Data Summary
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: NW-UT (338 feet)

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)		-	-	-	15.83	15.9		15.97	-	-							-	16.25	-						
Floodprone Width (ft)					20.26	40.13		60	-	-							63.71	88.9	119.7						
Bankfull Mean Depth (ft)		-	-	-	1.35	1.37		1.4	-	-							-	1.35	-						
[1]Bankfull Max Depth (ft)					1.29	1.98		2.64	-	-							1.29	1.98	2.64						
Bankfull Cross Sectional Area (ft[2])		-	-	-	21.5	22.1		21.8	-	-							-	22	-						
Width/Depth Ratio					11.34	11.6		11.86	-	-							-	12	-						
Entrenchment Ratio					1.28	2.52		3.76	-	-							3.92	5.47	7.37						
[1]Bank Height Ratio					1.12	1.85		2.46	-	-							1.00	1.00	1.00						
Profile																									
Riffle Length (ft)					9.77	29.36		56.76	-	-							9.77	29.36	56.76						
Riffle Slope (ft/ft)					0.012	0.025		0.054	-	-							0.012	0.025	0.054						
Pool Length (ft)					19.23	20.25		21.06	-	-							19.23	20.25	21.06						
Pool Max depth (ft)					3.08	3.37		3.86	-	-							3.08	3.37	3.86						
Pool Spacing (ft)					87.59	147.86		208.13	-	-							87.59	147.86	208.13						
Pattern																									
Channel Beltwidth (ft)					NA	NA		NA	-	-							NA	NA	NA						
Radius of Curvature (ft)					NA	NA		NA	-	-							NA	NA	NA						
Rc:Bankfull width (ft/ft)					NA	NA		NA	-	-							NA	NA	NA						
Meander Wavelength (ft)					NA	NA		NA	-	-							NA	NA	NA						
Meander Width Ratio					NA	NA		NA	-	-							NA	NA	NA						
Transport parameters																									
Reach Shear Stress (competency) lb/f[2]					1.163												1.182								
Max part size (mm) mobilized at bankfull					91												93								
Stream Power (transport capacity) W/m[2]					-												-								
Additional Reach Parameters																									
Rosgen Classification					E3/1												E3/1								
Bankfull Velocity (fps)		-	-	-	4.14												4.05								
Bankfull Discharge (cfs)		-	-	-	89																				
Valley length (ft)					323																				
Channel Thalweg length (ft)					355												355								
Sinuosity (ft)					1.1												1.1								
Water Surface Slope (Channel) (ft/ft)					0.01423												0.01477								
BF slope (ft/ft)					0.02043												0.01440								
[3]Bankfull Floodplain Area (acres)					-												-								
[4]% of Reach with Eroding Banks					-																				
Channel Stability or Habitat Metric					-																				
Biological or Other					-																				

Reference reach data not used for design

No baseline data collected.

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. Baseline Stream Data Summary
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: SW-UT (262 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)		-	-	-	11.48	11.5		11.52	-	-							-	11.96	-						
Floodprone Width (ft)					13.65	31.64		49.62	-	-							40.03	49.8	67.96						
Bankfull Mean Depth (ft)		-	-	-	1.04	1.14		1.24	-	-							-	1.09	-						
[1]Bankfull Max Depth (ft)					1.22	1.43		2.17	-	-							1.22	1.43	1.77						
Bankfull Cross Sectional Area (ft^2)		-	-	-	11.94	13.1		14.25	-	-							-	13	-						
Width/Depth Ratio					9.25	10.18		11.11	-	-							-	11	-						
Entrenchment Ratio					1.18	2.75		4.32	-	-							3.35	4.16	5.68						
[1]Bank Height Ratio					1.75	2.22		2.75	-	-							1.00	1.00	1.00						
Profile																									
Riffle Length (ft)					2.18	25.77		61.25	-	-							2.18	25.77	61.25						
Riffle Slope (ft/ft)					0.025	0.030		0.034	-	-							0.025	0.030	0.034						
Pool Length (ft)					8.5	11.92		14.39	-	-							8.5	11.92	14.39						
Pool Max depth (ft)					2.23	2.49		2.86	-	-							2.23	2.49	2.86						
Pool Spacing (ft)					40.98	52.43		63.87	-	-							40.98	52.43	63.87						
Pattern																									
Channel Beltwidth (ft)					NA	NA		NA	-	-							NA	NA	NA						
Radius of Curvature (ft)					NA	NA		NA	-	-							NA	NA	NA						
Rc:Bankfull width (ft/ft)					NA	NA		NA	-	-							NA	NA	NA						
Meander Wavelength (ft)					NA	NA		NA	-	-							NA	NA	NA						
Meander Width Ratio					NA	NA		NA	-	-							NA	NA	NA						
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					1.607												1.486								
Max part size (mm) mobilized at bankfull					128												118								
Stream Power (transport capacity) W/m^2					-												-								
Additional Reach Parameters																									
Rosgen Classification					E4b												E4b								
Bankfull Velocity (fps)		-	-	-	4.07												4.46								
Bankfull Discharge (cfs)		-	-	-	58																				
Valley length (ft)					261																				
Channel Thalweg length (ft)					271												271								
Sinuosity (ft)					1.04												1.04								
Water Surface Slope (Channel) (ft/ft)					0.02275												0.02275								
BF slope (ft/ft)					0.02597												0.02469								
[3]Bankfull Floodplain Area (acres)					-												-								
[4]% of Reach with Eroding Banks					-																				
Channel Stability or Habitat Metric					-																				
Biological or Other					-																				

Reference reach data not used for design

No baseline data collected.

