

Monitoring Report MY02

**Cedar Branch Restoration Site
Monitoring Year 02
DMS Contract 6598
DMS Project Number 97009**

**DWR #: 20150904
USACE Action ID: 2003-21395
Randolph County, North Carolina**



Prepared for:
NCDMS, 1652 Mail Service Center, Raleigh, NC 27699-1652

**Monitoring Data Collected: 2019
Date Submitted: December 2019**

Mitigation Project Name Cedar Branch Restoration Site
DMS ID 97009
River Basin Yadkin
Cataloging Unit 03040103

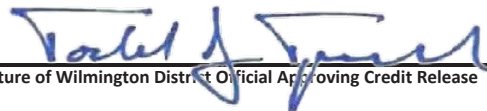
County Randolph
Date Project Instituted 7/15/2015
Date Prepared 6/13/2019

USACE Action ID 2003-21395
NCDWR Permit No 2015-0904

Credit Release Milestone	Stream Credits						Wetland Credits							
	Scheduled Releases (Stream)	Warm	Cool	Cold	Anticipated Release Year (Stream)	Actual Release Date (Stream)	Scheduled Releases (Forested)	Riparian Riverine	Riparian Non-riverine	Non-riparian	Scheduled Releases (Coastal)	Coastal	Anticipated Release Year (Wetland)	Actual Release Date (Wetland)
Potential Credits (Mitigation Plan)		6,200.000												
Potential Credits (As-Built Survey)		6,200.000												
1 (Site Establishment)	N/A				N/A	N/A	N/A				N/A		N/A	N/A
2 (Year 0 / As-Built)	30%	1,860.000			2018	8/20/2018	30%				30%		N/A	N/A
3 (Year 1 Monitoring)	10%	620.000			2019	4/26/2019	10%				10%		N/A	N/A
4 (Year 2 Monitoring)	10%				2020		10%				15%		N/A	N/A
5 (Year 3 Monitoring)	10%				2021		15%				20%		N/A	N/A
6 (Year 4 Monitoring)	5%				2022		5%				10%		N/A	N/A
7 (Year 5 Monitoring)	10%				2023		15%				15%		N/A	N/A
8 (Year 6 Monitoring)	5%				2024		5%				N/A		N/A	N/A
9 (Year 7 Monitoring)	10%				2025		10%				N/A		N/A	N/A
Stream Bankfull Standard	10%						N/A				N/A			
Total Credits Released to Date		2,480.000												

NOTES:

CONTINGENCIES:



Signature of Wilmington District Official Approving Credit Release

27 Sept 2019

Date

- 1 - For NCDMS, no credits are released during the first milestone
- 2 - For NCDMS projects, the second credit release milestone occurs automatically when the as-built report (baseline monitoring report) has been made available to the NCIRT by posting it to the NCDMS Portal, provided the following criteria have been met:
 - 1) Approval of the final Mitigation Plan
 - 2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property
 - 3) Completion of all physical and biological improvements to the mitigation site pursuant to the mitigation plan
 - 4) Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required
- 3 - A 10% reserve of credits is to be held back until the bankfull event performance standard has been met

Monitoring and Design Firm

Prepared by:



KCI Associates of North Carolina, PC
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(919) 783-9214

Project Contact: Tim Morris
Email: tim.morris@kci.com



MEMORANDUM

Date: February 11, 2020

To: Matthew Reid, DMS Project Manager

From: Tim Morris, Project Manager
KCI Associates of North Carolina, PA

Subject: Cedar Branch Stream Restoration Site
MY-02 Monitoring Report Comments
Yadkin River Basin CU 03040103
Randolph County, North Carolina
NCDMS Project # 97009
Contract # 006598

Please find below our responses in italics to the MY-02 Baseline Monitoring Report comments from NCDMS received on January 17, 2020, for the Cedar Branch Stream Restoration Site.

Did KCI conduct any invasive species treatment or beaver removal on site during MY2? If so, please add short discussion and dates to Table 2.

➤ *No invasive treatments or beaver removals have occurred on site.*

For transparency, please add Crossing Repair (outside easement) May 2019 to Table 2.

➤ *This has been added to Table 2.*

There are no discussions of stream problem areas or vegetation problem areas in the MY2 report. Also, Table 5 indicates that the entire site is “Stable, Performing as Intended” for 100% of all metrics. In the past, the IRT has commented that these percentages often times do not accurately reflect the site condition after conducting visits. Is KCI confident that Table 5 accurately reflects the site condition at Cedar Branch?

➤ *KCI is confident that all project reaches are stable and performing as intended. Based on this comment, Table 6 was reassessed as well and a couple areas of invasive species (Chinese privet) and one area of low stem density have been called out. KCI is planning to treat these areas of privet in the spring of 2020 and is evaluating the need for a supplemental planting in the low stem density area.*

The cross sections in Table 9 are not in numerical order and make reviewing the report difficult. Please reorganize Table 9 so cross sections are shown numerically in order.

➤ *The cross-sections in Table 9 were organized by reach. They have been reorganized to be in numerical order.*

Please add the following note (or something similar) to Table 9 to distinguish how BHR and other parameters are measured: “Bank Height Ratios are calculated based on the baseline (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section parameters are calculated based on the current year’s low bank height.”

➤ *This note has been added to the report.*

Sincerely,

A handwritten signature in black ink, appearing to read "Tim Morris".

Tim Morris
Project Manager

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PROJECT SUMMARY

The Cedar Branch Restoration Site (CBRS) was completed in April 2018 and restored a total of 7,047 linear feet of stream. The CBRS is a riparian system in the Lower Yadkin River Basin (03040103 8-digit cataloging unit) in Randolph County, North Carolina. The site's natural hydrologic regime had been substantially modified through the relocation and straightening of the existing stream channels, impacted by cattle access, and cleared of any riparian buffer. This completed project restored impacted agricultural lands to a stable stream ecosystem with a functional riparian buffer and floodplain access.

The CBRS is protected by a 20.6 acre permanent conservation easement, held by the State of North Carolina. The site is located approximately 2.8 miles west of Sophia, North Carolina. Specifically, the site is 0.5 mile west on Mt. Olive Church Road from its intersection with Edgar Road (SR-1526).

The North Carolina Ecosystem Enhancement Program (NCEEP) publication in 2009 identified HUC 03040103050040 (Caraway Creek) as a Targeted Local Watershed (TLW). The project is also located within the Upper Uwharrie Local Watershed Plan (LWP) study area. The goals and priorities for the CBRS are based on the information presented in the Lower Yadkin River Basin Restoration Priorities: maintaining and enhancing water quality, restoring hydrology, and improving fish and wildlife habitat (NCEEP, 2009). The project will support the following basin priorities:

- Managing stormwater runoff
- Reducing fecal coliform inputs
- Improving/restoring riparian buffers
- Reducing sediment loading
- Improving stream stability
- Reducing nutrient loading
- Excluding livestock and implementing other agricultural BMP's

The goals for the project are to:

- Restore channelized and livestock-impacted streams to stable C/Cb channels.
- Restore a forested riparian buffer to provide bank stability, filtration, and shading.

The project goals will be addressed through the following objectives:

- Relocate a channelized stream to its historic landscape position.
- Install cross-sections sized to the bankfull discharge.
- Create bedform diversity with pools, riffles, and habitat structures
- Fence out livestock to reduce nutrient, bacterial, and sediment impacts from adjacent grazing and farming practices.
- Plant the site with native trees and shrubs and an herbaceous seed mix.

