

# ***YEAR 1 MONITORING REPORT***

## **UT ROCKY RIVER – HARRIS ROAD MIDDLE**

Cabarrus County, North Carolina

EEP IMS No. 92383, Contract No. 004346



Submitted to:



### **NCDENR-Ecosystem Enhancement Program**

217 West Jones Street, Suite 3000A

Raleigh, North Carolina 27603

Construction Completed: August 2010

Morphology Data Collected: March 8, 2012

Vegetation Data Collected: October 3 and 4, 2012

Submitted: January 3, 2013

Prepared by:



**Florence & Hutcheson**

An **ICA** Company

**Florence & Hutcheson, Inc.  
5121 Kingdom Way, Suite 100  
Raleigh, North Carolina 27607**

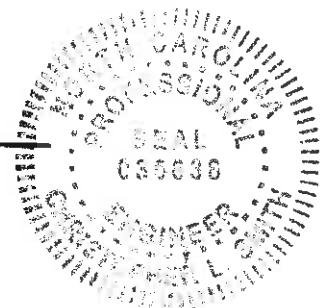
919.851.6066  
919.851.6846 (fax)

I HEREBY CERTIFY THAT THE DOCUMENTS CONTAINED HEREIN, UT ROCKY RIVER-HARRIS ROAD MIDDLE YEAR 1 MONITORING REPORT WERE PREPARED BY ME OR UNDER MY DIRECT SUPERVISION.

SIGNED SEALED, AND DATED THIS 3<sup>RD</sup> DAY OF JANUARY 2013.

A handwritten signature in blue ink, appearing to read 'Chris L. Smith', written over a horizontal line.

Chris L. Smith, PE



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## 1.0 EXECUTIVE SUMMARY

The following report summarizes the vegetation establishment and stream stability for Year 1 monitoring for the UT Rocky River–Harris Road Middle Site (hereafter referred to as the “Site”) in Cabarrus County, North Carolina.

### 1.1 Goals and Objectives

The primary goals of the UT Rocky River stream restoration project focus on:

- Improving water quality
- Enhancing aquatic and terrestrial habitat within the Site watershed
- Establishing wildlife corridors within the Site boundaries
- Enhancing riparian wetlands adjacent to UT Rocky River
- Providing educational opportunities for students at grade schools adjacent to the Site

These goals will be achieved through the following objectives:

- Stabilizing UT Rocky River by restoring a more natural pattern, profile, and dimension that transports its sediment and flow without aggrading (as seen in areas affected by beavers and erosion control devices), or degrading (as seen in gully reaches on-site).
- Establishing a natural vegetative buffer adjacent to the UT Rocky River that filters runoff from adjacent development.
- Enhancing semi-aquatic habitat by enhancing existing wetlands with native tree and shrub plantings.
- Enhancing stream bed variability, providing shading/cover areas within the stream channel, and introducing woody debris in the form of rootwads, log vanes, and log sills.
- Removing existing invasive vegetative species and planting the buffer (floodplain) with native trees, shrubs, herbs and grasses.
- Create a wildlife corridor through the Site that connects habitat areas along the Rocky River with habitat areas at the upstream end of the Site. The corridors provide connectivity to a diversity of habitats including mature forest, early successional forest, stream-side forest, riparian wetlands, and uplands.
- Providing an educational benefit to children who can utilize the planned pedestrian footpath crossing the floodplain, and can view the stream channel from adjacent terraces where schools are located.

### 1.2 Background Summary

The North Carolina Ecosystem Enhancement Program (NCEEP) has completed restoration of 2,715 linear feet of stream and enhanced 8.7 acres of riparian wetland at the Site to assist in fulfilling stream and wetland mitigation goals in the area. The Site is located in northwest Cabarrus County approximately 6 miles southwest of the town of Kannapolis (Figure 1). The Site has a latitude and longitude of 035° 25' 34.52" N and 080° 44' 25.53" W. The Site is situated in the northeast quadrant of the intersection of Harris Road and the Rocky River, between Harris Middle School and Odell Elementary School, approximately 1.5 miles south of

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Highway 73. The Site is located within United States Geological Survey (USGS) Hydrologic Unit (HU) and Targeted Local Watershed 03040105010010 (North Carolina Division of Water Quality [NCDWQ] Subbasin 03-07-11) of the Yadkin-Pee Dee River Basin, and will service the USGS 8-digit Cataloging Unit (CU) 03040105. The Site is currently owned by Cabarrus County and the State of North Carolina holds the conservation easement on the property.

### 1.3 Vegetation

Bare root and live stake plantings are surviving well across the Site with an average of 411 planted stems per acre surviving after Year 1. 11 of 14 vegetation plots are exceeding success criteria of at least 320 stems per acre. Plots 7, 8, and 10 each contain 283 stems per acre surviving after Year 1. Plot 7 is being affected by a beaver dam that is located immediately adjacent to the plot (see Figure 3.17 in Appendix B). The beaver dam has raised the groundwater table and approximately half of Plot 7 was inundated at the time of the site visit. The higher water table has created favorable conditions for hydrophytic herbaceous vegetation. Rushes (*Juncus effusus*), sedges (*Carex* spp.), and knotweed (*Polygonum* spp.) are currently dominating Plot 7, making it difficult for the planted bare root seedlings to receive sunlight. EEP has been informed of the beaver dam and has already coordinated with APHIS to trap beaver and remove the beaver dam at the Site. In addition, APHIS is contracted to conduct monthly inspections at the Site to ensure beaver are controlled throughout the monitoring phase of the project.

Plot 8 is located on a terrace slope along the southern boundary of the Site. This area appears to be drier than other areas at the Site, which may be contributing to the poor survival of planted stems in Plot 8. Approximately half of Plot 10 is also located along a terrace side slope and appears somewhat drier than other areas. Additional plantings are not recommended at this time because natural recruitment of character tree species is anticipated over the course of the monitoring period and the areas exhibiting poor survivability are relatively small.

A small cluster of *Sericea lespedeza* (*Lespedeza cuneata*) was observed adjacent to Plot 9. Plot 9 is located near Moss Farm Street and a sewer easement that crosses UT Rocky River at the beginning of the project making this area susceptible to encroachment of invasive species. Plot 9 is currently exceeding success criteria goals with 445 planted stems per acre surviving after Year 1; however, this area will be watched closely as monitoring progresses and invasive species will be controlled if they begin to compromise vegetative success at the Site.

### 1.4 Stream Stability

UT Rocky River appears to be stable and functioning as designed, with the exception of areas currently affected by the beaver dam. There is no evidence of trends toward significant change in channel dimension or pattern. Cross-sectional data indicates that the channel has experienced little change in dimension, with the exception of Cross Section 6. Cross Section 6 is approximately 0.7 foot deeper than baseline conditions, resulting in a larger cross sectional area and smaller width to depth ratio. The scour at Cross Section 6 is likely a result of increased shear stress caused by the beaver dam located approximately 50 feet upstream. The beaver dam

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has raised the water surface elevation above bankfull and increased the average water surface slope through this section. The profile data also depicts scour in the channel bed downstream of the beaver dam. This section is functioning as a step-pool system and all structures are stable and maintaining grade control.

The profile plots depict some shifting and deepening of pools throughout the reach. This is expected in sand bed channels, where the bed form is in constant flux and pools adjust their depths during most storm events. Sediment has deposited immediately upstream of the beaver dam, but the sediment is expected to flush out once the beaver dam is removed. The percentage of riffles and pools throughout the reach has changed slightly from baseline conditions. Year 1 data depicts riffles to account for 38 percent (compared to 43 percent at baseline) and pools to account for 62 percent (compared to 57 percent at baseline). The backwater effect upstream of the beaver dam and the scour downstream of the beaver dam are the primary reasons for the change in riffle/pool percentages in Year 1. The section downstream of the beaver dam is designed to function as a step-pool system to step the invert of the UT Rocky River down to the invert of the Rocky River. During Year 1, the pools between the log steps have enlarged, but the stream remains stable and is performing as intended. The riffle sections affected by backwater from the beaver dam are expected to regain function once the beaver dam is removed.

Table 5, Visual Stream Morphology Stability Assessment, details 99 percent of the stream bed as stable, performing as intended for Year 1 Monitoring. One riffle segment was noted as degrading. This segment is located near station 20+00, where two floodplain drains are entering the stream. The floodplain drains are creating a scour pool as they enter the stream; however, a double step log cross vane immediately downstream of this segment is maintaining grade control. The scour is expected to remain localized near the floodplain drains and will not compromise the overall stability of the stream. Three areas along the bank are experiencing erosion and are depicted on the Current Conditions Plan View (CCPV) located in Appendix B. Photos of each problem area are also included in Appendix B.

Approximately 40 feet of the right bank near station 14+50 has eroded to create a vertical bank; however, woody vegetation is well established in this area, due to live stake plantings and transplants located along the streambank. Woody vegetation should aid in stabilizing this section of streambank, therefore no repairs are recommended at this time.

Approximately 20 feet of the left bank near station 20+90 has scoured allowing higher flows to migrate into the floodplain. The erosion occurs just upstream of a log sill, but the stream has not fully migrated around the log sill at this time. Woody and herbaceous vegetation in the floodplain is slowing the progression of erosion. This area will be watched closely and if the stream continues to migrate around the log sill corrective actions will be recommended to repair the area.

Immediately downstream of the log sill near station 20+90, the right bank has scoured for approximately 15 feet. A rootwad was placed in this bank to stabilize the log sill and it appears

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that the erosion has occurred along the trunk of the rootwad. Due to the relatively small size of this eroded area and the stability of the bank behind the rootwad, corrective actions are not recommended at this time.