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. Baseline Stream Data Summary
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: Main West (1427 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)		-	-	-	13.83	16.72		18.7	-	-	11.9	15.48		17.7	-	-	-	18.03	-	No baseline data collected.					
Floodprone Width (ft)					46.36	70.06		104.89	-	-	162	171.25		186	-	-	55	277.5	500						
Bankfull Mean Depth (ft)		-	-	-	1.35	1.46		1.58	-	-	1.23	1.29		1.41	-	-	-	1.39	-						
[1]Bankfull Max Depth (ft)					1.27	2.13		2.99	-	-	1.6	1.94		2.12	-	-	1.72	2.08	2.28						
Bankfull Cross Sectional Area (ft^2)		-	-	-	23.01	24.66		25.52	-	-	20	21.33		22.7	-	-	-	25	-						
Width/Depth Ratio					10.22	12.06		13.89	-	-	11.42	12.97		14.33	-	-	-	13	-						
Entrenchment Ratio					2.87	4.36		7.58	-	-	10.06	11.3		14.45	-	-	2.2	15.39	20						
[1]Bank Height Ratio					1.48	1.74		1.92	-	-	1.00	1.06		1.15	-	-	1.00	1.00	1.00						
Profile																									
Riffle Length (ft)					9.21	32.04		73.15	-	-	4.87	9.64		15.7	-	-	4.87	9.64	15.7						
Riffle Slope (ft/ft)					0.007	0.025		0.081	-	-	0.016	0.023		0.027	-	-									
Pool Length (ft)					11.92	26.43		45.48	-	-	14.89	18.82		22.74	-	-	14.89	18.82	22.74						
Pool Max depth (ft)					1.87	2.94		3.39	-	-	2.85	2.87		2.89	-	-	2.85	2.87	2.89						
Pool Spacing (ft)					41.13	110.83		251.18	-	-	35.73	51.98		68.22	-	-	41.62	60.55	79.47						
Pattern																				No baseline data collected.					
Channel Beltwidth (ft)					8.76	27.68		60.42	-	-	12.54	31.92		54.25	-	-	14.61	37.19	63.2						
Radius of Curvature (ft)					10.12	18.07		24.31	-	-	11.73	18.44		25.3	-	-	13.66	21.48	29.47						
Rc:Bankfull width (ft/ft)					0.61	1.08		1.45	-	-	0.76	1.19		1.63	-	-	0.76	1.19	1.63						
Meander Wavelength (ft)					68.83	99.94		145.61	-	-	64.32	80		114	-	-	74.93	93.55	132.81						
Meander Width Ratio					0.52	1.66		3.61	-	-	0.81	2.06		3.51	-	-	0.81	2.06	3.51						
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					1.136												0.682								
Max part size (mm) mobilized at bankfull					89												52								
Stream Power (transport capacity) W/m^2					-												-								
Additional Reach Parameters																									
Rosgen Classification					E4						CE4/1						CE4/1								
Bankfull Velocity (fps)		-	-	-	4.19												4.28								
Bankfull Discharge (cfs)		-	-	-	107																				
Valley length (ft)					1165						219														
Channel Thalweg length (ft)					1235						309						1422			No baseline data collected.					
Sinuosity (ft)					1.06						1.41						1.27								
Water Surface Slope (Channel) (ft/ft)					0.01264						0.00872						0.01055								
BF slope (ft/ft)					0.01159						0.00781						(0.00773 - 0.00839)								
[3]Bankfull Floodplain Area (acres)					-						-						-								
[4]% of Reach with Eroding Banks					-						Less than 1%														
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. Baseline Stream Data Summary
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: Main Center (1513 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)		-	-	-	11.84	12.2		12.55	-	-	11.9	15.48		17.7	-	-	-	19.08	-	No baseline data collected.					
Floodprone Width (ft)					54.98	65.59		76.2	-	-	162	171.25		186	-	-	191.97	215.64	275.76						
Bankfull Mean Depth (ft)		-	-	-	2.19	2.22		2.25	-	-	1.23	1.29		1.41	-	-	-	1.47	-						
[1]Bankfull Max Depth (ft)					2.15	2.69		3.23	-	-	1.6	1.94		2.12	-	-	1.82	2.2	2.41						
Bankfull Cross Sectional Area (ft^2)		-	-	-	26.66	27.08		27.5	-	-	20	21.33		22.7	-	-	-	28	-						
Width/Depth Ratio					5.26	5.49		5.73	-	-	11.42	12.97		14.33	-	-	-	13	-						
Entrenchment Ratio					4.38	5.41		6.44	-	-	10.06	11.3		14.45	-	-	10.06	11.3	14.45						
[1]Bank Height Ratio					1.69	1.96		2.1	-	-	1.00	1.06		1.15	-	-	1.00	1.00	1.00						
Profile																									
Riffle Length (ft)					7.26	19.27		33.85	-	-	4.87	9.64		15.7	-	-	0.31	0.62	1.01						
Riffle Slope (ft/ft)					0.002	0.013		0.026	-	-	0.016	0.023		0.027	-	-	0.010	0.014	0.016						
Pool Length (ft)					11.98	26.85		55.23	-	-	14.89	18.82		22.74	-	-	18.36	23.2	28.04						
Pool Max depth (ft)					2.96	3.8		4.76	-	-	2.85	2.87		2.89	-	-	3.24	3.26	3.28						
Pool Spacing (ft)					45.62	98.98		249.88	-	-	35.73	51.98		68.22	-	-	44.05	64.08	84.11						
Pattern																									
Channel Beltwidth (ft)					4.48	25.55		60.75	-	-	12.54	31.92		54.25	-	-	15.46	39.35	66.88						
Radius of Curvature (ft)					14.59	21.7		26.88	-	-	11.73	18.44		25.3	-	-	14.46	22.73	31.19						
Rc:Bankfull width (ft/ft)					1.2	1.78		2.2	-	-	0.76	1.19		1.63	-	-	0.76	1.19	1.63						
Meander Wavelength (ft)					37.73	87.68		146.25	-	-	64.32	80		114	-	-	79.3	99	140.55						
Meander Width Ratio					0.37	2.1		4.98	-	-	0.81	2.06		3.51	-	-	0.81	2.06	3.51						
Transport parameters																									
Reach Shear Stress (competency) lb/f^2						0.749												0.499							
Max part size (mm) mobilized at bankfull						58												38							
Stream Power (transport capacity) W/m^2						-												-							
Additional Reach Parameters																									
Rosgen Classification						E4						CE 4/1						CE 4/1							
Bankfull Velocity (fps)		-	-	-		4.22												4.14							
Bankfull Discharge (cfs)		-	-	-		116																			
Valley length (ft)						1220						219													
Channel Thalweg length (ft)						1330						309						1568							
Sinuosity (ft)						1.09						1.41						1.33							
Water Surface Slope (Channel) (ft/ft)						0.00651						0.00872						0.00534							
BF slope (ft/ft)						0.00655						0.00781						0.00562							
[3]Bankfull Floodplain Area (acres)						-						-						-							
[4]% of Reach with Eroding Banks						-						Less than 1%													
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. Baseline Stream Data Summary
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: Main East (1192 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)		-	-	-	13.46	14.9		16.34	-	-	11.9	15.48		17.7	-	-	-	21.02	-						
Floodprone Width (ft)					109.14	113.16		117.17	-	-	162	171.25		186	-	-	46.2	180.6	315						
Bankfull Mean Depth (ft)		-	-	-	2.04	2.27		2.49	-	-	1.23	1.29		1.41	-	-	-	1.62	-						
[1]Bankfull Max Depth (ft)					2.58	3.19		4.38	-	-	1.6	1.94		2.12	-	-	2	2.43	2.65	No baseline data collected.					
Bankfull Cross Sectional Area (ft^2)		-	-	-	33.41	33.45		33.48	-	-	20	21.33		22.7	-	-	-	34	-						
Width/Depth Ratio					5.41	6.7		7.99	-	-	11.42	12.97		14.33	-	-	-	13	-						
Entrenchment Ratio					7.17	7.64		8.11	-	-	10.06	11.3		14.45	-	-	2.2	8.59	15						
[1]Bank Height Ratio					1.14	1.62		1.93	-	-	1.00	1.06		1.15	-	-	1.00	1.00	1.00						
Profile																									
Riffle Length (ft)					12.63	25.58		66.32	-	-	4.87	9.64		15.7	-	-	6.62	13.1	21.33						
Riffle Slope (ft/ft)					0.003	0.016		0.031	-	-	0.016	0.023		0.027	-	-	0.013	0.019	0.022						
Pool Length (ft)					20	36.17		52.63	-	-	14.89	18.82		22.74	-	-	20.23	25.57	30.89						
Pool Max depth (ft)					3.54	4.46		5.12	-	-	2.85	2.87		2.89	-	-	3.57	3.59	3.62						
Pool Spacing (ft)					41.05	118.95		207.37	-	-	35.73	51.98		68.22	-	-	48.54	70.62	92.68						
Pattern																				No baseline data collected.					