To restore the site, the stream was re-meandered and the bankfull elevation was tied to the historic floodplain where feasible. This restoration is expected to create wetland pockets throughout the new floodplain and bankfull bench. The entire site was planted to establish a forested riparian buffer.

The monitoring components were installed in April 2018. Three groundwater monitoring wells were installed to monitor the development of wetlands in the floodplain along the EI portions of T1 and T3. Three automatically recording pressure transducer stream gauges that take a reading every 10 minutes were installed near the top of T1, T1-1, and T3 to document flow within those reaches. Cameras were installed in the vicinity of each of these gauges and set to record a short video once a day to provide additional verification of flow. An additional stream gauge was installed along UTCC to record the occurrence of bankfull events. Thirteen 10 m x 10 m permanent vegetation monitoring plots were established. The locations of the planted stems relative to the origin within these plots, as well as the species, were recorded and planted stems were grouped into size categories (0-10 cm, 10-50 cm, 50-100 cm, >137 cm). Any

volunteers found within the plots were also grouped into size categories by species, but separate from the planted stems. Twelve permanent photo reference points were established and will be taken annually. Fifteen permanent cross-sections (ten riffle cross-sections and five pool cross-sections) were also established and a detailed longitudinal profile of the stream was taken. Wolman pebble counts were performed at all of the riffle cross-sections. The cross-section measurements will be repeated in future monitoring years, but the longitudinal profile will only be repeated if there are concerns about bed elevation adjustments. Reports will be submitted to DMS each year.

Vegetative success criteria for the site is 320 woody stems/acre after three years, 260 woody stems/acre after five years, and 210 woody stems/acre after seven years. A minimum of two bankfull events in separate years must also be recorded during the monitoring period. Bank height ratios should not exceed 1.2 and the entrenchment ratios should be 2.2 or greater. Visual assessments will also be used to identify problem areas.

MONITORING RESULTS

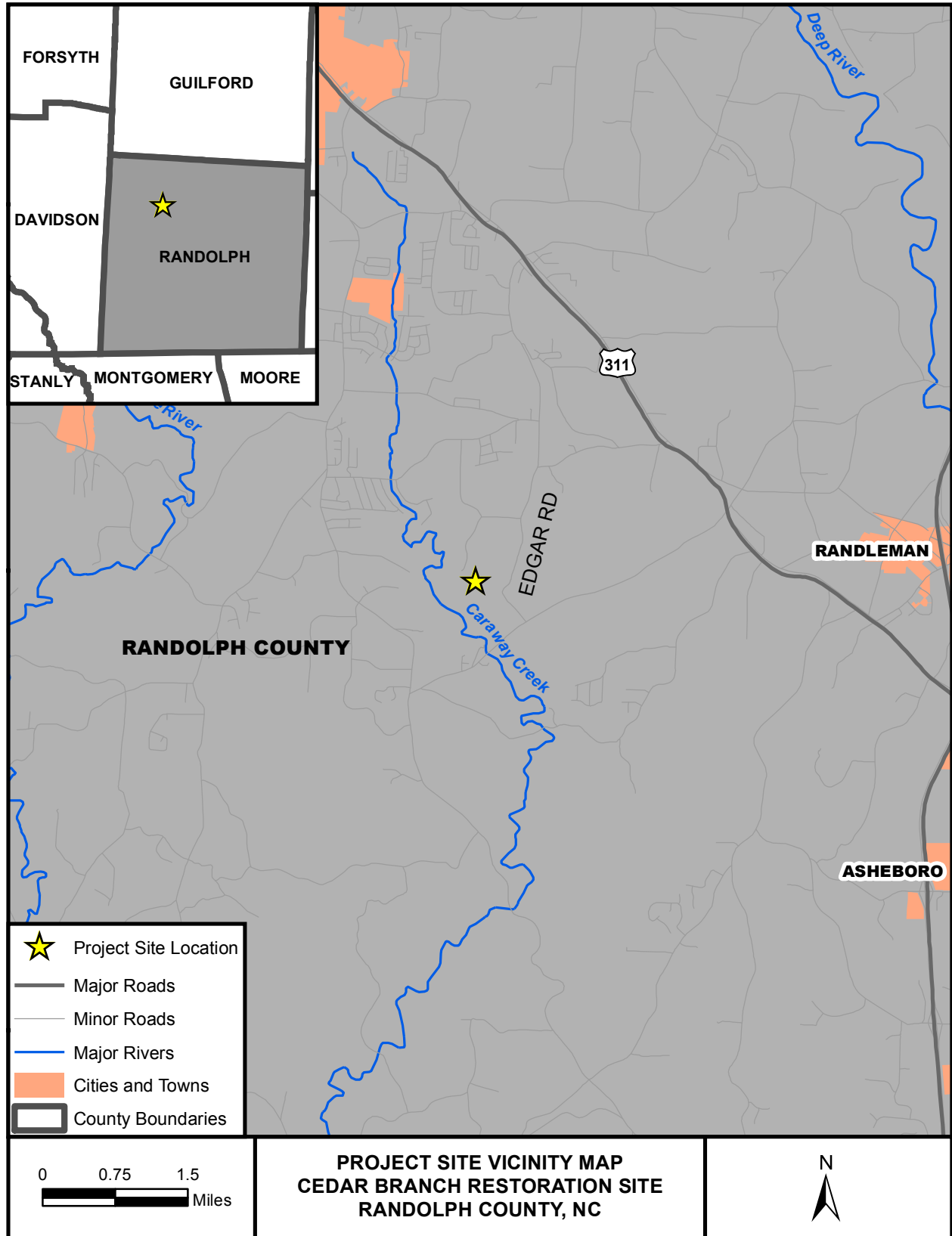
The second-year vegetation monitoring was conducted July 9, 2019. The site averaged 738 planted stems/acre across all 13 plots. Twelve of the thirteen plots had greater than 320 planted stems/acre, including volunteers, the site averaged 766 total stems/acre. In general the site is well vegetated, with widespread herbaceous coverage and healthy planted stems.

In addition to traditional stream monitoring, there are areas of fringe wetlands that were restored and enhanced along the bankfull benches of some reaches that will be monitored for informational purposes. These areas do not have success criteria associated with them, but they help illustrate the overall success of the restoration site. According to the Randolph County Soil Survey, the growing season at the CBRS extends from March 24 to November 13 (235 days). Daily rainfall data were obtained from the NC State Climate Office for a local weather station in Asheboro, NC. In 2019, October experienced above average rainfall, while February, April, June, and July experienced average rainfall. The months of January, March, May, August, September, and November experienced below average rainfall for the site. Overall, the area experienced below average rainfall during the 2019 growing season. During the site's second growing season, the groundwater monitoring well on T1 achieved 63 days (26.6%) of continuous saturation within twelve inches of the soil surface, while the two wells on T3 achieved 148 days (63.0%) and 26 days (10.9%). Several species of hydrophytic vegetation was also noted growing along the floodplains of T1 and T3 including *Juncus effuses* (FACW), *Cyperus strigosus* (FACW), *Persicaria pensylvanica* (FACW), and *Persicaria sagittata* (OBL). The stream gauge near the bottom of UTCC recorded 12 bankfull events in 2019. All three stream flow gauges recorded at least 30 consecutive days of flow. T1 recorded a maximum of 46 consecutive days of flow, while T1-1 recorded 66 days and T3 recorded 187 days. The gauge data was further backed up by the cameras on site. Based on the video recordings obtained from the cameras, T1 had flow for a maximum of 260 consecutive days, T1-1 had flow for a maximum of 105 consecutive days, and T3 had flow for a maximum of 252 consecutive days. The difference in these numbers from those obtained from the gauges is largely due to fact that the streams often flow at levels too small for the gauges to record.