Two structures are experiencing piping as noted in Table 5. The structures are two double step log cross vanes located at stations 20+50 and 22+30. The header logs are functioning as intended and holding grade but water is piping through the second step header and footer log on each structure. Since the header logs and vane arms are functioning as intended, corrective actions are not recommended at this time.

A beaver dam was observed near station 33+30. Backwater from the beaver dam was observed as far upstream as station 30+00. The beaver dam has not had a significant impact on the stability of the stream, and it will be removed prior to Year 2 Monitoring surveys. As noted in Section 1.3, EEP has been informed of the Beaver dam and they have contracted APHIS to trap beaver, remove the dam, and conduct monthly inspections to prevent re-colonization through the monitoring period.

The site has experienced several bankfull flows throughout the first monitoring year. Crest gauges installed on-site were inspected on March 8, 2012 and October 4, 2012. The crest gauges revealed that a bankfull event occurred at least twice during 2012 (Table 13). Additional overbank evidence includes debris lines, and vegetation bent in the downstream direction. Evidence of bankfull events can be found in Appendix E.

### **1.5 Wetlands**

Existing wetlands at the Site were enhanced by removing exotic vegetation and planting native species. All vegetation plots located within wetland areas are exceeding success criteria, with the exception of Plot 7 which is affected by the beaver dam. Section 1.3 provides more details concerning vegetation at the Site.

### **1.6 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 EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

## **2.0 METHODOLOGY**

The Year 1 Monitoring survey was completed using a Total Station. Each cross 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. Surveying these monuments throughout the Site ensured proper orientation. The survey data was imported into MicroStation for verification. The longitudinal stationing was developed from total station data and compared with previous year's data to ensure consistent beginning and ending points. RIVERMorph was used to analyze the profile and cross section data. Tables and figures were created using Microsoft Excel.

The channel is entirely a sand bed system; therefore a pebble count was not conducted.

Vegetation monitoring was completed using CVS level II methods, for 14, 100 square meter vegetation plots (Lee et al. 2006). The taxonomic standard for vegetation used for this document was Flora of the Southern and Mid-Atlantic States (Weakley 2011).

### 3.0 REFERENCES

Lee, Michael T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2006. CVS-EEP Protocol for Recording Vegetation, Version 4.0 (<http://cvs.bio.unc.edu/methods.htm>).

Weakley, Alan S. 2011. Flora of the Southern and Mid-Atlantic States (online). Available: [http://www.herbarium.unc.edu/FloraArchives/WeakleyFlora\\_2011-May-nav.pdf](http://www.herbarium.unc.edu/FloraArchives/WeakleyFlora_2011-May-nav.pdf) [May 15, 2011]. University of North Carolina Herbarium, North Carolina Botanical Garden, University of North Carolina, Chapel Hill, North Carolina.



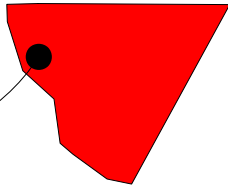
## APPENDICES

### **Appendix A. Project Vicinity Map and Background Tables**



# Cabarrus County North Carolina

## PROJECT AREA



# Vicinity Map

UT Rocky River – Harris Road Middle  
Baseline Monitoring Document  
Cabarrus County, North Carolina



**Florence & Hutcheson**

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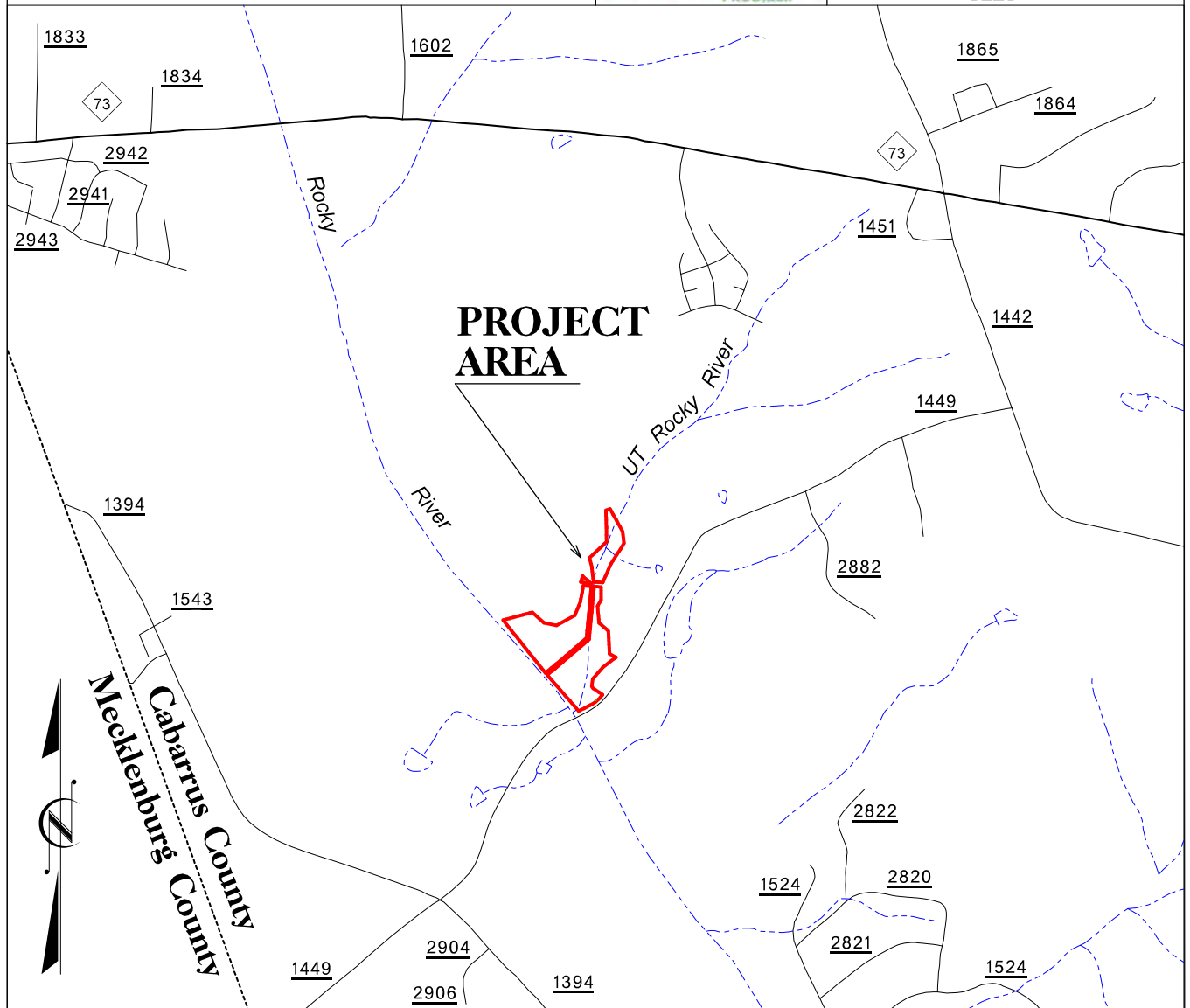
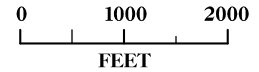
5121 Kingdom Way, Suite 100 Raleigh, NC 27607

NC License No: F-0258



Date: 5/24/12

Figure: 1



### Directions to the Site are as follows:

- Take I-40 West to I-85 South
- Take I-85 South to Exit 55 (NC 73 West)
- Travel west on NC 73 for approximately 3.9 miles
- Take a left on Odell School Road and travel for 0.5 miles.
- Take a right onto Harris Road and travel approximately 0.8 mile following signs to Harris Middle School
- Turn right onto Moss Farm Street. The UT to Rocky River flows southwest under Moss Farm Street in approximately 0.18 miles

"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."

**Table 1. Project Components and Mitigation Credits**

**UT Rocky River – Harris Road Middle (EEP IMS No. 92383)**

Mitigation Credits		
	Stream*	Riparian Wetland**
Type	R	R
Total	2,615	4.1

Project Components						
Restoration Segment/ Reach ID	Station Range	Existing LF/AC	Approach	Restoration or Restoration Equivalent	Restored LF/AC	Mitigation Ratio
UT to Rocky River	10+00 – 34+50	2,020	PI	R	2,450	1:1
UT to Rocky River	34+50 – 37+15	330	PII	R	265	1:1
Wetland	-	8.7	Invasive Removal & Planting	R	8.2	2:1

Component Summation		
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)
		Riverine
Restoration	2,715	
Enhancement		8.2

\*Stream credits are less than the linear feet restored because 100 feet of the restored stream flows through sewer line easements and was not included as part of the stream credit calculations.