Channel Beltwidth (ft)					12.23	25.4		45.16	-	-	12.54	31.92		54.25	-	-	17.04	43.37	73.7						
Radius of Curvature (ft)					23.16	39.42		54.37	-	-	11.73	18.44		25.3	-	-	15.94	25.05	34.37						
Rc:Bankfull width (ft/ft)					1.55	2.65		3.65	-	-	0.76	1.19		1.63	-	-	0.76	1.19	1.63						
Meander Wavelength (ft)					88.19	127.68		178.67	-	-	64.32	80		114	-	-	87.38	109.09	154.88						
Meander Width Ratio					0.82	1.7		3.03	-	-	0.81	2.06		3.51	-	-	0.81	2.06	3.51						
Transport parameters																									
Reach Shear Stress (competency) lb/f^2						1.024												0.522							
Max part size (mm) mobilized at bankfull						80												40							
Stream Power (transport capacity) W/m^2						-												-							
Additional Reach Parameters																									
Rosgen Classification						E4						CE 4/1						CE 4/1							
Bankfull Velocity (fps)		-	-	-		4.27												4.2							
Bankfull Discharge (cfs)		-	-	-		143																			
Valley length (ft)						1067						219								No baseline data collected.					
Channel Thalweg length (ft)						1163						309						1195							
Sinuosity (ft)						1.09						1.41						1.25							
Water Surface Slope (Channel) (ft/ft)						0.00826						0.00872						0.0072							
BF slope (ft/ft)						0.00764						0.00781						0.00535							
[3]Bankfull Floodplain Area (acres)						-						-						-							
[4]% of Reach with Eroding Banks						-						Less than 1%													
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. Baseline Stream Data Summary
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: SW-Trib (1509 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)		-	-	-	3.92	4.5		5.07	-	-	8.7	10.75		12.6	-	-	-	8	-	No baseline data collected.					
Floodprone Width (ft)					8.51	15.89		23.26	-	-	21.6	26.97		38.36	-	-	14.02	20.81	30.69						
Bankfull Mean Depth (ft)		-	-	-	0.48	0.74		1.01	-	-	0.49	0.73		0.9	-	-	-	0.5	-						
[1]Bankfull Max Depth (ft)					0.9	1.07		1.24	-	-	0.97	1.19		1.3	-	-	0.66	0.81	0.89						
Bankfull Cross Sectional Area (ft^2)		-	-	-	2.43	3.19		3.94	-	-	5.7	7.9		9.8	-	-	-	4	-						
Width/Depth Ratio					3.9	7.24		10.58	-	-	10.66	15.26		24.02	-	-	-	16	-						
Entrenchment Ratio					2.17	3.38		4.59	-	-	1.75	2.6		3.84	-	-	1.75	2.6	3.84						
[1]Bank Height Ratio					1.13	1.82		2.31	-	-	1.03	1.12		1.24	-	-	1.00	1.00	1.00						
Profile																									
Riffle Length (ft)					5.91	13.72		23..67	-	-	4.9	16.93		34.09	-	-	3.65	12.6	25.37						
Riffle Slope (ft/ft)					0.008	0.053		0.152	-	-	0.014	0.038		0.055	-	-	0.009	0.026	0.009						
Pool Length (ft)					6.99	12		19.64	-	-	4.13	6.4		9.01	-	-	3.07	4.76	6.71	No baseline data collected.					
Pool Max depth (ft)					1.29	1.62		1.95	-	-	1.52	1.66		1.78	-	-	1.03	1.13	1.21						
Pool Spacing (ft)					11.13	52.59		176.28	-	-	27.6	34.59		49.44	-	-	20.54	25.74	36.79						
Pattern																									
Channel Beltwidth (ft)					4.44	15.85		37.56	-	-	12	15		18	-	-	8.93	11.16	13.4						
Radius of Curvature (ft)					8.69	17.81		25.68	-	-	8.1	13.4		22.3	-	-	6.03	9.97	16.6						
Rc:Bankfull width (ft/ft)					1.93	3.96		5.74	-	-	0.75	1.25		2.07	-	-	0.75	1.25	2.07						
Meander Wavelength (ft)					54.12	55.36		57.65	-	-	47	59		67	-	-	34.98	43.91	49.86						
Meander Width Ratio					0.99	3.53		8.36	-	-	1.12	1.4		1.67	-	-	1.12	1.4	1.67						
Transport parameters																									
Reach Shear Stress (competency) lb/f^2						0.76												0.707							
Max part size (mm) mobilized at bankfull						59												59							
Stream Power (transport capacity) W/m^2						-												-							
Additional Reach Parameters																									
Rosgen Classification						E4b						B 4/1a						B 4/1a							
Bankfull Velocity (fps)		-	-	-		3.61												2.19		No baseline data collected.					
Bankfull Discharge (cfs)		-	-	-		9																			
Valley length (ft)						1333						203.6													
Channel Thalweg length (ft)						1440						224						1564							
Sinuosity (ft)						1.08						1.1						1.22							
Water Surface Slope (Channel) (ft/ft)						0.03009						0.04009						0.02664							
BF slope (ft/ft)						0.0289						0.04159						(0.02180 - 0.04359)							
[3]Bankfull Floodplain Area (acres)						-						-						-							
[4]% of Reach with Eroding Banks						-						None													
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. Baseline Stream Data Summary
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: SE-UT(1106 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)		-	-	-	3.02	3.1		3.17	-	-	8.7	10.75		12.6	-	-	-	6.32	-						
Floodprone Width (ft)					3.61	4.54		5.46	-	-	21.6	26.97		38.36	-	-	8.4	10.8	13.2						
Bankfull Mean Depth (ft)		-	-	-	0.65	0.67		0.68	-	-	0.49	0.73		0.9	-	-	-	0.4	-						
[1]Bankfull Max Depth (ft)					0.81	0.87		0.92	-	-	0.97	1.19		1.3	-	-	0.52	0.64	0.7						
Bankfull Cross Sectional Area (ft^2)		-	-	-	2.05	2.06		2.07	-	-	5.7	7.9		9.8	-	-	-	2.5	-						
Width/Depth Ratio					4.45	4.65		4.85	-	-	10.66	15.26		24.02	-	-	-	16	-						
Entrenchment Ratio					1.14	1.47		1.81	-	-	1.75	2.6		3.84	-	-	1.4	1.71	2.2						
[1]Bank Height Ratio					2.64	3.17		3.7	-	-	1.03	1.12		1.24	-	-	1.00	1.00	1.00						
Profile																									
Riffle Length (ft)					0.5	10.27		45.5	-	-	4.9	16.93		34.09	-	-	2.88	9.96	20.06						
Riffle Slope (ft/ft)					0.000	0.087		0.459	-	-	0.014	0.038		0.055	-	-	0.009	0.024	0.004						
Pool Length (ft)					2.32	7.8		18.47	-	-	4.13	6.4		9.01	-	-	2.43	3.77	5.3						
Pool Max depth (ft)					1.15	1.32		1.49	-	-	1.52	1.66		1.78	-	-	0.82	0.89	0.96						
Pool Spacing (ft)					13.69	46.05		88.11	-	-	27.6	34.59		49.44	-	-	16.24	20.35	29.09						
Pattern																									
Channel Beltwidth (ft)					17.13	25.49		36.11	-	-	12	15		18	-	-	7.06	8.82	10.59						
Radius of Curvature (ft)					9.88	18.11		32.13	-	-	8.1	13.4		22.3	-	-	4.77	7.88	13.12						
Rc:Bankfull width (ft/ft)					3.19	5.85		10.38	-	-	0.75	1.25		2.07	-	-	0.75	1.25	2.07						
Meander Wavelength (ft)					63.75	90.5		138.87	-	-	47	59		67	-	-	27.65	34.71	39.42						
Meander Width Ratio					5.53	8.24		11.67	-	-	1.12	1.4		1.67	-	-	1.12	1.4	1.67						
Transport parameters																									
Reach Shear Stress (competency) lb/f^2						0.879												0.499							
Max part size (mm) mobilized at bankfull						68												38							
Stream Power (transport capacity) W/m^2						-												-							
Additional Reach Parameters																									
Rosgen Classification						G5						B 4/1a						B 4/1a							
Bankfull Velocity (fps)		-	-	-		3.68												3.04							
Bankfull Discharge (cfs)		-	-	-		8																			
Valley length (ft)						895						203.6													
Channel Thalweg length (ft)						1020						224						1106							
Sinuosity (ft)						1.14						1.1						1.24							
Water Surface Slope (Channel) (ft/ft)						0.02691						0.04009						0.02474							
BF slope (ft/ft)						0.02948						0.04159						(0.01980 - 0.02739)							
[3]Bankfull Floodplain Area (acres)						-						-						-							
[4]% of Reach with Eroding Banks						-						None													
Channel Stability or Habitat Metric						-						-													
Biological or Other						-						-													