The longitudinal profile was not repeated for the second-year monitoring because the baseline survey found that the stream was constructed as designed, and there were no concerns about bed elevation adjustments. The second-year cross-section survey found that the dimensions of the stream are as designed, with some small variation as is typical for stream restoration projects. The monitored cross-section data have been calculated by adjusting the bankfull elevation to maintain the baseline bankfull area for each cross-section. A total cross-sectional area metric has been added to the cross-section data to indicate the cross-sectional area below the baseline bankfull elevation.

In May 2019, damage to the main stream crossing from Hurricane Michael the previous year was repaired. This work took place outside of the easement and did not impact the project stream.

Figure 1. Project Site Vicinity Map



REFERENCES

- NCDENR, Ecosystem Enhancement Program. 2009. Broad River Basin Restoration Priorities 2009. Raleigh, NC. Last accessed 1/2016 at:
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- NCDENR, Ecosystem Enhancement Program. 2014. NCDENR, Ecosystem Enhancement Program. 2014. Stream and Wetland Mitigation Monitoring Guidelines. Last accessed 1/2016 at:
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- NC Wetland Functional Assessment Team. 2010. NC Wetland Assessment Method (NC WAM) User Manual, version 4.1. Last accessed 11/2012 at:
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- Schafale, M.P. and A.S. Weakley. 2012. Guide to the Natural Communities of North Carolina: Fourth Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment and Natural Resources. Raleigh, NC.
- Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. *Soil Survey of Randolph County, North Carolina*. 2006

APPENDIX A

Background Tables

Table 1. Project Components and Mitigation Credits Cedar Branch Restoration Site, DMS Project #97009									
Mitigation Credits									
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Linear Feet/Acres	5,230	1,813							
Credits†	5,234	966							
TOTAL CREDITS	6,200								
Project Components									
Project Component -or- Reach ID	Stationing/ Location		Existing Footage/ Acreage	Approach (PI, PII etc.)	Restoration -or- Restoration Equivalent	Restoration Footage/ Acreage	Mitigation Ratio		
Tributary 1	50+00 to 55+50		550	Enhancement II	220	550	2.5:1		
	55+50 to 58+24		257	Enhancement I	183	274	1.5:1		
	58+24 to 61+17		229	Restoration	294	293	1:1		
Tributary 1-1	70+00 to 73+13		313	Enhancement II	125	313	2.5:1		
Tributary 2	80+00 to 80+49		46	Enhancement II	20	49	2.5:1		
	80+49 to 81+27		77	Restoration	78	78	1:1		
Tributary 3	90+00 to 96+27		624	Enhancement I	418	627	1.5:1		
	96+27 to 101-57		517	Restoration	530	530	1:1		
Tributary 3-1	150+00 to 150+78		68	Restoration	78	78	1:1		
Tributary 4*	250+00 to 257+42		677	Restoration	692	692	1:1		
Tributary 5**	300+00 to 300+95		64	N/A	0	(95)	N/A		
UTCC*	10+00 to 46+09		3,246	Restoration	3,562	3,559	1:1		
Component Summation									
Restoration Level	Stream (linear feet)	Riparian Wetlands (Acres)		Non-Riparian Wetlands (Acres)	Buffer (square feet)	Upland (Acres)			
		Riverine	Non-Riverine						
Restoration	5,234 lf								
Enhancement									
Enhancement I	901								
Enhancement II	912								
TOTAL CREDITS	6,200								

R= Restoration RE= Restoration Equivalent of Creation or Enhancement

*=Crossings have been removed from creditable linear footage for all project streams.

**=Tributary 5 does not have any mitigation credit, but is included to show its stationing as part of the mitigation project.

†=Changes made during construction resulted in the loss of 4 lf of stream, but per IRT review, this did not result in a loss of credits. Please see Appendix F for additional information.

Table 2. Project Activity & Reporting History Cedar Branch Restoration Sites, DMS Project #97009		
Activity or Report	Data Collection Complete	Actual Completion or Delivery
Mitigation Plan		May 2017
Final Design - Construction Plans		March 8, 2017
Construction Grading Completed		March 28, 2018
Planting Completed		April 6, 2018
Baseline Monitoring/Report	April 2018	May 2018
<i>Vegetation Monitoring</i>	<i>April 10, 2018</i>	
<i>Stream Survey</i>	<i>April 11, 2018</i>	
Year 1 Monitoring	January 2019	January 2019
<i>Vegetation Monitoring</i>	<i>November 5, 2018</i>	
<i>Stream Survey</i>	<i>January 14, 2019</i>	
Crossing Repair(outside easement)	May 2019	
Year 2 Monitoring	July 2019	December 2019
<i>Vegetation Monitoring</i>	<i>July 9, 2019</i>	
<i>Stream Survey</i>	<i>June 26, 2019</i>	

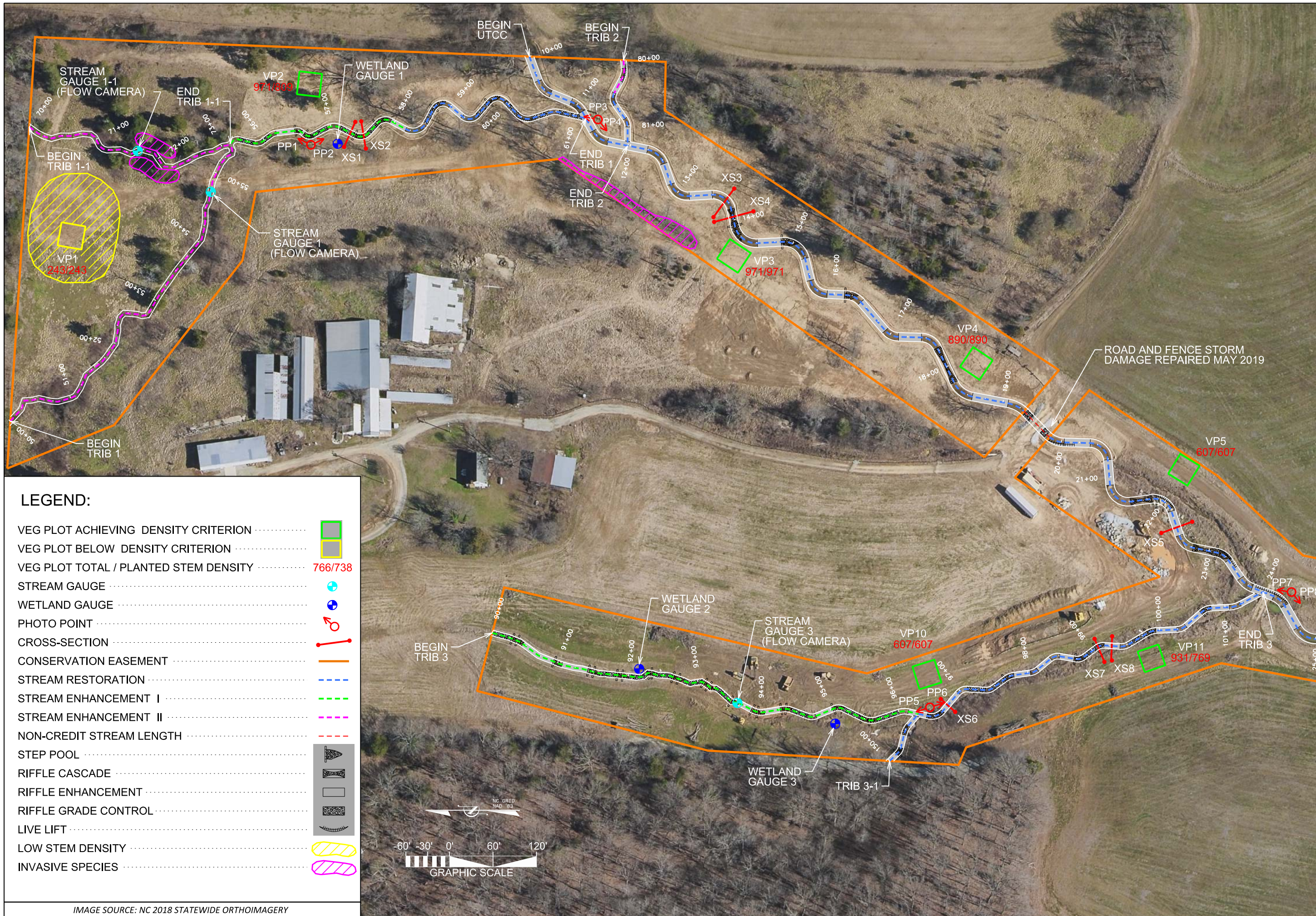
Table 3. Project Contacts Cedar Branch Restoration Sites, DMS Project #97009	
Design Firm	KCI Associates of North Carolina, PC 4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 278-2512 Fax: (919) 783-9266
Construction Contractor	KCI Environmental Technologies and Construction 4505 Falls of Neuse Road, Suite 400 Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 278-2512
Planting Contractor	Conservation Services Inc. 1620 N. Delphine Ave. Waynesboro, VA 22980 Contact: Mr. David Coleman Phone: (540) 941-0067
Monitoring Performers	KCI Associates of North Carolina, PC 4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266