\*\*Wetlands located within the sewer line easements were not planted during the construction phase of this project and are not included as part of the enhanced wetland acreage or Wetland Mitigation Credits

**Table 2. Project Activity and Reporting History**

**UT Rocky River – Harris Road Middle (EEP IMS No. 92383)**

<b>Activity or Report</b>	<b>Data Collection Complete</b>	<b>Completion or Delivery</b>
Restoration Plan	April 2008	September 2008
Final Design – Construction Plans	September 2008	October 2008
Construction	June 11, 2010	March 23, 2011
Temporary S&E Mix Applied to Entire Project Area	August 30, 2010	March 23, 2011
Permanent Seed Mix Applied to Entire Project Area	August 30, 2010	March 23, 2011
Bare Root, Containerized, and B&B plantings for Entire Project Area	February 14, 2011	February 15, 2011
Mitigation Plan/As-built (Year 0 Monitoring-Baseline)	April 11, 2012	June 27, 2012
Year 1 Monitoring	October 4, 2012	January 3, 2013
Year 2 Monitoring		
<b>Structural maintenance (bench expansion, vane, etc.)</b>		
Year 3 Monitoring		
<b>Supplemental planting of containerized material</b>		
Year 4 Monitoring		

**Table 3. Project Contacts Table**

**UT Rocky River – Harris Road Middle (EEP IMS No. 92383)**

<b>Designer</b>  Primary project design POC	Florence & Hutcheson 5121 Kingdom Way, Suite 100 Raleigh, North Carolina 27607 Kevin Williams (919) 851-6066
<b>Construction Contractor</b>  Construction Contractor POC	Vaughn Contracting, Inc. Tommy Vaughn P.O. Box 796 Wadesboro, NC 28170 (704) 694-6450
<b>Planting Contractor</b>  Planting Contractor POC	Bruton Natural Systems Charlie Bruton PO Box 1197 Fremont, NC 27830 (919) 242-6555
<b>Seeding Contractor</b>  Seeding Contractor POC	Vaughn Contracting, Inc. Tommy Vaughn P.O. Box 796 Wadesboro, NC 28170 (704) 694-6450
Seed Mix Sources	Green Resources – Triad Office
Nursery Stock Suppliers	1) ArborGen - South Carolina SuperTree Nursery 2) Dykes & Son Nursery 3) NC Division of Forest Resources 4) Carolina Wetland Services
<b>Monitoring Performers</b>	Florence & Hutcheson 5121 Kingdom Way, Suite 100 Raleigh, North Carolina 27607 Ben Furr (919) 851-6066
Stream Monitoring POC	Florence & Hutcheson 5121 Kingdom Way, Suite 100 Raleigh, North Carolina 27607 Ben Furr (919) 851-6066
Vegetation Monitoring POC	Florence & Hutcheson 5121 Kingdom Way, Suite 100 Raleigh, North Carolina 27607 Ben Furr (919) 851-6066

**Table 4. Project Information**

**UT Rocky River – Harris Road Middle (EEP IMS No. 92383)**

<b>Project Information</b>	
Project Name	UT Rocky River – Harris Road Middle
Project County	Cabarrus
Project Area (acres)	20
Project Coordinates	35° 25' 34.52" N, 80° 44' 25.53" W
<b>Project Watershed Summary Information</b>	
Physiographic Region	Southern Piedmont
Ecoregion	Southern Outer Piedmont
Project River Basin	Yadkin-Pee Dee
USGS 8-digit HUC	03040105
USGS 14-digit HUC	03040105010010
NCDWQ Subbasin	03-07-11
Project Drainage Area	0.77 sq. mi (at end of restoration reach)
Watershed Land Use	Forested = 15% Residential/Commerical = 85%
<b>Reach Summary Information</b>	
<b>Parameters</b>	<b>UT Rocky River</b>
Restored length	2,715
Drainage Area	0.77 sq. mi.
NCDWQ Index Number	14-(7)
NCDWQ Classification	C
Valley Type/Morphological Description	VIII/C5
Dominant Soil Series	Chewacla
Drainage Class	Somewhat poorly drained
Soil Hydric Status	Hydric
Slope	0.0060
FEMA Classification	AE & X
Native Vegetation Community	Piedmont Alluvial Forest
Percent Composition of Exotic Invasives	0.1%
<b>Wetland Summary Information</b>	
<b>Parameters</b>	<b>Wetland 1</b>
Size of Wetland (acres)	8.2
Wetland Type	Riparian Riverine
Mapped Soil Series	Chewacla
Drainage Class	Somewhat poorly drained
Soil Hydric Status	Hydric
Source of Hydrology	Groundwater and Floodwater
Hydrologic Impairment	No
Native Vegetation Community	Piedmont Alluvial Forest
Percent Composition of Exotic Invasive Veg.	0%

**Table 4. Project Information (continued)**

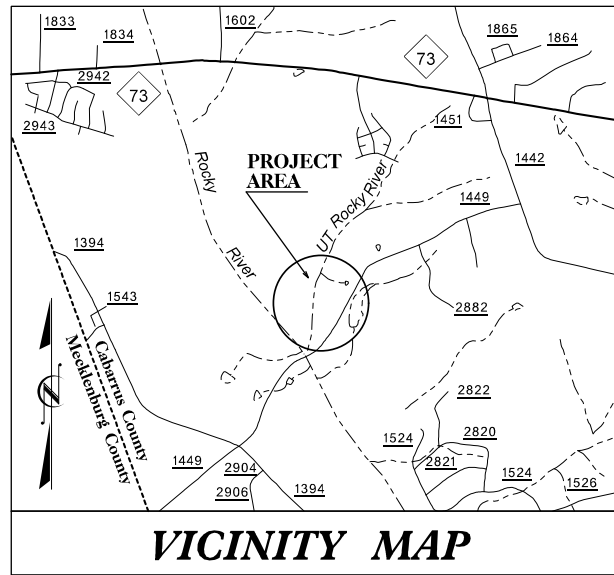
<b>Regulatory Considerations</b>			
<b>Regulation</b>	<b>Applicable</b>	<b>Resolved</b>	<b>Supporting Documentation</b>
Waters of the U.S. –Sections 404 and 401	Yes	Yes	Restoration Plan
Endangered Species Act	Yes	Yes	Restoration Plan
Historic Preservation Act	Yes	Yes	Restoration Plan
CZMA/CAMA	No	--	--
FEMA Floodplain Compliance	Yes	Yes	Restoration Plan
Essential Fisheries Habitat	No	--	--



**Appendix B. Visual Assessment Data**



**CONTRACT: UT ROCKY RIVER - HARRIS ROAD MIDDLE SCO# 070708001**



**VICINITY MAP**

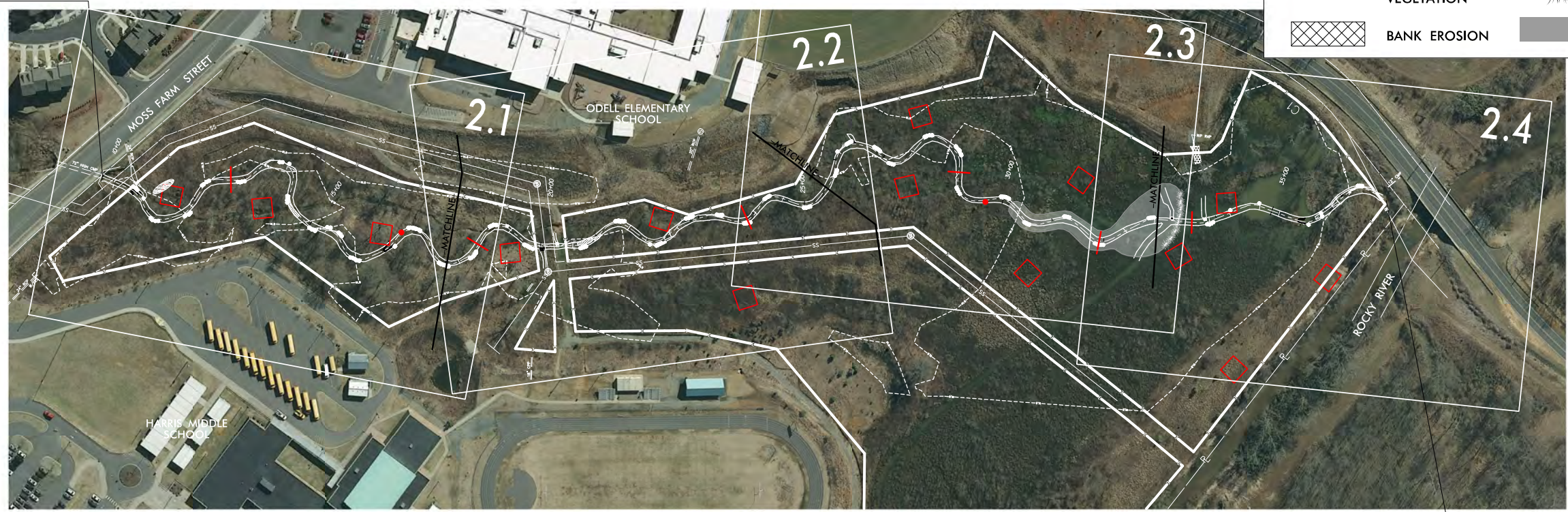
# CURRENT CONDITIONS PLAN VIEW (CCPV) UT ROCKY RIVER - HARRIS ROAD MIDDLE

**LOCATION: CABARRUS COUNTY, NORTH CAROLINA**  
**LAT: 35°25'34.52" N LONG: 80°44'25.53" W**  
**TYPE OF WORK: CURRENT CONDITIONS PLAN VIEW**



LEGEND			
	MONITORING CROSS SECTION (XS-)		ROCK L-VANE
	CREST GAUGE		ROCK CROSS VANE
	WETLAND BOUNDARY		LOG VANE W/SILL
	EXISTING PROPERTY LINE		LOG CROSS VANE
	EASEMENT BOUNDARY		DOUBLE STEP LOG CROSS VANE
	BANKFULL		TRANSPLANTS
	THALWEG		LOG SILL
	TOE OF SLOPE		BEAVER DAM
	FPI - FLOODPLAIN INTERCEPTOR		AREA EFFECTED BY BEAVER DAM
	INVASIVE EXOTIC VEGETATION		
	BANK EROSION		

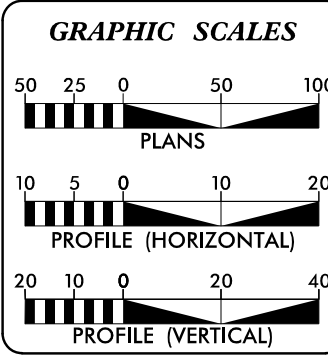
**BEGIN UT ROCKY RIVER - HARRIS ROAD MIDDLE**



**END UT ROCKY RIVER - HARRIS ROAD MIDDLE**  
**N=613901.2913**  
**E=1481460.2720**

**INDEX OF SHEETS**

TITLE/SITE OVERVIEW FIGURE.....	2
CCPV PLAN FIGURES.....	2.1 - 2.4



**DESIGN DATA**


DESIGN STREAM TYPE	=	C5/E5
BANKFULL AREA (FT <sup>2</sup> )	=	9.0
CROSS-SECTIONED		
BANKFULL WIDTH (FT)	=	9.5
MAX DEPTH (FT)	=	1.4
WIDTH /DEPTH RATIO	=	10
DRAINAGE AREA (MI <sup>2</sup> )	=	0.8
BANKFULL SLOPE (FT/FT)	=	0.002

**PROJECT LENGTH**

EXISTING STREAM LENGTH	=	2,350 FT
PROPOSED DESIGN STREAM LENGTH	=	2,715 FT
WETLAND ENHANCEMENT AREA	=	8.20 AC.