No baseline data collected.

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. Baseline Stream Data Summary
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: N-UT (288 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)		-	-	-	7.36	7.56		7.76	-	-	11.9	15.48		17.7	-	-	-	13	-	No baseline data collected.					
Floodprone Width (ft)					66.47	70.9		75.5	-	-	162	171.25		186	-	-	130.81	146.93	187.9						
Bankfull Mean Depth (ft)		-	-	-	1.65	1.71		1.76	-	-	1.23	1.29		1.41	-	-	-	1	-						
[1]Bankfull Max Depth (ft)					2.04	2.27		2.55	-	-	1.6	1.94		2.12	-	-	1.24	1.5	1.64						
Bankfull Cross Sectional Area (ft^2)		-	-	-	12.82	12.9		12.97	-	-	20	21.33		22.7	-	-	-	13	-						
Width/Depth Ratio					4.18	4.44		4.7	-	-	11.42	12.97		14.33	-	-	-	13	-						
Entrenchment Ratio					9.03	9.38		9.73	-	-	10.06	11.3		14.45	-	-	10.06	11.3	14.45						
[1]Bank Height Ratio					1.1	1.21		1.35	-	-	1.00	1.06		1.15	-	-	1.00	1.00	1.00						
Profile																									
Riffle Length (ft)					2.55	14.03		34.73	-	-	4.87	9.64		15.7	-	-	4.09	8.1	13.19						
Riffle Slope (ft/ft)					0.000	0.027		0.070	-	-	0.016	0.023		0.027	-	-	0.018	0.027	0.031						
Pool Length (ft)					15.89	19.52		23.15	-	-	14.89	18.82		22.74	-	-	12.51	15.81	19.1						
Pool Max depth (ft)					2.87	3.08		3.23	-	-	2.85	2.87		2.89	-	-	2.21	2.22	2.24						
Pool Spacing (ft)					40.02	80.83		121.64	-	-	35.73	51.98		68.22	-	-	30.02	43.67	57.31						
Pattern																				No baseline data collected.					
Channel Beltwidth (ft)					NA	NA		NA	-	-	12.54	31.92		54.25	-	-	10.53	26.81	45.57						
Radius of Curvature (ft)					NA	NA		NA	-	-	11.73	18.44		25.3	-	-	9.85	15.49	21.25						
Rc:Bankfull width (ft/ft)					NA	NA		NA	-	-	0.76	1.19		1.63	-	-	0.76	1.19	1.63						
Meander Wavelength (ft)					NA	NA		NA	-	-	64.32	80		114	-	-	54.03	67.46	95.77						
Meander Width Ratio					NA	NA		NA	-	-	0.81	2.06		3.51	-	-	0.81	2.06	3.51						
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					0.781												0.546								
Max part size (mm) mobilized at bankfull					60												42								
Stream Power (transport capacity) W/m^2					-												-								
Additional Reach Parameters																									
Rosgen Classification					E4						CE 4/1						CE 4/1								
Bankfull Velocity (fps)		-	-	-	4.02												4.14			No baseline data collected.					
Bankfull Discharge (cfs)		-	-	-	52																				
Valley length (ft)					184						219														
Channel Thalweg length (ft)					206						309						300								
Sinuosity (ft)					1.12						1.41						1.21								
Water Surface Slope (Channel) (ft/ft)					0.01096						0.00872						0.01015								
BF slope (ft/ft)					0.0135						0.00781						0.00937								
[3]Bankfull Floodplain Area (acres)					-						-						-								
[4]% of Reach with Eroding Banks					-						Less than 1%														
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. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: NW-UT (338 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data	Design							As-built/Baseline
[1]Ri% / Ru% / P% / G% / S%	35	29	18	18	0			Reference reach data not used for design	35	29	18	18	0			No baseline data collected.
[1]SC% / Sa% / G% / C% / B% / Be%	0	9.8	39.22	47.02	0.98	2.94										
[1]d16 / d35 / d50 / d84 / d95 / di^P / di^{sp} (mm)	10.17	47.02	65.37	120.2	228.1	110	156									
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	114	213	0	0	0											
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0	0	0	25	75												

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: SW-UT (262 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data	Design							As-built/Baseline
[1]Ri% / Ru% / P% / G% / S%	38	25	18.5	18.5	0			Reference reach data not used for design	38	25	18.5	18.5	0			No baseline data collected.
[1]SC% / Sa% / G% / C% / B% / Be%	0	26.26	34.35	33.33	0	6.06										
[1]d16 / d35 / d50 / d84 / d95 / di^P / di^{sp} (mm)	1.37	8.72	21.77	120.2	bedr	103	83									
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	22.2	0	32.8	45	0											
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0	0	0	20	80												

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: Main West (1427 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline
[1]Ri% / Ru% / P% / G% / S%	38	25	18.5	18.5	0			26.3	31.6	26.3	15.8	0			25	25	25	25	0			No baseline data collected.
[1]SC% / Sa% / G% / C% / B% / Be%	0	15.15	24.24	50.51	9.09	1.01		4.23	23	60.09	8.45	0	4.23									
[1]d16 / d35 / d50 / d84 / d95 / di^P / di^{sp} (mm)	3.68	44.25	86.74	174.0	476	70.0	142.0	0.36	7.52	17.15	55.6	123.8	76	96								
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	0	0	75	25	0			0	0	0	0	100										
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0	0	25	75	0				100	0	0	0											

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: Main Center (1513 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline
[1]Ri% / Ru% / P% / G% / S%	28.3	30	20	21.7	0			26.3	31.6	26.3	15.8	0			25	25	25	25	0			No baseline data collected.
[1]SC% / Sa% / G% / C% / B% / Be%	0	28.71	56.44	11.88	0.99	1.98		4.23	23	60.09	8.45	0	4.23									
[1]d16 / d35 / d50 / d84 / d95 / di^P / di^{sp} (mm)	1.08	8.97	18.89	61.2	169	50.0	45.0	0.36	7.52	17.15	55.6	123.8	76	96								
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	0	0	20	80	0			0	0	0	0	100										
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0	0	0	25	75				100	0	0	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-constrution distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: Main East (1192 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline
[1]Ri% / Ru% / P% / G% / S%	31	31	18	20	0			26.3	31.6	26.3	15.8	0			25	25	25	25	0			No baseline data collected.
[1]SC% / Sa% / G% / C% / B% / Be%	6	31	40	16	1	6		4.23	23	60.09	8.45	0	4.23									
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)	0.36	1.75	27.3	82.2	Bed	73.0	130.0	0.36	7.52	17.15	55.6	123.8	76	96								
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	0	25	0	75	0			0	0	0	0	100										
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0	20	20	60	0				100	0	0	0											

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: SW-Trib (1509 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline
[1]Ri% / Ru% / P% / G% / S%	45.5	32.7	3	18.8	0			28.6	25	21.4	25	0			25	25	25	25	0			No baseline data collected.
[1]SC% / Sa% / G% / C% / B% / Be%	7.92	40.59	49.51	1.98	0	0		0	30	38	22	5	5									
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)	0.2	0.63	2.6	16.92	31.92	11	19	0.42	3.67	10.36	123.8	bed										
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	0.0	33.3	33.3	0.3	0.0			0	50	50	0	0										
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0	20	20	20	40				75	25	0	0											