Table 4. Project Information						
Cedar Branch Restoration Site, DMS Project #97009						
Project Name	Cedar Branch Restoration Site					
County	Randolph County					
Project Area (acres)	21.3 acres					
Project Coordinates (lat. and long.)	35.823878° N, -79.90855° W					
Project Watershed Summary Information						
Physiographic Province	Piedmont					
River Basin	Yadkin					
USGS Hydrologic Unit 8-digit	03040103	USGS Hydrologic Unit 14-digit		03040103050040		
DWQ Sub-basin	13-2-3					
Project Drainage Area (acres)	294 acres					
Project Drainage Area Percentage of Impervious Area	4%					
CGIA Land Use Classification	Managed Herbaceous Cover 59% (173 ac), Mixed Hardwoods/Conifers 34% (100 ac), Low Density Developed 5% (15 ac), Transportation 2% (6 ac)					
Existing Reach Summary Information						
Parameters	UTCC	T1, T1-1	T2	T3, T3-1	T4	T5
Length of reach (linear feet)	3,038	1,349	124	1,209	627	61
Drainage area (acres)	88 acres	30 acres	18 acres	28 acres	30 acres	31 acres
NCDWQ Water Quality Classification	C	C	C	C	C	C
Rosgen Classification	G4c-E4	G4	G4	E4	G4	C4b
Evolutionary trend	Channelized, Stage III	Channelized, Stage III	Channelized, Stage III	Channelized, Stage III	Channelized, Stage III	Stable
Mapped Soil Series	Mecklenburg Clay Loam	Wynott-Enon Complex	Mecklenburg Clay Loam	Mecklenburg Clay Loam	Mecklenburg Clay Loam	Mecklenburg Clay Loam
Drainage class	Well drained	Well drained	Well drained	Well drained	Well drained	Well drained
Soil Hydric status	Hydric	Hydric	Hydric	Hydric	Hydric	Hydric
Slope	1.5%	3.1%	3.1%	3.7%	3.1%	2.7%
FEMA classification	Zone X	Zone X	Zone X	Zone X	Zone X	Zone X
Existing vegetation community	Pasture, Headwater Forest	Pasture, Headwater Forest	Headwater Forest	Pasture	Pasture	Headwater Forest
Existing Wetland Summary Information						
Parameters						
Size of Wetland (acres)	0.02 (WA)		0.03 (WB and WC)			
Wetland Type	Bottomland Hardwood Forest		Bottomland Hardwood Forest			
Mapped Soil Series	Wynott-Enon Complex		Mecklenburg clay loam			
Drainage class	Well Drained		Well Drained			
Soil Hydric Status	Hydric		Hydric			
Source of Hydrology	Stream Floodplain		Hillside Seepage and Stream Floodplain			
Hydrologic Impairment	Ditching and Grazing		Ditching and Grazing			
Existing vegetation community	Forested Wetland (Headwater Forest)		Emergent Wetland (Non-Tidal Freshwater Marsh)			

Regulatory Considerations			
Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States – Section 404	Yes	NWP 27	Jurisdictional Determination
Waters of the United States – Section 401	Yes	NWP 27	Jurisdictional Determination
Endangered Species Act	No	N/A	N/A
Historic Preservation Act	No	N/A	N/A
Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

APPENDIX B

Visual Assessment Data



LEGEND:

- VEG PLOT ACHIEVING DENSITY CRITERION
- VEG PLOT BELOW DENSITY CRITERION
- VEG PLOT TOTAL / PLANTED STEM DENSITY 766/738
- STREAM GAUGE +
- WETLAND GAUGE +
- PHOTO POINT ♂
- CROSS-SECTION —
- CONSERVATION EASEMENT
- STREAM RESTORATION
- STREAM ENHANCEMENT I
- STREAM ENHANCEMENT II
- NON-CREDIT STREAM LENGTH
- STEP POOL
- RIFFLE CASCADE
- RIFFLE ENHANCEMENT
- RIFFLE GRADE CONTROL
- LIVE LIFT
- LOW STEM DENSITY
- INVASIVE SPECIES

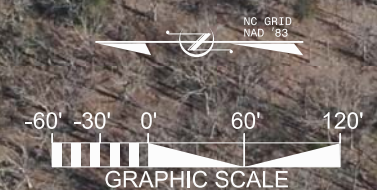


IMAGE SOURCE: NC 2018 STATEWIDE ORTHOIMAGERY

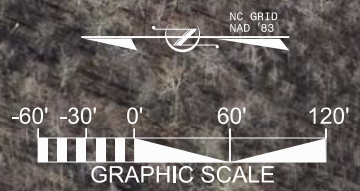
	REVISIONS
 KCI ASSOCIATES OF NC ENGINEERS • PLANNERS • SCIENTISTS 4605 FALLS OF NEUSE ROAD, SUITE 400 RALEIGH, NORTH CAROLINA 27609	
CEDAR BRANCH STREAM RESTORATION SITE MONITORING YEAR 2 RANDOLPH COUNTY, NORTH CAROLINA	
DATE: DEC 2019 SCALE: GRAPHIC	
CURRENT CONDITION PLAN VIEW	
SHEET 1 OF 2	



IMAGE SOURCE: NC 2018 STATEWIDE ORTHOIMAGERY

LEGEND:

- VEG PLOT ACHIEVING DENSITY CRITERION
- VEG PLOT BELOW DENSITY CRITERION
- VEG PLOT TOTAL / PLANTED STEM DENSITY 766/738
- STREAM GAUGE +
- WETLAND GAUGE +
- PHOTO POINT ⚙
- CROSS-SECTION ┆
- CONSERVATION EASEMENT
- STREAM RESTORATION
- STREAM ENHANCEMENT I
- STREAM ENHANCEMENT II
- NON-CREDIT STREAM LENGTH
- STEP POOL
- RIFFLE CASCADE
- RIFFLE ENHANCEMENT
- RIFFLE GRADE CONTROL
- LIVE LIFT
- LOW STEM DENSITY
- INVASIVE SPECIES



REVISIONS
 KCI ASSOCIATES OF NC ENGINEERS • PLANNERS • SCIENTISTS 4605 FALLS OF NEUSE ROAD, SUITE 400 RALEIGH, NORTH CAROLINA 27609
<p>CEDAR BRANCH STREAM RESTORATION SITE MONITORING YEAR 2 RANDOLPH COUNTY, NORTH CAROLINA</p>
<p>DATE: DEC 2019 SCALE: GRAPHIC</p> <p style="text-align: center;">CURRENT CONDITION PLAN VIEW</p>
SHEET 2 OF 2

Table 5 Visual Stream Morphology Stability Assessment

Cedar Branch Stream Restoration Site, DMS Project#97009

Reach ID UTCC

Assessed Length 3,559

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
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	48	48			100%
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	47	47			100%
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	47	47			100%
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	48	48			100%
2. Thalweg centering at downstream of meander (Glide)		47	47	100%			
Totals							
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%
	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%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%
Totals							
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	36	36			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	36	36			100%
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	36	36			100%
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	36	36			100%
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	36	36			100%

Table 5 Visual Stream Morphology Stability Assessment

Cedar Branch Stream Restoration Site, DMS Project#97009

Reach ID T1

Assessed Length 1,117

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
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	14	14		100%	
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	14	14		100%	
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	14	14		100%	
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	14	14		100%	
2. Thalweg centering at downstream of meander (Glide)		14	14	100%			
Totals					0	0	100%
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%
	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%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%
Totals					0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	5	5		100%	
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	5	5		100%	
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	5	5		100%	
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	5	5		100%	
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	5	5		100%	

Table 5 Visual Stream Morphology Stability Assessment

Cedar Branch Stream Restoration Site, DMS Project#97009

Reach ID T2

Assessed Length 127

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
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	4	4		100%	
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	3	3		100%	
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	3	3		100%	
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	4	4		100%	
2. Thalweg centering at downstream of meander (Glide)		3	3	100%			
Totals					0	0	100%
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%
	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%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%
Totals					0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	0	0		N/A	
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	0	0		N/A	
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	0	0		N/A	
	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)	0	0		N/A	
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	0	0		N/A	

Table 5 Visual Stream Morphology Stability Assessment

Cedar Branch Stream Restoration Site, DMS Project#97009

Reach ID T3

Assessed Length 1,157

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
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	27	27			100%
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	37	37			100%
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	37	37			100%
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	27	27			100%
2. Thalweg centering at downstream of meander (Glide)		37	37	100%			
Totals					0	0	100%
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%
	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%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	28	28			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	28	28			100%
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	28	28			100%
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	28	28			100%
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	28	28			100%

Table 5 Visual Stream Morphology Stability Assessment

Cedar Branch Stream Restoration Site, DMS Project#97009

Reach ID T4

Assessed Length 692

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
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	19	19		100%	
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	22	22		100%	
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	22	22		100%	
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	19	19		100%	
2. Thalweg centering at downstream of meander (Glide)		22	22	100%			
Totals							
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%
	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%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%
Totals							
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	13	13		100%	
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	13	13		100%	
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	13	13		100%	
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	13	13		100%	
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	13	13		100%	

Table 6 **Vegetation Condition Assessment**
Cedar Branch Stream Restoration Site, DMS Project# 97009
Planted Acreage 20.6

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	0.00	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	1	0.36	1.7%
Total				1	0.36	1.7%
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	0.00	0.0%
Cumulative Total				1	0.36	1.7%
Easement Acreage 20.6						
Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000 SF	Pattern and Color	3	0.11	0.5%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0.00	0.0%

Photo Reference Photos



PP1 – MY-00 – 4/18/18



PP1 – MY-02 – 11/18/19



PP2 – MY-00 – 4/18/18



PP2 – MY-02 – 11/18/19



PP3– MY-00 – 4/18/18



PP3 – MY-02 – 11/18/19



PP4 – MY-00 – 4/18/18



PP4 – MY-02 – 11/18/19



PP5 – MY-00 – 4/18/18



PP5 – MY-02 – 11/18/19



PP6– MY-00 – 4/18/18



PP6– MY-02 – 11/18/19



PP7 – MY-00 – 4/18/18



PP7 – MY-02 – 11/18/19



PP8 – MY-00 – 4/18/18



PP8 – MY-02 – 11/18/19



PP9 – MY-00 – 4/18/18



PP9 – MY-02 – 11/18/19



PP10 – MY-00 – 4/18/18



PP10 – MY-02 – 11/18/19



PP11 – MY-00 – 4/18/18



PP11 – MY-02 – 11/18/19



PP12– MY-00 – 4/18/18



PP12– MY-02 – 11/18/19

Vegetation Monitoring Plot Photos



Vegetation Plot 1 – MY-00 – 4/10/18



Vegetation Plot 1 – MY-02 – 7/9/19



Vegetation Plot 2 – MY-00 – 4/10/18



Vegetation Plot 2 – MY-02 – 7/9/19



Vegetation Plot 3 – MY-00 – 4/10/18



Vegetation Plot 3 – MY-02 – 7/9/19



Vegetation Plot 4 – MY-00 – 4/10/18



Vegetation Plot 4 – MY-02 – 7/9/19



Vegetation Plot 5 – MY-00 – 4/11/18



Vegetation Plot 5 – MY-02 – 7/9/19



Vegetation Plot 6 – MY-00 – 4/11/18



Vegetation Plot 6 – MY-02 – 7/9/19



Vegetation Plot 7 – MY-00 – 4/11/18



Vegetation Plot 7 – MY-02 – 7/10/19



Vegetation Plot 8 – MY-00 – 4/11/18



Vegetation Plot 8 – MY-02 – 7/10/19



Vegetation Plot 9 – MY-00 – 4/11/18



Vegetation Plot 9 – MY-02 – 7/10/19



Vegetation Plot 10 – MY-00 – 4/10/18



Vegetation Plot 10 – MY-02 – 7/10/19



Vegetation Plot 11 – MY-00 – 4/10/18



Vegetation Plot 11 – MY-02 – 7/10/19



Vegetation Plot 12 – MY-00 – 4/11/18



Vegetation Plot 12 – MY-02 – 7/10/19



Vegetation Plot 13 – MY-00 – 4/11/18



Vegetation Plot 13 – MY-02 – 7/10/19

APPENDIX C

Vegetation Plot Data

Table 7. Stem Count by Plot and Species Cedar Branch Restoration Site, DMS Project #97009																
Species	Current Plot Data (MY02 2019)															
	Plot 01		Plot 02		Plot 03		Plot 04		Plot 05		Plot 06		Plot 07		Plot 08	
	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Green Ash (<i>Fraxinus pennsylvanica</i>)					6	6	9	9	8	8	3	3	2	2	6	6
Black Willow (<i>Salix nigra</i>)																
Eastern Sycamore (<i>Platanus occidentalis</i>)				1	6	6	4	4	3	3	10	10	5	5	4	4
Persimmon (<i>Diospyros virginiana</i>)	2	2		1												
Pin oak (<i>Quercus palustris</i>)	1	1	3	3												
River Birch (<i>Betula nigra</i>)					2	2					3	3			6	6
Silver Willow (<i>Salix sericea</i>)																
Smooth Sumac (<i>Rhus glabra</i>)																
Swamp Chestnut Oak (<i>Quercus michauxii</i>)					7	7	6	6	1	1	9	9	4	4	11	11
Tulip Poplar (<i>Liriodendron tulipifera</i>)			6	8			3	3	1	1			1	1		
Willow Oak (<i>Quercus phellos</i>)	1	1	7	7	3	3			2	2					2	2
Oak (<i>Quercus sp.</i>)																
Unknown																
White Oak (<i>Quercus alba</i>)	2	2	4	4												
Stem count	6	6	20	24	24	24	22	22	15	15	25	25	12	12	29	29
size (ares)	1		1		1		1		1		1		1		1	
size (ACRES)	0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025	
Species count	4	4	4	6	5	5	4	4	5	5	4	4	4	4	5	5
Stems per ACRE	243	243	809	971	971	971	890	890	607	607	1,012	1,012	486	486	1,174	1,174