**OWNER CONTACT:**

<b>PAUL WIESNER</b>
<i>EPP PROJECT MANAGER</i>
<b>LIN XU</b>
<i>REVIEW COORDINATOR</i>



Prepared In the Office of:



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 NC License No: F-0258

**R. KEVIN WILLIAMS**  
*PROJECT ENGINEER*

**RYAN V. SMITH**  
*PROJECT DESIGNER*

### CURRENT CONDITIONS PLAN VIEW (CCPV)

LEGEND			
	MONITORING CROSS SECTION (XS-)		ROCK L-VANE
	CREST GAUGE		ROCK CROSS VANE
	WETLAND BOUNDARY (WLB)		LOG VANE W/SILL
	EXISTING PROPERTY LINE		LOG CROSS VANE
	EASEMENT BOUNDARY (E)		DOUBLE STEP LOG CROSS VANE
	BANKFULL		TRANSPLANTS
	THALWEG		LOG SILL
	TOE OF SLOPE		BANK EROSION
	FPI - FLOODPLAIN INTERCEPTOR		
	INVASIVE EXOTIC VEGETATION		



CP-3  
N=616053.1140  
E=1481902.6200  
ELEV=633.910

UT ROCKY RIVER -  
HARRIS ROAD MIDDLE  
N=616015.2714  
E=1481909.5722

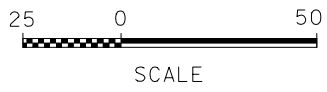
CP-4  
N=615583.8840  
E=1481538.7100  
ELEV=636.439

FOR SITE OVERVIEW SEE FIGURE 2  
FOR CCPV PLANS SEE FIGURES 2.1 THRU 2.4

CCPV UT ROCKY RIVER - HARRIS ROAD MIDDLE	
SCDF: 070708001	COUNTY: CABARRUS
DESIGNED BY: RVS	
CHECKED BY: RKW	DATE: 11/2

I:\11\2013\Projects\RockyRiver\CCPV\_pah\_2.1.dgn  
Florence & Hutcheson, Inc.

# CURRENT CONDITIONS PLAN VIEW (CCPV)



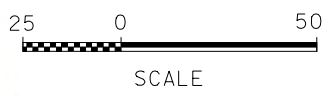
LEGEND			
	MONITORING CROSS SECTION (XS- )		ROCK L-VANE
	CREST GAUGE		ROCK CROSS VANE
	WETLAND BOUNDARY		LOG VANE W/SILL
	EXISTING PROPERTY LINE		LOG CROSS VANE
	EASEMENT BOUNDARY		DOUBLE STEP LOG CROSS VANE
	BANKFULL		TRANSPLANTS
	THALWEG		LOG SILL
	TOE OF SLOPE		BANK EROSION
	FPI - FLOODPLAIN INTERCEPTOR		



I:\1\2013\Projects\RockyRiver\CCPV\_Plan\RockyRiver\_CCPV\_pah\_2.2.dgn  
 Florence & Hutcheson, Inc.

FOR SITE OVERVIEW SEE FIGURE 2  
 FOR CCPV PLANS SEE FIGURES 2.1 THRU 2.4

CCPV UT ROCKY RIVER - HARRIS ROAD MIDDLE	
COUNTY: CABARRUS	
DESIGNED BY:	RVS
CHECKED BY:	RKW DATE: 11/12



# CURRENT CONDITIONS PLAN VIEW (CCPV)

LEGEND	
	MONITORING CROSS SECTION (XS- )
	CREST GAUGE
	WETLAND BOUNDARY
	EXISTING PROPERTY LINE
	EASEMENT BOUNDARY
	BANKFULL
	THALWEG
	TOE OF SLOPE
	FPI - FLOODPLAIN INTERCEPTOR
	ROCK L-VANE
	ROCK CROSS VANE
	LOG VANE W/SILL
	LOG CROSS VANE
	DOUBLE STEP LOG CROSS VANE
	TRANSPLANTS
	LOG SILL



CP-5  
N = 614891.8620  
E = 1481797.3510  
ELEV = 635.892

CP-6  
N = 614257.9240  
E = 1481738.0020  
ELEV = 635.892

-MATCHLINE- SEE FIGURE 2.2

-MATCHLINE- SEE FIGURE 2.4

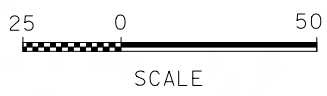
AREAS EXPERIENCING BACKWATER DUE TO EFFECTS OF BEAVER DAM AT STA. 33+35

1/31/2013 R:\Streams\Proj\CCPV\_Plans\RockyRiver\_CCPV\_pah\_2.3.dgn Florence & Hutcheson, Inc.

FOR SITE OVERVIEW SEE FIGURE 2  
FOR CCPV PLANS SEE FIGURES 2.1 THRU 2.4

CCPV UT ROCKY RIVER - HARRIS ROAD MIDDLE	
SCDF: 070708001	COUNTY: CABARRUS
DESIGNED BY: RVS	
CHECKED BY: RKW	DATE: 05/12

# CURRENT CONDITIONS PLAN VIEW (CCPV)



-MATCHLINE- SEE FIGURE 2.3



AREA EXPERIENCING BACKWATER DUE TO EFFECTS OF BEAVER DAM

HALF OF VEG PLOT INUNDATED DUE TO EFFECTS OF BEAVER DAM ON GROUNDWATER TABLE

END UT ROCKY RIVER - HARRIS ROAD MIDDLE  
 N=613901.2913  
 E=1481460.2720

25' ACCESS, USE AND CONSTRUCTION EASEMENT  
 DB 3159 PG 65

### LEGEND

	MONITORING CROSS SECTION (XS- )		ROCK L-VANE
	CREST GAUGE		ROCK CROSS VANE
	WETLAND BOUNDARY		LOG VANE W/SILL
	EXISTING PROPERTY LINE		LOG CROSS VANE
	EASEMENT BOUNDARY		DOUBLE STEP LOG CROSS VANE
	BANKFULL		TRANSPLANTS
	THALWEG		LOG SILL
	TOE OF SLOPE		
	FPI - FLOODPLAIN INTERCEPTOR		
	BEAVER DAM		





**Table 5 Visual Stream Morphology Stability Assessment**  
**UT Rocky River - Harris Road Middle Stream Restoration Project, 92383**  
**UT Rocky River - 2,715 feet assessed**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			1	27	99%			
	2. Riffle Condition*	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	N/A	N/A			100%			
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient	36	36			100%			
		2. <u>Length</u> appropriate	36	36			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	32	32			100%			
2. Thalweg centering at downstream of meander (Glide)		32	32			100%				
<b>Totals</b>										
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			3	75	97%	1	40	99%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> 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 collaps			0	0	100%	N/A	N/A	N/A
<b>Totals</b>										
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	27	27			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	27	27			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	25	27			93%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	27	27			100%			
	4. Habitat	Pool forming structures maintaing ~ Max Pool Depth : Mean Bankfull Depth ratio > 1.6 Rootwads/logs providing some cover at base-flow.	27	27			100%			

\*Stream is a sand bed system, riffles are not expected to coarsen

**Table 6. Vegetation Condition Assessment**  
**UT Rocky River-Harris Road Middle, 92383**  
**UT Rocky River: 2,715 feet**

**Planted Acreage = 15.0**

<b>Vegetation Category</b>	<b>Definitions</b>	<b>Mapping Threshold</b>	<b>CCPV Depiction</b>	<b>Number of Polygons</b>	<b>Combined Acreage</b>	<b>% of Planted Acreage</b>
<b>1. Bare Areas</b>	Very limited ground cover (grass).	None	N/A	N/A	N/A	N/A
<b>2. Low Stem Density Areas</b>	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	Vegetation Plots	VEG 7, 8, 10	3.00	0.07	0.49%
<b>3. Areas of Poor Growth Rates or Vigor</b>	Areas with woody stems of a size class that are obviously small given the monitoring year.	None	N/A	N/A	N/A	N/A

**Easement Acreage = 67.85**

<b>Vegetation Category</b>	<b>Definitions</b>	<b>Mapping Threshold</b>	<b>CCPV Depiction</b>	<b>Number of Polygons</b>	<b>Combined Acreage</b>	<b>% of Planted Acreage</b>
<b>4. Invasive Areas of Concern</b>	Areas or points (if too small to render as polygons at map scale).	All populations were mapped	See legend on CCPV	1	0.02	0.1
<b>5. Easement Encroachment Areas</b>	Areas or points (if too small to render as polygons at map scale).	None	N/A	N/A	N/A	N/A