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: SE-UT(1106 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline
[1]Ri% / Ru% / P% / G% / S%	37.5	25	16.7	20.8	0			28.6	25	21.4	25	0			25	25	25	25	0			No baseline data collected.
[1]SC% / Sa% / G% / C% / B% / Be%	20	46	29	3	0	2		0	30	38	22	5	5									
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)	0.05	0.18	0.59	14.12	64	52	19	0.42	3.67	10.36	123.8	bed										
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	66.6	33.3	0	0	0			0	50	50	0	0										
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0	0	0	0	100				75	25	0	0											

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: N-UT (288 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline
[1]Ri% / Ru% / P% / G% / S%	33.3	25	16.7	25	0			26.3	31.6	26.3	15.8	0			25	25	25	25	0			No baseline data collected.
[1]SC% / Sa% / G% / C% / B% / Be%	7	35	56	2	0	0		4.23	23	60.09	8.45	0	4.23									
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)	0.33	0.97	10.75	31.3	44	34.0	32.0	0.36	7.52	17.15	55.6	123.8	76	96								
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	0	0	0	100	0			0	0	0	0	100										
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0	60	40	0	0				100	0	0	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-constrution distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of 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)
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: SW-Trib (724 feet)

	Cross Section 1 (Riffle)							Cross Section 2 (Pool)							Cross Section 3 (Riffle)																									
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+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used		688.7	688.7	688.7	668.6				683.4	683.5	683.3	683.2				678.7	678.7	678.7	678.8																						
Bankfull Width (ft)		6.68	6.91	6.79	6.67				6.49	7.22	6.31	6.4				4.05	2.73	3.56	3.99																						
Floodprone Width (ft)		13.0	14.0	14.62	16.41				14.6	15.0	12.82	12.49				11.23	9.19	10.85	12.94																						
Bankfull Mean Depth (ft)		0.53	0.48	0.61	0.72				0.57	0.48	0.53	0.45				0.39	0.49	0.5	0.54																						
Bankfull Max Depth (ft)		1.02	1.13	1.29	1.56				1.21	1.15	1	1.06				1.25	0.97	1.13	1.64																						
Bankfull Cross Sectional Area (ft^2)		3.56	3.32	4.15	4.79				3.73	3.45	3.33	2.88				1.59	1.33	1.77	2.15																						
Bankfull Width/Depth Ratio		12.6	14.4	11.13	9.26				11.39	15.04	11.91	14.22				10.38	5.57	7.12	7.39																						
Bankfull Entrenchment Ratio		1.95	2.02	2.15	2.46				2.25	2.08	2.03	1.95				2.77	3.37	3.05	3.24																						
Bankfull Bank Height Ratio		1.00	1.00	1.00	1.00				N/A	N/A	N/A	N/A				1.00	1.00	1.00	1.00																						
Based on current/developing bankfull feature[2]																																								
Record elevation (datum) used																																								
Bankfull Width (ft)																																								
Floodprone Width (ft)																																								
Bankfull Mean Depth (ft)																																								
Bankfull Max Depth (ft)																																								
Bankfull Cross Sectional Area (ft^2)																																								
Bankfull Width/Depth Ratio																																								
Bankfull Entrenchment Ratio																																								
Bankfull Bank Height Ratio																																								
Cross Sectional Area between end pins (ft^2)																																								
d50 (mm)																																								

These cells may or may not require population in any given year. See footnote 2 below

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: Main West (235 feet)

	Cross Section 4 (Pool)							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+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used		678.5	678.4	678.4	678.3				677.1	677.2	677.2	677.1																												
Bankfull Width (ft)		17.58	16.26	15.33	16.16				23.84	24.05	24.3	24.56																												
Floodprone Width (ft)		100+	100+	100	100				115	115	115	115																												
Bankfull Mean Depth (ft)		1.49	1.68	1.65	1.59				1.6	1.65	1.57	1.45																												
Bankfull Max Depth (ft)		3.43	3.52	3.35	3.37				3.21	3.27	3.3	3.3																												
Bankfull Cross Sectional Area (ft^2)		26.27	27.3	25.24	25.77				38.18	39.77	38.07	35.48																												
Bankfull Width/Depth Ratio		11.8	9.68	9.29	10.16				14.9	14.58	15.48	16.94																												
Bankfull Entrenchment Ratio		5.69	6.15	6.52	6.19				4.82	4.78	4.73	4.68																												
Bankfull Bank Height Ratio		N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A																												
Based on current/developing bankfull feature[2]																																								
Record elevation (datum) used																																								
Bankfull Width (ft)																																								
Floodprone Width (ft)																																								
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Bankfull Width/Depth Ratio																																								
Bankfull Entrenchment Ratio																																								
Bankfull Bank Height Ratio																																								
Cross Sectional Area between end pins (ft^2)																																								
d50 (mm)																																								

These cells may or may not require population in any given year. See footnote 2 below

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."

2 = Based on the elevation of any dominant depositional feature that develops and is observed at the time of survey. If the baseline datum remains the only significant depositional feature then these two sets of dimensional parameters will be equal, however, if another depositional feature of significance develops above or below the baseline bankfull datum then this should be tracked and quantified in these cells.

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: Main Center and Main East (1588 feet)

	Cross Section 6 (Riffle)							Cross Section 7 (Pool)							Cross Section 8 (Riffle)							Cross Section 9 (Pool)							Cross Section 10 (Riffle)						
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		675.7	675.7	675.7	675.5				675.0	675.0	674.9	675.0				673.8	673.7	673.7	675.0				673.0	673.0	673.0	672.9				671.1	671.1	671.0	671.0		
Bankfull Width (ft)		17.9	17.57	17.98	17.65				20.2	20.43	21.84	22.81				21.42	21.48	21.5	22.81				19.2	19.73	21.31	21.27				17.86	19.78	17.53	19.26		
Floodprone Width (ft)		110	110	110	110				100+	100+	100	100				100+	100+	100	100				100+	100+	100	100				100+	100+	100	100		
Bankfull Mean Depth (ft)		1.76	1.68	1.67	1.59				2	1.9	1.7	1.64				1.71	1.66	1.59	1.64				1.99	1.88	1.73	1.79				1.59	1.52	1.54	1.53		
Bankfull Max Depth (ft)		2.88	2.87	2.9	2.95				4.23	4.2	4.08	4.25				3.66	3.71	3.81	4.25				4.03	4.12	4.03	3.85				3.05	3.21	3.23	3.31		
Bankfull Cross Sectional Area (ft^2)		31.51	29.51	30.08	28.04				40.29	39.72	37.19	37.45				36.71	35.63	34.14	37.45				38.25	37.13	36.76	38.16				28.39	30.13	27.02	29.47		
Bankfull Width/Depth Ratio		10.17	10.46	10.77	11.1				10.1	10.53	12.85	13.91				12.53	12.94	13.52	13.91				9.67	10.49	12.32	11.88				11.23	13.01	11.38	12.59		
Bankfull Entrenchment Ratio		6.15	6.26	6.12	6.23				4.95	4.9	4.58	4.38				4.67	4.66	4.65	4.38				5.2	5.07	4.69	4.7				5.6	5.06	5.7	5.19		
Bankfull Bank Height Ratio		1.00	1.00	1.00	1.00				N/A	N/A	N/A	N/A				1.00	1.00	1.00	N/A				N/A	N/A	N/A	N/A				1.00	1.00	1.00	1.00		
Based on current/developing bankfull feature[2]																																			
Record elevation (datum) used																																			
Bankfull Width (ft)																																			
Floodprone Width (ft)																																			
Bankfull Mean Depth (ft)																																			
Bankfull Max Depth (ft)																																			
Bankfull Cross Sectional Area (ft^2)																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			

These cells may or may not require population in any given year. See footnote 2 below

	Cross Section 11 (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		669.9	669.9	669.8	669.7																														
Bankfull Width (ft)		18.66	19.95	21	18.87																														
Floodprone Width (ft)		100+	100+	100	100																														
Bankfull Mean Depth (ft)		1.54	1.47	1.28	1.52																														
Bankfull Max Depth (ft)		3.64	3.87	3.81	4.02																														
Bankfull Cross Sectional Area (ft^2)		28.75	29.23	26.98	28.68																														
Bankfull Width/Depth Ratio		12.12	13.57	16.41	12.41																														
Bankfull Entrenchment Ratio		5.36	5.01	4.76	5.3																														
Bankfull Bank Height Ratio		N/A	N/A	N/A	N/A																														
Based on current/developing bankfull feature[2]																																			
Record elevation (datum) used																																			
Bankfull Width (ft)																																			
Floodprone Width (ft)																																			
Bankfull Mean Depth (ft)																																			
Bankfull Max Depth (ft)																																			
Bankfull Cross Sectional Area (ft^2)																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			

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."