Table 7. Stem Count by Plot and Species Cedar Branch Restoration Site, DMS Project #97009																
Species	Current Plot Data (MY02 2019)										Annual Means					
	Plot 09		Plot 10		Plot 11		Plot 12		Plot 13		MY02 (2019)		MY01 (2018)		MY00 (2018)	
	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Green Ash (<i>Fraxinus pennsylvanica</i>)	1	1	2	2							37	37	36	38		
Black Willow (<i>Salix nigra</i>)						3						3		1		
Eastern Sycamore (<i>Platanus occidentalis</i>)	6	7	8	8							46	48	46	46		
Persimmon (<i>Diospyros virginiana</i>)					2	2			8	8	12	13	8	8		
Pin oak (<i>Quercus palustris</i>)					1	1					5	5	5	5		
River Birch (<i>Betula nigra</i>)	3	3	2	2							16	16	16	16	6	6
Silver Willow (<i>Salix sericea</i>)						1						1		1		
Smooth Sumac (<i>Rhus glabra</i>)																
Swamp Chestnut Oak (<i>Quercus michauxii</i>)	4	4	1	1	1	1	3	3	5	5	52	52	68	68		
Tulip Poplar (<i>Liriodendron tulipifera</i>)	4	4	1	1	2	2			1	1	19	21	31	31	13	13
Willow Oak (<i>Quercus phellos</i>)			1	1	4	4	9	9	1	1	30	30	31	31		
Oak (<i>Quercus sp.</i>)															30	30
Unknown															280	280
White Oak (<i>Quercus alba</i>)					9	9			5	5	20	20				
Stem count	18	19	15	15	19	23	12	12	20	20	237	246	241	246	329	329
size (ares)	1		1		1		1		1		1	13	13		13	
size (ACRES)	0.025		0.025		0.025		0.025		0.025		0.32		0.32		0.32	
Species count	5	5	6	6	6	8	2	2	5	5	9	11	8	11	4	4
Stems per ACRE	728	769	607	607	769	931	486	486	809	809	738	766	750	766	1,024	1,024

APPENDIX D

Stream Measurement and Geomorphology Data

**Table 8. UTCC Baseline Stream Data Summary
Cedar Branch Restoration Site, DMS Project #97009**

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design			As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	UTCC-1	UTCC-2	UTCC-3	Min	Mean	Max	n
Bankfull Width (ft)	7.8	10.5	10.1	13.9	4	9.0	13.3	13.1	17.7	6	11.7	13.2	15.0	11.7	13.4	15.2	5
Floodprone Width (ft)	9.6	31.7	33.5	50.0	4	13.1	55.6	50.0	100.0	6	90	100	105	>40	>40	>50	5
Bankfull Mean Depth (ft)	1.2	1.4	1.4	1.7	4	0.9	1.2	1.2	1.5	6	1.0	1.0	1.1	0.8	1.0	1.1	5
Bankfull Max Depth (ft)	1.7	2.2	2.2	2.8	4	1.3	1.7	1.7	2.0	6	1.5	1.5	1.7	1.4	1.6	1.8	5
Bankfull Cross-Sectional Area (ft ²)	11.3	14.6	15.1	16.9	4	10.4	16.4	14.0	24.7	6	11.3	13.2	16.9	9.6	12.8	15.8	5
Width/Depth Ratio	5.3	7.6	6.9	11.4	4	7.6	11.1	11.5	13.4	6	12.1	13.2	13.2	10.8	14.3	18.1	5
Entrenchment Ratio	1.2	2.9	2.6	5.0	4	1.3	3.8	3.9	5.9	6	>2.2	>2.2	>2.2	2.9	3.6	4.8	5
Bank Height Ratio	1.0	1.9	2.0	2.5	4	1.0	1.0	1.0	1.0	6	1.0	1.0	1.0	1.0	1.0	1.0	5
Pattern																	
Channel Beltwidth (ft)	*					45					41-54	46-58	53-74	41	54	74	47
Radius of Curvature (ft)	*					13-42					25-35	30-35	35-45	25	34	45	47
Rc:Bankfull width (ft/ft)	*					1.3-4.4					2.1-3.0	2.3-2.7	2.3-3.0	2.1	2.6	3.0	47
Meander Wavelength (ft)	*					93-136					101-150	115-155	153-180	101	142	180	47
Meander Width Ratio	*					4.5-5.0					3.5-4.6	3.5-4.4	3.5-4.9	3.5	4.1	4.9	47
Profile																	
Riffle Length (ft)														4.6	34.7	57.4	48
Riffle Slope (ft/ft)	0.021	0.032	0.03	0.048	4	0.013-0.028					0.020-0.037	0.020-0.035	0.020-0.035	0.039	0.023	0.053	48
Pool Length (ft)	*					3-25					19-42	20-49	36-61	4.3	28.5	55.0	47
Pool Spacing (ft)	*					30-59					50-83	67-91	79-105	37.3	77.5	124.0	47
Substrate and Transport Parameters																	
SC% / Sa% / G% / C% / B% / Be%	0%/23%/63%/13%/1%/0%					0.3%/19%/66%/14%/0.7%/0%								3%/6%/67%/23%/0%/0%			
d16 / d35 / d50 / d84 / d95 (mm)	1.5/5.4/16/55/90					1.7/6.4/19/56/93								10/27/37/78/113			
Channel Characteristics																	
Channel length (ft)	3,246										1,400	512	1,650	3,562			
Drainage Area (SM)	0.45					0.13-0.49					0.22	0.28	0.41	0.41			
Rosgen Classification	G4c-E4					B4c					C4	C4	C4	C4			
Sinuosity	1.0					1.2					1.2	1.2	1.2	1.2			
Water Surface Slope (ft/ft)	0.015					0.013					0.013	0.013	0.013	0.013			