**Figures 3.1-3.22. Vegetation Plot Photos and Problem Areas**



**3.1 Vegetation Plot 1**



**3.2 Vegetation Plot 2**



**3.3 Vegetation Plot 3**



**3.4 Vegetation Plot 4**



**3.5 Vegetation Plot 5**



**3.6 Vegetation Plot 6**



**3.7 Vegetation Plot 7**



**3.8 Vegetation Plot 8**



**3.9 Vegetation Plot 9**



**3.10 Vegetation Plot 10**



**3.11 Vegetation Plot 11**



**3.12 Vegetation Plot 12**



**3.13 Vegetation Plot 13**



**3.14 Vegetation Plot 14**



**3.15 Beaver dam near station 33+50**



**3.16 Backwater from beaver dam**



**3.17 Looking at beaver dam in floodplain  
at VP7**



**3.18 Looking upstream at Beaver Dam**



**3.19 Eroded right bank near 14+50**



**3.20 Eroded left bank near 20+90**



**3.21 Eroded bank downstream of log sill  
near 20+90**



**3.22 Double step log cross vane, notice  
water piping under second log step**



**Appendix C. Vegetation Plot Data**

**Table 7. Vegetation Plot Mitigation Success Summary**

<b>UT Rocky River – Harris Road Middle (EEP IMS No. 92383)</b>					
<b>Plot ID</b>	<b>Community Type</b>	<b>CVS Level</b>	<b>Planted Stems</b>	<b>Stems Per Acre</b>	<b>Survival Threshold Met?</b>
1	Piedmont Alluvial Forest (non-wetland area)	II	11	445	Yes
2	Piedmont Alluvial Forest (supplemental planting)	II	10	405	Yes
3	Piedmont Alluvial Forest (riverine wetland area)	II	11	445	Yes
4	Piedmont Alluvial Forest (non-wetland area)	II	9	364	Yes
5	Piedmont Alluvial Forest (riverine wetland area)	II	9	364	Yes
6	Piedmont Alluvial Forest (riverine wetland area)	II	12	486	Yes
7	Piedmont Alluvial Forest (riverine wetland area)	II	7	283	No
8	Piedmont Alluvial Forest (non-wetland area)	II	7	283	No
9	Piedmont Alluvial Forest (non-wetland area)	II	11	445	Yes
10	Piedmont Alluvial Forest (non-wetland area)	II	7	283	No
11	Piedmont Alluvial Forest (non-wetland area)	II	12	486	Yes
12	Piedmont Alluvial Forest (riverine wetland area)	II	10	405	Yes
13	Piedmont Alluvial Forest (riverine wetland area)	II	13	526	Yes
14	Piedmont Alluvial Forest (non-wetland area)	II	13	526	Yes
<b>Average Stems Per Acre</b>				411	

**Table 8. CVS Vegetation Metadata**

<b>Report Prepared By</b>	Ben Furr
<b>Date Prepared</b>	11/06/2012 15:28
<b>database name</b>	cvs-eep-entrytool-v2.2.7.mdb
<b>database location</b>	S:\ UT_Rocky_River\Docs\Monitoring\CVS Data
<b>computer name</b>	NC10465
<b>file size</b>	49401856
<b>DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----</b>	
<b>Metadata</b>	Description of database file, the report worksheets, and a summary of project(s) and project data.
<b>Proj, planted</b>	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
<b>Proj, total stems</b>	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
<b>Plots</b>	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
<b>Vigor</b>	Frequency distribution of vigor classes for stems for all plots.
<b>Vigor by Spp</b>	Frequency distribution of vigor classes listed by species.
<b>Damage</b>	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
<b>Damage by Spp</b>	Damage values tallied by type for each species.
<b>Damage by Plot</b>	Damage values tallied by type for each plot.
<b>Planted Stems by Plot and Spp</b>	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
<b>ALL Stems by Plot and spp</b>	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
<b>PROJECT SUMMARY-----</b>	
<b>Project Code</b>	RR
<b>project Name</b>	UT Rocky River
<b>Description</b>	Stream and Wetland Restoration Project
<b>River Basin</b>	Yadkin-Pee Dee
<b>length(ft)</b>	2715
<b>stream-to-edge width (ft)</b>	50
<b>area (sq m)</b>	25220.62
<b>Required Plots (calculated)</b>	14
<b>Sampled Plots</b>	14

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

UT Rocky River – Harris Road Middle (EEP IMS No. 92383) (Year 1 Monitoring 2012)

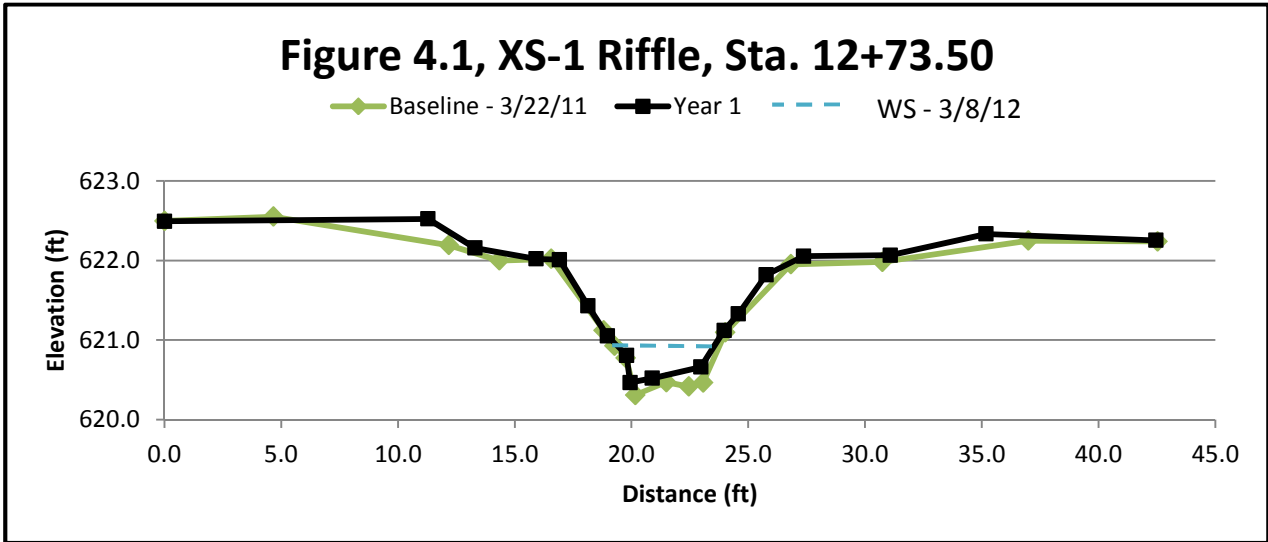
		Annual Means																																	
		Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7		Plot 8		Plot 9		Plot 10		Plot 11		Plot 12		Plot 13		Plot 14		YR1 (2012)		AB (2011/2012)			
Scientific Name	Common Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T					
<i>Acer rubrum</i>	Red maple	Tree		30		1						2																	0.0	11.0	0.0	21.9			
<i>Alnus serrulata</i>	Tag alder	Shrub																		1	1									1.0	1.0	1.0	1.0		
<i>Asimina triloba</i>	Paw-paw	Shrub			1	1			3	3										1	1									1.7	1.7	2.0	2.0		
<i>Baccharis halimifolia</i>	Eastern baccharis	Shrub		4		2													6											0.0	4.0	0.0	3.5		
<i>Betula nigra</i>	River birch	Tree										1	1											2	2					1.5	1.5	1.5	1.5		
<i>Carya sp.</i>	Hickory	Tree																												0.0	0.0	0.0	1.0		
<i>Carya ovata</i>	Shagbark hickory	Tree						1	1							2	2													1.5	1.5	2.5	2.5		
<i>Celtis laevigata</i>	Hackberry	Tree																						2	2					2.0	2.0	1.0	1.0		
<i>Cornus amomum</i>	Silky dogwood	Shrub		3		1	4	6				13			3	3				4	1	1		1						2.7	4.7	2.3	2.8		
<i>Cornus florida</i>	Flowering dogwood	Tree	2	3		1																								2.0	2.0	2.0	2.0		
<i>Diospyros virginiana</i>	Common persimmon	Tree		8						1														1						0.0	3.3	0.0	1.0		
<i>Fraxinus pennsylvanica</i>	Green ash	Tree	4	4	4	4			5	5	7	7			1	1			1	1	1			5	5	1	1	5	5	2	2	3.5	3.3	3.6	4.5
<i>Liquidambar styraciflua</i>	Sweetgum	Tree		6		20						1									15									0.0	9.8	0.0	10.0		
<i>Liriodendron tulipifera</i>	Yellow poplar	Tree		1			1	1																						1.0	1.0	1.0	1.0		
<i>Platanus occidentalis</i>	Sycamore	Tree				5	5			1	1					5	5	5	5	3	3	6	6			1	1	1	1	3.4	3.4	4.3	4.1		
<i>Quercus sp.</i>	Oak	Tree	2	2	1	1																								1.5	1.5	1.5	1.5		
<i>Quercus falcata</i>	Southern red oak	Tree	3	3																5	5	1	1	1	1					7	7	3.4	3.4	3.5	3.5
<i>Quercus michauxii</i>	Swamp chesnut oak	Tree								1	1	3	3												4	4	3	3			2.8	2.8	3.0	3.0	
<i>Quercus phellos</i>	Willow oak	Tree			3	3							4	4	3	3									5	5					3.8	3.8	3.8	3.8	
<i>Rosa multiflora</i>	Multiflora rose	Shrub							2														1								0.0	1.5	0.0	0.0	
<i>Salix nigra</i>	Black willow	Tree									1										6										0.0	3.5	0.0	3.0	
<i>Sambucus canadensis</i>	Common elderberry	Shrub						1		1																					0.0	5.7	0.0	0.0	
<i>Ulmus sp.</i>	Elm	Tree																													3.0	3.0	2.5	5.3	
<i>Ulmus alata</i>	Winged elm	Tree														1															2	0.0	1.5	0.0	0.0
<i>Ulmus americana</i>	American elm	Tree		22	1	1	1	1					4	4																	4	2.0	5.5	2.0	2.0
<b>Plot Area (acres)</b>			0.0247		0.0247		0.0247		0.0247		0.0247		0.0247		0.0247		0.0247		0.0247		0.0247		0.0247		0.0247										
<b>Species Count</b>			4	11	5	10	4	4	3	6	3	8	4	4	3	3	2	4	3	6	5	8	3	5	3	6	5	6	4	6	3.64	6.21	4.1	6.1	
<b>Stem Count</b>			11	86	10	35	11	13	9	13	9	27	12	12	7	7	7	9	11	22	7	31	12	14	10	36	13	20	13	19	10.1	24.6	11.4	30.5	
<b>Stems per Acre</b>			445	3482	405	1417	445	526	364	526	364	1093	486	486	283	283	283	364	445	891	283	1255	486	567	405	1457	526	810	526	769	411	995	463	1235	