2 = Based on the elevation of any dominant depositional feature that develops and is observed at the time of survey. If the baseline datum remains the only significant depositional feature then these two sets of dimensional parameters will be equal, however, if another depositional feature of significance develops above or below the baseline bankfull datum then this should be tracked and quantified in these cells.

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

UT to Uwharrie River Stream Enhancement Project (#847) - Segment/Reach: SE-UT (517 feet)

	Cross Section 12 (Riffle)							Cross Section 13 (Pool)							Cross Section 14 (Riffle)																									
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+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used		681.7	681.7	681.5	681.5				675.6	675.5	675.5	675.5				672.6	672.6	672.2	672.2																					
Bankfull Width (ft)		7.08	7.26	7.6	7.6				8.45	10.22	6.67	6.67				7.26	7.48	5.72	5.72																					
Floodprone Width (ft)		16.11	30.83	17.25	17.25				23.18	18.67	21.4	21.4				24.64	44.35	33.22	33.22																					
Bankfull Mean Depth (ft)		0.5	0.58	0.58	0.58				0.69	0.47	0.7	0.7				0.51	0.58	0.66	0.66																					
Bankfull Max Depth (ft)		1.11	1.3	1.2	1.2				1.64	1.2	1.62	1.62				1.25	1.35	1.36	1.36																					
Bankfull Cross Sectional Area (ft^2)		3.51	4.21	4.39	4.39				5.82	4.81	4.68	4.68				3.71	4.33	3.76	3.76																					
Bankfull Width/Depth Ratio		14.16	12.52	13.1	13.1				12.25	21.74	9.53	9.53				14.24	12.9	8.67	8.67																					
Bankfull Entrenchment Ratio		2.28	4.25	2.27	2.27				2.74	1.83	3.21	3.21				3.39	5.93	5.81	5.81																					
Bankfull Bank Height Ratio		1.00	1.00	1.00	1.00				N/A	N/A	N/A	N/A				1.00	1.00	1.00	1.00																					
Based on current/developing bankfull feature[2]																																							
Record elevation (datum) used																																							
Bankfull Width (ft)																																							
Floodprone Width (ft)																																							
Bankfull Mean Depth (ft)																																							
Bankfull Max Depth (ft)																																							
Bankfull Cross Sectional Area (ft^2)																																							
Bankfull Width/Depth Ratio																																							
Bankfull Entrenchment Ratio																																							
Bankfull Bank Height Ratio																																							
Cross Sectional Area between end pins (ft^2)																																							
d50 (mm)																																							

These cells may or may not require population in any given year. See footnote 2 below

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."

2 = Based on the elevation of any dominant depositional feature that develops and is observed at the time of survey. If the baseline datum remains the only significant depositional feature then these two sets of dimensional parameters will be equal, however, if another depositional feature of significance develops above or below the baseline bankfull datum then this should be tracked and quantified in these cells.

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: SW-Trib (724 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)							4.05	5.37		6.68		2	2.73	4.82		6.91		2	3.56	5.18		6.79		2	3.99	5.33		6.67		2						
Floodprone Width (ft)							11.2	12.13		13.0		2	9.19	13.99		11.59		2	10.9	12.74		14.6		2	12.9	14.68		16.4		2						
Bankfull Mean Depth (ft)							0.39	0.46		0.53		2	0.48	0.485		0.49		2	0.5	0.56		0.61		2	0.54	0.63		0.72		2						
[1]Bankfull Max Depth (ft)							1.02	1.14		1.25		2	0.97	1.05		1.13		2	1.13	1.21		1.29		2	1.34	1.45		1.56		2						
Bankfull Cross Sectional Area (ft[2])							1.59	2.58		3.56		2	1.33	2.33		3.32		2	1.77	2.96		4.15		2	2.15	3.47		4.79		2						
Width/Depth Ratio							10.4	11.67		12.6		2	5.57	9.99		14.4		2	7.12	9.25		11.1		2	7.39	8.33		9.26		2						
Entrenchment Ratio							1.95	2.36		2.77		2	2.02	2.69		3.37		2	2.15	2.6		3.05		2	2.46	2.85		3.24		2						
[1]Bank Height Ratio							1.00	1.00		1.00		2	1.00	1.00		1.00		2	1.00	1.00		1.00		2	1.00	1.00		1.00		2						
Profile																																				
Riffle Length (ft)							0.61	4.99	4.9	13.2	2.74	36	1.59	8.77	6.49	41.01	8.38	22	1.99	5.75	5.35	11.76	3.03	20	0.58	6.71	4.56	25.21	6.83	31						
Riffle Slope (ft/ft)							0.00566	0.08389	0.03966	0.08710	0.15297	36	0.01912	0.05624	0.04528	0.16753	0.03265	22	0.00000	0.04870	0.03584	0.20290	0.04368	20	0.00694	0.09564	0.04228	0.78218	0.15623	31						
Pool Length (ft)							2.40	9.68	10.02	14.64	3.15	31	4.88	11.60	9.66	28.93	6.45	16	4.25	9.37	8.68	16.16	3.53	16	2.14	7.59	6.83	16.73	3.83	30						
Pool Max depth (ft)							0.62	1.24	1.25	1.80	0.28	31	0.54	1.21	1.16	1.81	0.35	17	0.76	1.37	1.39	1.9	0.34	16	0.55	1.22	1.20	2.12	0.37	30						
Pool Spacing (ft)							8.54	22.22	22.34	37.32	8.30	30	12.44	30.42	31.38	56.92	15.78	14	10.63	25.17	22.00	42.55	11.16	15	7.46	25.74	21.07	60.02	15.32	30						
Pattern																																				
Channel Beltwidth (ft)							6.57	10.8	10.5	15.1	2.51	20																								
Radius of Curvature (ft)							9.83	13.88	13.6	17.4	2.64	28																								
Rc:Bankfull width (ft/ft)							1.83	2.585	2.54	3.25		28																								
Meander Wavelength (ft)							37	42.87	42.4	50.5	3.41	20																								
Meander Width Ratio							1.22	2.011	1.95	2.81		20																								
Additional Reach Parameters																																				
Rosgen Classification							B4						B4						E5b						E5b											
Channel Thalweg length (ft)							724						724						724						724											
Sinuosity (ft)							1.15						1.15						1.15						1.15											
Water Surface Slope (Channel) (ft/ft)							0.02372						0.02474						0.02389						0.02393											
BF slope (ft/ft)							0.02376						0.02422						0.02382						0.02357											
[3]Ri% / Ru% / P% / G% / S%							38.3	17.02	33	11.7	0		35.6	25.4	30.5	8.5	0		38.5	30.8	23.1	7.6	0		38.3	18.5	27.2	16.0	0.0							
[3]SC% / Sa% / G% / C% / B% / Be%							3	42	55	0	0	0	0	45	55	0	0	0	20	71	9	0	0	0	17	73	10	0	0	0						
[3]d16 / d35 / d50 / d84 / d95 /							0.7	1.57	2.91	7.23	32		0.7	1.57	2.91	10.48	37.2		0.05	0.23	0.52	1.62	9.65		0.06	0.24	0.49	1.67	9.24							
[2]% of Reach with Eroding Banks							0%						0%						0%						0%											
Channel Stability or Habitat Metric							N/A						N/A						N/A						N/A											
Biological or Other							N/A						N/A						N/A						N/A											