*No data shown due to channelization/lack of bed diversity

Table 8. T1 Baseline Stream Data Summary																			
Cedar Branch Restoration Site, DMS Project #97009																			
Parameter	Pre-Existing Condition					Reference Reach(es) Data (UTCC)					Design				As-built				
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Mean	Max	n	Min	Mean	Max	n	
Bankfull Width (ft)	5.8					9.0	13.3	13.1	17.7	6	7.8				8.9				
Floodprone Width (ft)	9.0					13.1	55.6	50.0	100.0	6	50				>40				
Bankfull Mean Depth (ft)	0.9					0.9	1.2	1.2	1.5	6	0.6				0.5				
Bankfull Max Depth (ft)	1.2					1.3	1.7	1.7	2.0	6	1.0				1.0				
Bankfull Cross-Sectional Area (ft ²)	5.0					10.4	16.4	14.0	24.7	6	5.0				4.6				
Width/Depth Ratio	6.7					7.6	11.1	11.5	13.4	6	12.1				17.0				
Entrenchment Ratio	1.5					1.3	3.8	3.9	5.9	6	>2.2				4.2				
Bank Height Ratio	2.3					1.0	1.0	1.0	1.0	6	1.0				1.0				
Pattern																			
Channel Beltwidth (ft)			*					45			29-36				29	33	36	14	
Radius of Curvature (ft)			*					13-42			15-25				15	20	25	14	
Rc:Bankfull width (ft/ft)			*					1.3-4.4			1.9-3.2				1.9	2.6	3.2	14	
Meander Wavelength (ft)			*					93-136			72-80				72	76	80	14	
Meander Width Ratio			*					4.5-5.0			3.7-4.6				3.7	4.2	4.6	14	
Profile																			
Riffle Length (ft)															3.6	20.9	32.9	14	
Riffle Slope (ft/ft)	0.018							0.013-0.028			0.025-0.040				0.019	0.042	0.076	14	
Pool Length (ft)	*							3-25			8-25				5.1	11.8	20.1	14	
Pool Spacing (ft)	*							30-59			42-51				17.1	40.1	58.5	14	
Substrate and Transport Parameters																			
SC% / Sa% / G% / C% / B% / Be%	0%/15%/75%/10%/0%/0%					0.3%/19%/66%/14%/0.7%/0%									1%/14%/79%/6%/0%/0%				
d16 / d35 / d50 / d84 / d95 (mm)	2.1/5/12/50/98					1.7/6.4/19/56/93									2.7/15/24/47/77				
Channel length (ft)	1,036										1,118				1,118				
Drainage Area (SM)	0.05					0.13-0.49					0.05				0.05				
Rosgen Classification	G4					B4c					C4b				C4b				
Sinuosity	1.0					1.2					1.3				1.3				
Water Surface Slope (ft/ft)	0.031					0.013					0.025				0.025				

*No data shown due to channelization/lack of bed diversity

Table 8. T2 Baseline Stream Data Summary																		
Cedar Branch Restoration Site, DMS Project #97009																		
Parameter	Pre-Existing Condition					Reference Reach(es) Data (UTCC)					Design				As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Mean	Max	n	Min	Mean	Max	n
Bankfull Width (ft)	**					9.0	13.3	13.1	17.7	6	7.8				**			
Floodprone Width (ft)	**					13.1	55.6	50.0	100.0	6	30				**			
Bankfull Mean Depth (ft)	**					0.9	1.2	1.2	1.5	6	0.6				**			
Bankfull Max Depth (ft)	**					1.3	1.7	1.7	2.0	6	1.0				**			
Bankfull Cross-Sectional Area (ft ²)	**					10.4	16.4	14.0	24.7	6	5.0				**			
Width/Depth Ratio	**					7.6	11.1	11.5	13.4	6	12.1				**			
Entrenchment Ratio	**					1.3	3.8	3.9	5.9	6	>2.2				**			
Bank Height Ratio	**					1.0	1.0	1.0	1.0	6	1.0				**			
Pattern																		
Channel Beltwidth (ft)			*					45			N/A				**			
Radius of Curvature (ft)			*					13-42			15-25				**			
Rc:Bankfull width (ft/ft)			*					1.3-4.4			1.9-3.2				**			
Meander Wavelength (ft)			*					93-136			N/A				**			
Meander Width Ratio			*					4.5-5.0			N/A				**			
Profile																		
Riffle Length (ft)	**														9.4	20.0	24.9	4
Riffle Slope (ft/ft)	**							0.013-0.028			0.026-0.027				0.023	0.025	0.027	4
Pool Length (ft)	**							3-25			12-17				6.4	8.1	9.0	3
Pool Spacing (ft)	**							30-59			38				36.4	37.8	39.1	3
Substrate and Transport Parameters																		
SC% / Sa% / G% / C% / B% / Be%			**					0.3%/19%/66%/14%/0.7%/0%							**			
d16 / d35 / d50 / d84 / d95 (mm)			**					1.7/6.4/19/56/93							**			
Channel length (ft)				123									127					127
Drainage Area (SM)				0.03				0.13-0.49					0.03					0.03
Rosgen Classification				G4				B4c					C4					C4
Sinuosity				1.0				1.2					N/A					N/A
Water Surface Slope (ft/ft)				0.031				0.013					0.017					0.016

*No data shown due to channelization/lack of bed diversity

Table 8. T3 Baseline Stream Data Summary Cedar Branch Restoration Site, DMS Project #97009																		
Parameter	Pre-Existing Condition					Reference Reach(es) Data (UTCC)					Design				As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Mean	Max	n	Min	Mean	Max	n
Bankfull Width (ft)	4.7	5.4		6.0	2	9.0	13.3	13.1	17.7	6	7.8				5.9	5.9	6.0	2
Floodprone Width (ft)	11.3	13.5		15.7	2	13.1	55.6	50.0	100.0	6	30				>25	>25	>25	2
Bankfull Mean Depth (ft)	0.8	0.8		0.8	2	0.9	1.2	1.2	1.5	6	0.6				0.4	0.5	0.5	2
Bankfull Max Depth (ft)	1.3	1.3		1.3	2	1.3	1.7	1.7	2.0	6	1.0				0.7	0.8	0.8	2
Bankfull Cross-Sectional Area (ft ²)	3.9	4.5		5.0	2	10.4	16.4	14.0	24.7	6	5.0				2.5	2.8	3.1	2
Width/Depth Ratio	5.6	6.4		7.1	2	7.6	11.1	11.5	13.4	6	12.1				11.4	12.6	13.8	2
Entrenchment Ratio	1.3	2.4		3.4	2	1.3	3.8	3.9	5.9	6	>2.2				4.4	4.7	5.1	2
Bank Height Ratio	1.6	2.1		2.6	2	1.0	1.0	1.0	1.0	6	1.0				1.0	1.0	1.0	2
Pattern																		
Channel Beltwidth (ft)			*					45			N/A							
Radius of Curvature (ft)			*					13-42			15-25							
Rc:Bankfull width (ft/ft)			*					1.3-4.4			1.9-3.2							
Meander Wavelength (ft)			*					93-136			N/A							
Meander Width Ratio			*					4.5-5.0			N/A							
Profile																		
Riffle Length (ft)															19.7	28.1	68.8	26
Riffle Slope (ft/ft)	0.046	0.067		0.087	2			0.013-0.028			0.025-0.042				0.021	0.034	0.063	26
Pool Length (ft)	*							3-25			11-22				3.6	7.3	11.3	35
Pool Spacing (ft)	*							30-59			32-55				6.8	30.5	85.9	35
Substrate and Transport Parameters																		
SC% / Sa% / G% / C% / B% / Be%	0%/31%/63%/6%/0%/0%					0.3%/19%/66%/14%/0.7%/0%									6%/0%/75%/19%/0%/0%			
d16 / d35 / d50 / d84 / d95 (mm)	1.0/2.4/6.5/33/73					1.7/6.4/19/56/93									18/32/41/71/105			
Channel length (ft)	1,141										1,157				1,157			
Drainage Area (SM)	0.04					0.13-0.49					0.04				0.04			
Rosgen Classification	E4					B4c					C4b				C4b			
Sinuosity	1.0					1.2					N/A				N/A			
Water Surface Slope (ft/ft)	0.037					0.013					0.035				0.035			