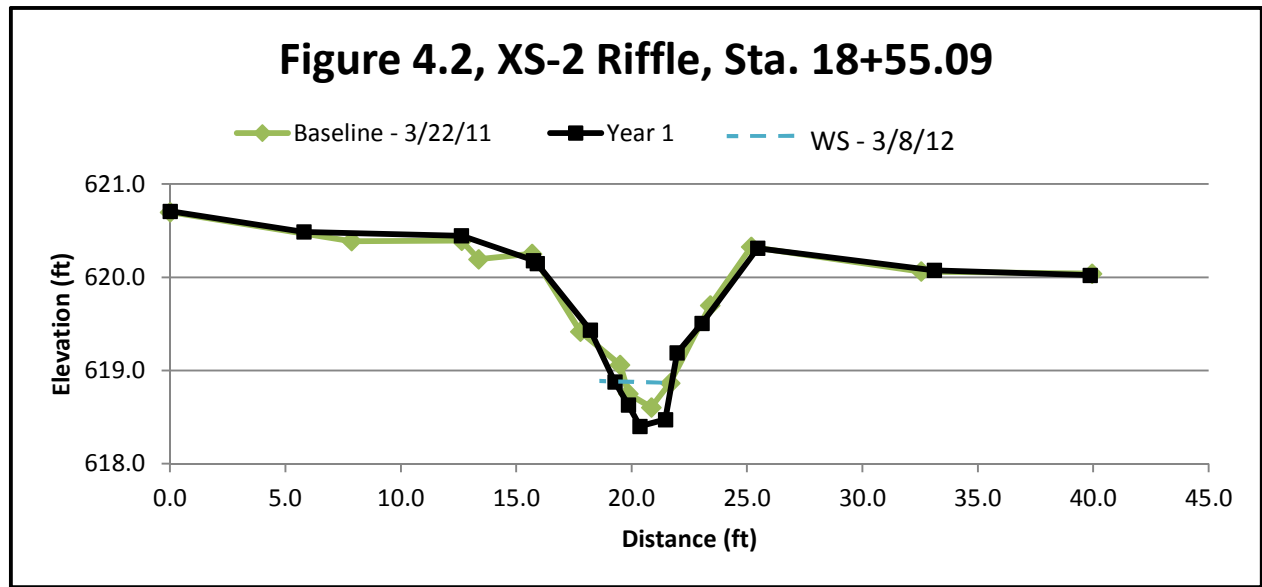
## Appendix D. Stream Survey Data



XS-1 Riffle, Sta. 12+73.50	Baseline		MY1	
	Sta.	Elev.	Sta.	Elev.
	0.00	622.50	0.00	622.49
	4.66	622.55	11.29	622.52
	12.17	622.19	13.30	622.16
	14.34	622.00	15.92	622.02
	16.56	622.02	16.91	622.01
	18.81	621.12	18.13	621.43
	19.28	620.93	18.97	621.05
	19.76	620.78	19.79	620.81
	20.16	620.31	19.94	620.47
	21.49	620.47	20.89	620.52
	22.46	620.41	22.97	620.66
	23.07	620.47	23.97	621.12
	24.02	621.09	24.58	621.33
	26.83	621.95	25.77	621.82
	30.75	621.98	27.38	622.05
	36.99	622.25	31.09	622.07
	42.53	622.24	35.19	622.34
			42.46	622.25

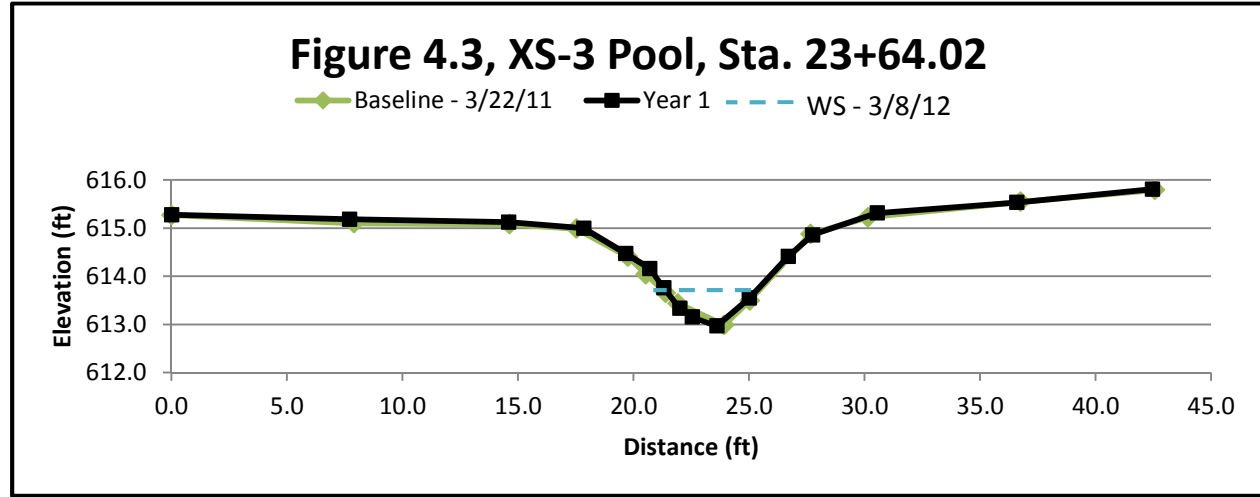


XS-2 Riffle, Sta. 18+55.09	Baseline		MY1	
	Sta.	Elev.	Sta.	Elev.
	0.00	620.70	0.00	620.71
	7.86	620.39	5.80	620.49
	12.63	620.39	12.62	620.45
	13.37	620.19	15.74	620.18
	15.68	620.25	15.90	620.15
	17.78	619.42	18.20	619.43
	19.50	619.06	19.27	618.88
	19.86	618.75	19.85	618.63
	20.85	618.60	20.36	618.40
	21.67	618.87	21.46	618.47
	23.40	619.70	21.97	619.19
	25.18	620.33	23.05	619.51
	32.54	620.06	25.46	620.31
	39.94	620.04	33.11	620.07
			39.86	620.02