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

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4 = Of value/needed only if the n exceeds 3

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: Main West (235 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)							Only pool cross sections exist on Main West Reach						Only pool cross sections exist on Main West Reach						Only pool cross sections exist on Main West Reach						Only pool cross sections exist on Main West Reach											
Floodprone Width (ft)																																				
Bankfull Mean Depth (ft)																																				
[1]Bankfull Max Depth (ft)																																				
Bankfull Cross Sectional Area (ft[2])																																				
Width/Depth Ratio																																				
Entrenchment Ratio																																				
[1]Bank Height Ratio																																				
Profile																																				
Riffle Length (ft)							2.23	5.47	6.14	7.26	1.91	5	5.94	8.32	8.64	11.34	2.10	5	5.4	11.25	9.72	21.6	5.53	6	6.10	14.58	14.01	24.20	7.45	4						
Riffle Slope (ft/ft)							0.0091	0.0225	0.0228	0.0372	0.0128	5	0.00441	0.01943	0.01683	0.04339	0.01446	5	0.00000	0.01320	0.01164	0.03497	0.01223	6	0.00000	0.00726	0.00801	0.013	0.00543	4						
Pool Length (ft)							8.1	16.58	12.6	35.2	9.94	8	15.13	18.98	17.43	25.93	5.12	4	3.78	9.39	8.51	16.8	6.16	4	14.67	20.77	20.87	26.68	5.61	4						
Pool Max depth (ft)							3.18	3.36	3.29	3.68	0.17	8	3.48	3.61	3.53	3.93	0.19	5	3.50	3.66	3.67	3.80	0.15	4	3.32	3.59	3.66	3.70	0.18	4						
Pool Spacing (ft)							19.8	29.2	26	44.7	9.23	7	21.61	37.01	32.96	60.50	17.02	4	15.40	43.02	39.44	77.79	26.48	4	18.87	49.23	59.65	69.18	26.72	3						
Pattern																																				
Channel Beltwidth (ft)							18.7	29.28	33.6	35.5	9.24	3	Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline																							
Radius of Curvature (ft)							24.3	27.54	26.8	32.3	3.87	4																								
Rc:Bankfull width (ft/ft)							See note above																													
Meander Wavelength (ft)							86.4	91.22		96.1		2																								
Meander Width Ratio							See note above																													
Additional Reach Parameters																																				
Rosgen Classification							E4/1						CE4/1						C4/1						C4/1											
Channel Thalweg length (ft)							235						235						235						235											
Sinuosity (ft)							1.28						1.28						1.28						1.28											
Water Surface Slope (Channel) (ft/ft)							0.0056						0.00575						0.00532						0.00437											
BF slope (ft/ft)							0.0085 (Pools)						0.00783 (Pools)						0.00964 (Pools)						0.00786(Pools)											
[3]Ri% / Ru% / P% / G% / S%							25.0	20.0	40.0	15.0	0		25.0	25.0	25.0	25.0	0		26.1	24.8	17.4	21.7	0		26.7	20.0	26.7	26.7	0.0							
[3]SC% / Sa% / G% / C% / B% / Be%							9	31	52	8	0	0	7	33	54	6	0	0	3	34	60	3	0	0	4	31	55	10	0	0						
[3]d16 / d35 / d50 / d84 / d95 /							0.19	1.55	10.6	42.4	83.5		0.25	1.67	9.24	38.5	72.67		0.67	1.87	8.66	48.6	61.6		0.79	2.0	9.65	55.9	85.7							
[2]% of Reach with Eroding Banks							5%						0%						0%						0%											
Channel Stability or Habitat Metric							N/A						N/A						N/A						N/A											
Biological or Other							N/A						N/A						N/A						N/A											

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. Monitoring Data - Stream Reach Data Summary
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: Main Center and Main East (1588 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)							17.9	19.06	17.9	21.4	2.04	3	17.57	19.61	19.78	21.48	1.96	3	17.53	19.00	17.98	21.50	2.17	3	17.65	18.80	19.26	19.49	1.00	3						
Floodprone Width (ft)							100	103.3	100	110	5.77	3	100	103.3	100	110	5.77	3	100.0	103.3	100.0	110.0	5.77	3	####	103.33	####	####	5.77	3						
Bankfull Mean Depth (ft)							1.59	1.69	1.71	1.76	0.09	3	1.52	1.62	1.66	1.68	0.09	3	1.54	1.60	1.59	1.67	0.07	3	1.53	1.59	1.59	1.65	0.06	3						
[1]Bankfull Max Depth (ft)							2.88	3.2	3.05	3.66	0.41	3	2.87	3.26	3.21	3.71	0.42	3	2.90	3.31	3.23	3.81	0.46	3	2.95	3.33	3.31	3.74	0.40	3						
Bankfull Cross Sectional Area (ft^2)							28.4	32.2	31.5	36.7	4.2	3	29.51	31.76	30.13	35.63	3.37	3	27.02	30.41	30.08	34.14	3.57	3	28.04	29.92	29.47	32.25	2.14	3						
Width/Depth Ratio							10.2	11.31	11.2	12.5	1.18	3	10.46	12.14	12.94	13.01	1.45	3	10.77	11.89	11.38	13.52	1.44	3	11.10	11.83	11.81	12.59	0.75	3						
Entrenchment Ratio							4.67	5.47	5.6	6.15	0.75	3	4.66	5.33	5.06	6.26	0.83	3	4.65	5.49	5.70	6.12	0.76	3	5.13	5.52	5.19	6.23	0.62	3						
[1]Bank Height Ratio							1.00	1.00	1.00	1.00	0.00	3	1.00	1.00	1.00	1.00	0.00	3	1.00	1.00	1.00	1.00	0.00	3	1.00	1.00	1.00	1.00	0.00	3						
Profile																																				
Riffle Length (ft)							5.23	12.98	11.9	29	6.04	28	3.63	12.91	11.99	26.28	5.99	27	4.94	15.93	13.8	37.1	9.21	26	4.23	14.64	14.23	38.56	8.88	23						
Riffle Slope (ft/ft)							0.0013	0.0153	0.0113	0.0700	0.0142	28	0.00066	0.01974	0.01320	0.08619	0.02119	27	0.00086	0.02686	0.01264	0.12352	0.02885	26	0.00494	0.02288	0.01607	0.05544	0.01592	22						
Pool Length (ft)							11.1	24.93	22.8	44.2	10.6	27	8.53	20.59	19.13	51.83	10.70	27	6.67	20.60	17.60	55.97	11.87	27	8.62	15.81	13.39	31.32	6.39	24						
Pool Max depth (ft)							3	4.09	4.12	4.91	0.44	27	3.25	4.33	4.34	4.99	0.39	27	3.04	4.05	4.10	4.91	0.43	29	2.73	3.96	3.91	5.06	0.53	24						
Pool Spacing (ft)							20.1	56.26	50	109	23	27	18.05	58.05	54.39	115.72	25.70	26	20.97	54.29	52.66	#####	20.15	28	16.20	64.61	59.39	####	31.40	24						
Pattern																																				
Channel Beltwidth (ft)							19.1	36.85	35.8	57.4	11.7	20																								
Radius of Curvature (ft)							22.6	29.81	29.6	35.1	3.56	22																								
Rc:Bankfull width (ft/ft)							1.19	1.564	1.55	1.84		22																								
Meander Wavelength (ft)							78.9	103	111	119	13.7	18																								
Meander Width Ratio							1.00	1.933	1.88	3.01		18																								
Additional Reach Parameters																																				
Rosgen Classification							E4						C4						C4						C4											
Channel Thalweg length (ft)							1588						1588						1588						1588											
Sinuosity (ft)							1.28						1.28						1.28						1.28											
Water Surface Slope (Channel) (ft/ft)							0.00584						0.00597						0.00559						0.00594											
BF slope (ft/ft)							0.00543						0.00544						0.00562						0.00538											
[3]Ri% / Ru% / P% / G% / S%							29.2	23.96	28.1	18.8	0		25.0	25.9	25.0	24.1	0		23.9	26.6	23.9	25.6	0.0		27.9	23.3	27.9	20.9	0.0							
[3]SC% / Sa% / G% / C% / B% / Be%							9	31	52	8	0	0	7	33	54	6	0	0	3	34	60	3	0	0	4	31	55	10	0	0						
[3]d16 / d35 / d50 / d84 / d95 /							0.19	1.55	10.6	42.4	83.5		0.25	1.67	9.24	38.5	72.67		0.67	1.87	8.66	48.6	61.6		0.79	2.0	9.65	55.9	85.7							
[2]% of Reach with Eroding Banks							6%						9%						5%						8%											
Channel Stability or Habitat Metric							N/A						N/A						N/A						N/A											
Biological or Other							N/A						N/A						N/A						N/A											