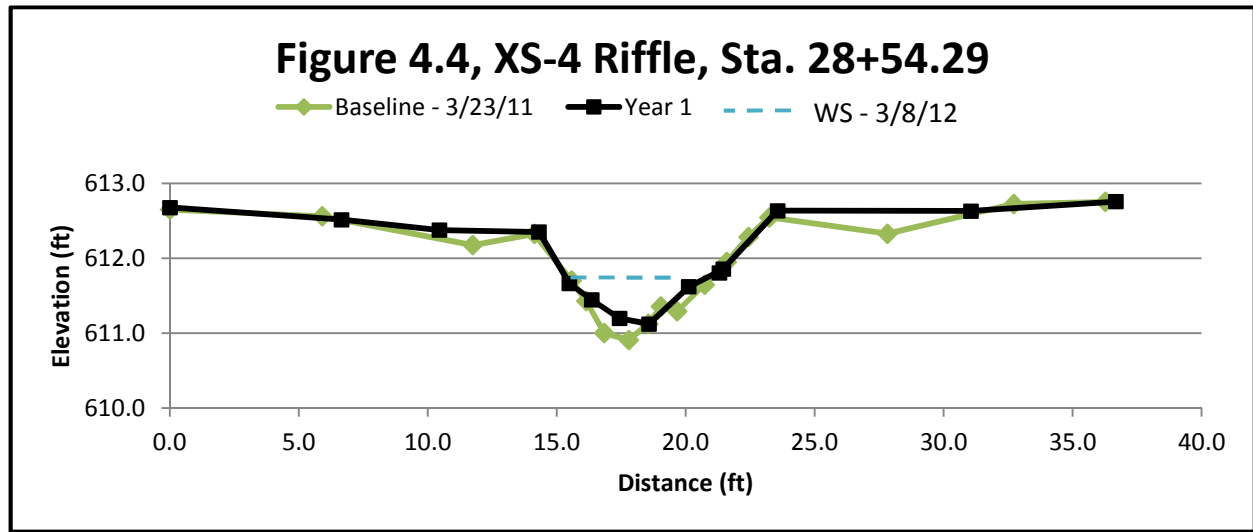




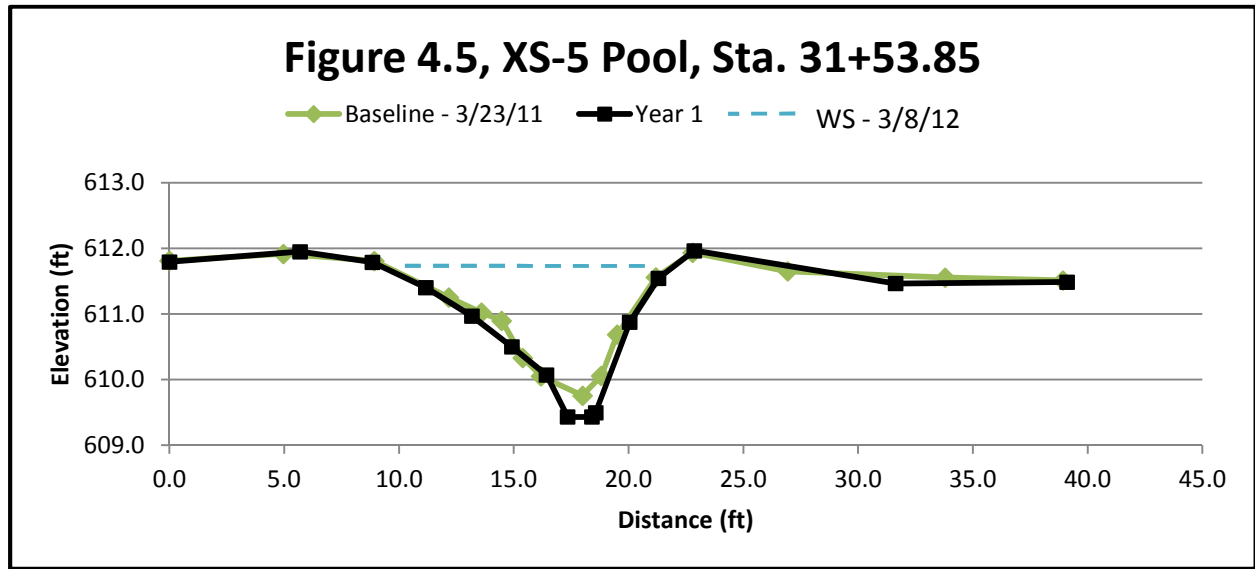
XS-3 Pool, Sta. 23+64.02	Baseline		MY1	
	Sta.	Elev.	Sta.	Elev.
	0.00	615.27	0.0	615.28
	7.90	615.10	7.7	615.18
	14.63	615.08	14.6	615.12
	17.53	614.99	17.8	615.00
	19.75	614.41	19.7	614.47
	20.53	614.04	20.7	614.16
	21.39	613.65	21.3	613.76
	21.92	613.43	22.0	613.33
	23.93	612.99	22.5	613.15
	25.03	613.49	23.6	612.96
	27.66	614.87	25.0	613.54
	30.14	615.22	26.7	614.41
	36.75	615.54	27.8	614.86
	42.56	615.79	30.5	615.31
			36.6	615.53
			42.5	615.81



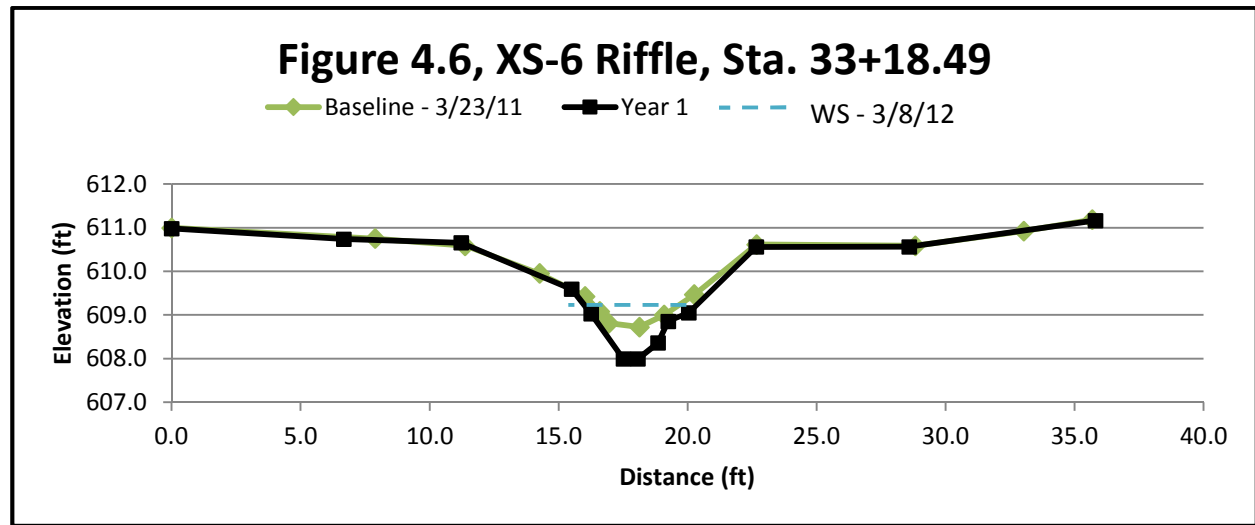
XS-4 Riffle, Sta. 28+54.29	Baseline		MY1	
	Sta.	Elev.	Sta.	Elev.
	0.00	612.65	0.00	612.68
	5.91	612.56	6.65	612.52
	11.74	612.18	10.45	612.38
	14.13	612.33	14.31	612.35
	15.57	611.70	15.49	611.66
	16.14	611.43	16.36	611.45
	16.84	611.00	17.43	611.20
	17.79	610.91	18.58	611.12
	18.55	611.13	20.12	611.62
	19.04	611.36	21.46	611.86
	19.67	611.30	21.31	611.81
	20.73	611.65	23.56	612.64
	21.59	611.95	31.05	612.63
	22.43	612.29	36.67	612.76
	23.24	612.55		
	27.82	612.33		
	32.72	612.73		
	36.27	612.75		



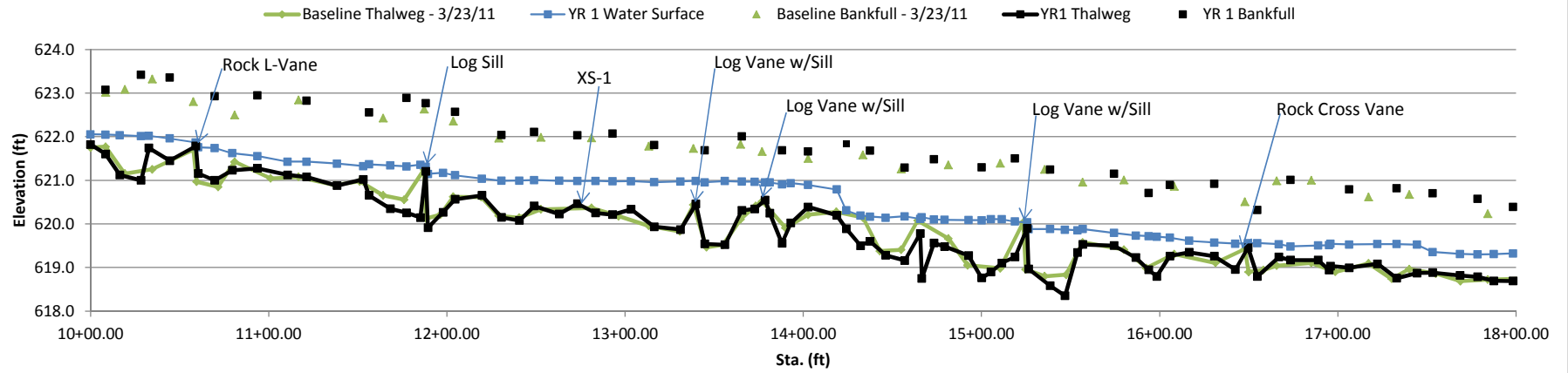
XS-5 Pool, Sta. 31+53.85	Baseline		MY1	
	Sta.	Elev.	Sta.	Elev.
	0.00	611.81	0.00	611.79
	4.96	611.92	5.69	611.95
	8.92	611.81	8.84	611.79
	12.17	611.25	11.17	611.40
	13.60	611.02	13.18	610.97
	14.48	610.90	14.92	610.50
	15.40	610.33	16.43	610.07
	16.19	610.05	17.35	609.43
	18.00	609.75	18.40	609.43
	18.81	610.06	18.57	609.50
	19.50	610.68	20.05	610.88
	21.19	611.56	21.30	611.54
	22.79	611.94	22.87	611.97
	26.94	611.65	31.64	611.47
	33.80	611.56	39.11	611.49
	38.93	611.51		



XS-6 Riffle, Sta. 33+18.49	Baseline		MY1	
	Sta.	Elev.	Sta.	Elev.
	0.00	611.00	0.00	610.98
	7.89	610.75	6.68	610.74
	11.38	610.58	11.23	610.66
	14.26	609.95	15.51	609.59
	16.03	609.43	16.26	609.03
	16.60	609.08	17.51	607.99
	16.95	608.81	18.07	607.99
	18.13	608.72	18.85	608.36
	19.09	609.00	19.25	608.85
	20.26	609.47	20.05	609.05
	22.68	610.61	22.66	610.56
	28.83	610.59	28.59	610.56
	33.03	610.92	35.81	611.16
	35.68	611.18		