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

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

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

2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table

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

4 = Of value/needed only if the n exceeds 3

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
UT to Uwharrie River Stream Enhancement Project (#847) - Reach: SE-UT (517 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)							7.08	7.17		7.26		2	7.26	7.37		7.48		2	5.72	6.66		7.6		2	5.97	7.14		8.30		2						
Floodprone Width (ft)							16.1	20.38		24.6		2	30.83	37.59		44.35		2	17.3	25.24		33.2		2	28.60	37.00		45.40		2						
Bankfull Mean Depth (ft)							0.5	0.51		0.51		2	0.58	0.58		0.58		2	0.58	0.62		0.66		2	0.54	0.57		0.60		2						
[1]Bankfull Max Depth (ft)							1.11	1.18		1.25		2	1.3	1.33		1.35		2	1.2	1.28		1.36		2	1.35	1.37		1.38		2						
Bankfull Cross Sectional Area (ft^2)							3.51	3.61		3.71		2	4.21	4.27		4.33		2	3.76	4.08		4.39		2	3.61	4.04		4.46		2						
Width/Depth Ratio							14.2	14.2		14.2		2	12.52	12.71		12.9		2	9.86	10.74		11.5		2	9.95	12.66		15.37		2						
Entrenchment Ratio							2.28	2.84		3.39		2	4.25	5.09		5.93		2	2.27	4.04		5.81		2	3.45	5.53		7.60		2						
[1]Bank Height Ratio							1.00	1.00		1.00		2	1.00	1.00		1.00		2	1.00	1.00		1.00		2	1.00	1.00		1.00		2						
Profile																																				
Riffle Length (ft)							1.39	6.09	4.91	19.2	4.36	26	0.72	6.92	6.06	16.62	4.00	23	0.49	7.17	5.60	20.18	5.55	19	1.51	7.83	6.37	22.71	5.24	20						
Riffle Slope (ft/ft)							0.00974	0.07638	0.04626	0.28489	0.07563	26	0.00267	0.06052	0.03962	0.39232	0.08218	23	0.00443	0.08146	0.05577	0.44753	0.10347	19	0.01134	0.10099	0.04842	0.793	0.17456	20						
Pool Length (ft)							3.84	10.82	10.6	20	4.07	22	4.23	10.23	3.2	16.72	10.29	19	2.72	10.31	11.19	19.17	5.16	17	2.79	6.76	6.35	14.20	3.27	21						
Pool Max depth (ft)							0.74	1.41	1.43	1.99	0.32	22	1.08	1.62	1.58	2.58	0.33	19	1.12	1.60	1.60	2.20	0.32	17	1.05	1.75	1.80	2.46	0.35	21						
Pool Spacing (ft)							6.27	22.3	18.8	56.9	11.64	22	6.94	27.65	25.85	57.73	15.49	19	5.44	28.04	21.76	64.25	18.88	17	3.45	21.65	20.80	60.63	13.65	20						
Pattern																																				
Channel Beltwidth (ft)							5.57	8.88	8.24	13.2	2.37	13																								
Radius of Curvature (ft)							10.1	13.24	12.6	16.3	2.29	21																								
Rc:Bankfull width (ft/ft)							1.41	1.847	1.75	2.28		21																								
Meander Wavelength (ft)							30.9	36.99	37.4	41.4	3.34	16																								
Meander Width Ratio							0.78	1.238	1.15	1.83		16																								
Additional Reach Parameters																																				
Rosgen Classification							C5b						C5b						C/E 5b						C5b											
Channel Thalweg length (ft)							517						517						517						517											
Sinuosity (ft)							1.17						1.17						1.17						1.17											
Water Surface Slope (Channel) (ft/ft)							0.02925						0.02839						0.02852						0.02882											
BF slope (ft/ft)							0.02975						0.02932						0.03018						0.02951											
[3]Ri% / Ru% / P% / G% / S%							39.4	15.15	33.3	12.1	0		39.1	17.2	31.2	12.5	0		35.2	31.5	14.8	18.5	0		35.7	26.8	26.8	10.7	0.0							
[3]SC% / Sa% / G% / C% / B% / Be%							20	67	11	0	0	2	18	69	13	0	0		22	74	4	0	0	0	24	73	3	0	0	0						
[3]d16 / d35 / d50 / d84 / d95 /							0.05	0.21	0.5	1.79	7.42		0.06	0.23	0.58	1.82	10.48		0.05	0.11	0.25	1.08	1.92		0.04	0.11	0.24	0.95	1.82							
[2]% of Reach with Eroding Banks							0%						0%						0%						0%											
Channel Stability or Habitat Metric							N/A						N/A						N/A						N/A											
Biological or Other							N/A						N/A						N/A						N/A											

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
Hydrologic Data

Table 12. Verification of Bankfull Events

Table 12. Verification of Bankfull Events UT to Uwharrie River Stream Restoration Project (#847)			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo No. (If Available)**
4/25/2013	Unknown	Crest Gauges (Main East and SW-Trib)[1]	
4/25/2013	Unknown	Wrack Lines and Debris on Main Center	Photos 1, 2
11/12/2013	Unknown	Crest Gauges (Main East and SW-Trib)[2]	Photo 3
5/21/2014	Unknown	Wrack Lines and Debris on Main West and East	Photos 4, 5
11/11/2014	Unknown	Wrack Lines and Debris on Main Center	Photo 6

1 - Elevations above bankfull were not measure at the crest gauges for this event.

2 - The storm event was measured at 1.4 feet above bankfull elevation on the SW-Trib.

Photo 1: Wrack Lines on Main Center
Following Bankfull Event - Spring 2013

Photo 2: Wrack Lines on Main Center
Following Bankfull Event - Spring 2013

Photo 3: Crest Gauge (Main East)
Leaning Over Following Bankfull Event - Fall 2013

Photo 4: Wrack Lines on Main West
Following Bankfull Event - Spring 2014

Photo 5: Wrack Lines on Main East
Following Bankfull Event - Spring 2014

Photo 6: Wrack Lines on Main Center
Following Bankfull Event - Fall 2014