### Figure 5.1 UT Rocky River - Longitudinal Profile



### Figure 5.2 UT Rocky River - Longitudinal Profile

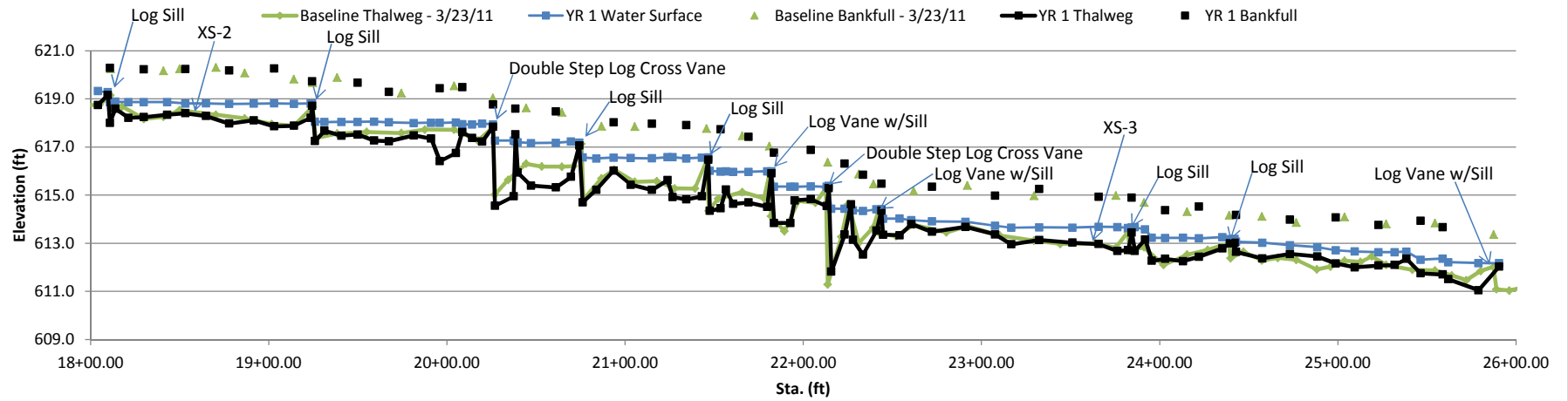
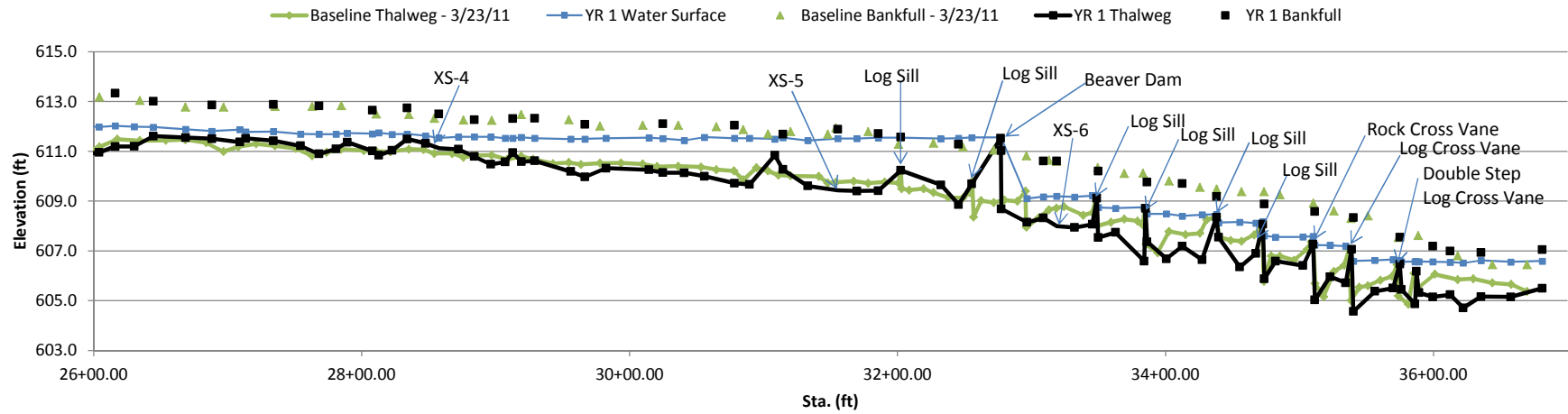


Figure 5.3 UT Rocky River - Longitudinal Profile





**Table 11. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross Section)**

**UT Rocky River - Harris Road Middle (EEP IMS No. 92383)**

**UT Rocky River: 2,715 lf**

	Cross Section 1 (Riffle)							Cross Section 2 (Riffle)						
<b>Dimension and substrate<sup>1</sup></b>	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	10.1	10.30						9.3	10.06					
Floodprone Width (ft)	185	185						175	175					
Bankfull Mean Depth (ft)	0.9	0.87						0.9	0.83					
Bankfull Max Depth (ft)	1.6	1.56						1.65	1.83					
Bankfull Cross Sectional Area (ft <sup>2</sup> )	9.2	8.93						8.0	8.33					
Bankfull Width/Depth Ratio	11.1	11.85						10.8	12.12					
Bankfull Entrenchment Ratio	18.3	17.94						18.8	17.4					
Bankfull Bank Height Ratio	1	1						1	1					
	Cross Section 3 (Pool)							Cross Section 4 (Riffle)						
<b>Dimension and substrate<sup>1</sup></b>	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	11.02	10.13						8.5	8.88					
Floodprone Width (ft)	132	132						292	292					
Bankfull Mean Depth (ft)	0.97	0.96						0.8	0.85					
Bankfull Max Depth (ft)	2	1.97						1.4	1.38					
Bankfull Cross Sectional Area (ft <sup>2</sup> )	10.68	9.75						6.7	7.5					
Bankfull Width/Depth Ratio	11.36	10.55						10.7	10.45					
Bankfull Entrenchment Ratio	12	13.03						34.3	32.88					
Bankfull Bank Height Ratio	1	1						1	1					
	Cross Section 5 (Pool)							Cross Section 6 (Riffle)						
<b>Dimension and substrate<sup>1</sup></b>	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	13.3	13.71						11.6	11.24					
Floodprone Width (ft)	300	300						250	250					
Bankfull Mean Depth (ft)	0.9	1.09						0.9	1.18					
Bankfull Max Depth (ft)	2.05	2.45						1.9	2.62					
Bankfull Cross Sectional Area (ft <sup>2</sup> )	12.3	14.95						10.7	13.27					
Bankfull Width/Depth Ratio	14.5	12.58						12.6	9.53					
Bankfull Entrenchment Ratio	22.6	21.88						21.6	22.24					
Bankfull Bank Height Ratio	1	1						1	1					

<sup>1</sup> = Based on current bankfull elevation, determined by field indicators of bankfull.



Table 12. Monitoring Data - Stream Reach Data Summary

UT Rocky River - Harris Road Middle (EEP IMS No. 92383)

UT Rocky River - 2.715 lf

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
<b>Dimension and substrate - Riffle only</b>																																				
Bankfull Width (ft)	8.50	9.88	9.70	11.60	1.32	4	8.88	10.12	10.18	11.24	0.97	4																								
Floodprone Width (ft)	175.00	225.50	217.50	292.00	55.42	4	175.00	225.50	217.50	292.00	55.42	4																								
Bankfull Mean Depth (ft)	0.80	0.88	0.90	0.90	0.05	4	0.83	0.93	0.86	1.18	0.17	4																								
<sup>1</sup> Bankfull Max Depth (ft)	1.40	1.64	1.63	1.90	0.21	4	1.38	1.85	1.70	2.62	0.55	4																								
Bankfull Cross Sectional Area (ft <sup>2</sup> )	6.70	8.65	8.60	10.70	1.71	4	7.50	9.51	8.63	13.27	2.58	4																								
Width/Depth Ratio	10.70	11.30	10.95	12.60	0.88	4	9.53	10.99	11.15	12.12	1.22	4																								
Entrenchment Ratio	18.30	23.25	20.20	34.30	7.51	4	17.40	22.62	20.09	32.88	7.18	4																								
<sup>1</sup> Bank Height Ratio	1	1	1	1	0	4	1	1	1	1	0	4																								
<b>Profile</b>																																				
Riffle Length (ft)	9.05	45.88	46.41	88.46	24.23	32	2.68	27.52	25.65	73.53	17.11	35																								
Riffle Slope (ft/ft)	0.001	0.004	0.003	0.013	0.002	32	0.000	0.005	0.002	0.048	0.011	35																								
Pool Length (ft)	3.94	15.98	14.75	32.84	7.40	46	1.72	23.68	23.17	69.48	12.65	65																								
Pool Max Depth (ft)	1.48	2.23	2.07	4.85	0.56	46	0.84	2.18	2.11	3.76	0.62	65																								
Pool Spacing (ft)	13.31	45.43	37.86	98.34	24.40	45	7.52	40.69	35.43	99.43	22.98	64																								
<b>12.3</b>																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																																				
Re:Bankfull Width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
<b>Additional Reach Parameters</b>																																				
Rosgen Classification	C5						C5																													
Channel Thalweg length (ft)	2715						2715																													
Sinuosity (ft)	1.25						1.25																													
Water Surface Slope (Channel) (ft/ft)	0.006						0.006																													
BF slope (ft/ft)	0.006						0.006																													
<sup>3</sup> Ri% / P%	43% / 57%						38% / 62%																													
<sup>3</sup> SC% / Sa% / G% / C% / B% / Be%																																				
<sup>3</sup> d16 / d35 / d50 / d84 / d95																																				
<sup>2</sup> % of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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

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

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

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



**Appendix E. Hydrologic Data**

**Table 7. Verification of Bankfull Events**

Date	Crest Gauge Info		Gauge Reading (ft)	Gauge Elevation (ft)	Crest Elevation (ft)	Bankfull Elevation (ft)	Height above Bankfull (ft)	Photo
	Site	Sta.						
3/8/2012	1	16+85	0.75	620.65	621.40	621.05	0.35	6.1
10/4/2012	1	16+85	1.13	620.65	621.78	621.05	0.73	6.2



**Figures 4.1 & 6.2 Crest Gauge Photos**