*No data shown due to channelization/lack of bed diversity

Table 8. T4 Baseline Stream Data Summary																			
Cedar Branch Restoration Site, DMS Project #97009																			
Parameter	Pre-Existing Condition					Reference Reach(es) Data (UTCC)					Design				As-built				
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Mean	Max	n	Min	Mean	Max	n	
Bankfull Width (ft)	6.5					9.0	13.3	13.1	17.7	6	7.8				6.7	6.8	6.9	2	
Floodprone Width (ft)	7.8					13.1	55.6	50.0	100.0	6	30				>30	>30	>30	2	
Bankfull Mean Depth (ft)	0.8					0.9	1.2	1.2	1.5	6	0.6				0.5	0.5	0.5	2	
Bankfull Max Depth (ft)	1.0					1.3	1.7	1.7	2.0	6	1.0				0.8	0.8	0.8	2	
Bankfull Cross-Sectional Area (ft ²)	5.0					10.4	16.4	14.0	24.7	6	5.0				3.3	3.4	3.5	2	
Width/Depth Ratio	8.5					7.6	11.1	11.5	13.4	6	12.1				12.7	13.6	14.6	2	
Entrenchment Ratio	1.2					1.3	3.8	3.9	5.9	6	>2.2				4.7	4.9	5.1	2	
Bank Height Ratio	4.5					1.0	1.0	1.0	1.0	6	1.0				1.0	1.0	1.0	2	
Pattern																			
Channel Beltwidth (ft)			*					45			N/A								
Radius of Curvature (ft)			*					13-42			15-25								
Rc:Bankfull width (ft/ft)			*					1.3-4.4			1.9-3.2								
Meander Wavelength (ft)			*					93-136			N/A								
Meander Width Ratio			*					4.5-5.0			N/A								
Profile																			
Riffle Length (ft)															5.5	21.5	42.1	19	
Riffle Slope (ft/ft)	0.038							0.013-0.028			0.030-0.040				0.017	0.040	0.121	19	
Pool Length (ft)	*							3-25			13-19				4.0	8.5	12.7	21	
Pool Spacing (ft)	*							30-59			34-48				5.5	32.3	55.1	21	
Substrate and Transport Parameters																			
SC% / Sa% / G% / C% / B% / Be%	0%/23%/72%/5%/0%/0%					0.3%/19%/66%/14%/0.7%/0%					3%/0%/73%/24%/0%/0%								
d16 / d35 / d50 / d84 / d95 (mm)	1.6/4.0/6.4/35/67					1.7/6.4/19/56/93					28/37/44/78/115								
Channel length (ft)	677										692				692				
Drainage Area (SM)	0.05					0.13-0.49					0.05				0.05				
Rosgen Classification	G4					B4c					C4b				C4b				
Sinuosity	1.0					1.2					N/A				N/A				
Water Surface Slope (ft/ft)	0.031					0.013					0.028				0.028				

*No data shown due to channelization/lack of bed diversity

Table 9. Cross-Section Morphology Data Tables
Cedar Branch Stream Restoration Site, DMS Project #97009

Dimension and Substrate	Cross-Section 1 (Riffle) Station 57+19, T1							Cross-Section 2 (Pool) Station 57+44, T1							Cross-Section 3 (Pool) Station 13+58, UTCC						
	686.84							686.01							676.01						
Baseline Bankfull Elevation:	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	8.9	8.3	8.6					11.8	13.5	12.9					13.5	13.6	13.8				
Floodprone Width (ft)	>40	>40	>40					-	-	-					-	-	-				
Bankfull Mean Depth (ft)	0.5	0.6	0.5					1.1	1.0	1.0					1.5	1.5	1.5				
Bankfull Max Depth (ft)	1.0	1.0	1.0					2.1	2.0	2.0					2.8	2.8	2.9				
Bankfull Cross-Sectional Area (ft ²)	4.6	4.6	4.6					13.4	13.4	13.4					20.2	20.2	20.2				
Total Cross-Sectional Area (ft ²)	4.6	4.3	4.4					13.4	11.8	12.2					20.2	20.0	20.2				
Bankfull Width/Depth Ratio	17.0	14.8	15.9					-	-	-					-	-	-				
Bankfull Entrenchment Ratio	4.2	4.6	4.0					-	-	-					-	-	-				
Bankfull Bank Height Ratio	1.0	0.9	1.0					-	-	-					-	-	-				
d50 (mm)	24	18	3					-	-	-					-	-	-				
Dimension and Substrate	Cross-Section 4 (Riffle) Station 13+85, UTCC							Cross-Section 5 (Riffle) Station 22+44, UTCC							Cross-Section 6 (Riffle) Station 96+69, T3						
	675.79							662.96							673.00						
Baseline Bankfull Elevation:	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	12.1	12.5	12.7					14.5	14.3	14.1					6.0	6.5	5.8				
Floodprone Width (ft)	>50	>50	>50					>40	>40	>40					>30	>30	>30				
Bankfull Mean Depth (ft)	1.0	1.0	1.0					1.1	1.1	1.1					0.5	0.5	0.5				
Bankfull Max Depth (ft)	1.7	1.7	1.8					1.7	1.9	1.9					0.8	1.0	1.0				
Bankfull Cross-Sectional Area (ft ²)	12.6	12.6	12.6					15.8	15.8	15.8					3.1	3.1	3.1				
Total Cross-Sectional Area (ft ²)	12.6	13.8	12.6					15.8	15.7	16.6					3.1	3.2	3.0				
Bankfull Width/Depth Ratio	11.6	12.3	12.7					13.3	13.0	12.6					11.7	13.7	10.8				
Bankfull Entrenchment Ratio	4.6	4.5	4.1					3.1	3.2	3.2					4.4	4.1	4.6				
Bankfull Bank Height Ratio	1.0	1.0	0.9					1.0	1.0	1.0					1.0	0.9	0.9				
d50 (mm)	33	49	40					31	40	69					41	41	54				

Bank Height Ratios are calculated based on the baseline (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section parameters are calculated based on the current year's low bank height.

Table 9. Cross-Section Morphology Data Tables

Cedar Branch Stream Restoration Site, DMS Project #97009

Dimension and Substrate	Cross-Section 7 (Pool) Station 99+07, T3							Cross-Section 8 (Riffle) Station 99+25, T3							Cross-Section 9 (Riffle) Station 26+17, UTCC						
	666.60							665.93							657.32						
Baseline Bankfull Elevation:	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	10.3	8.9	8.5					6.0	5.6	6.1					13.2	13.0	13.8				
Floodprone Width (ft)	-	-	-					>30	>30	>30					>40	>40	>40				
Bankfull Mean Depth (ft)	0.7	0.8	0.8					0.4	0.4	0.4					1.0	1.0	0.9				
Bankfull Max Depth (ft)	1.8	1.6	1.7					0.7	0.9	0.9					1.8	1.8	2.0				
Bankfull Cross-Sectional Area (ft ²)	6.9	6.9	6.9					2.5	2.5	2.5					13.0	13.0	13.0				
Total Cross-Sectional Area (ft ²)	6.9	8.7	7.2					2.5	2.7	2.7					13.0	12.0	12.7				
Bankfull Width/Depth Ratio	-	-	-					14.1	12.6	14.8					13.3	12.9	14.7				
Bankfull Entrenchment Ratio	-	-	-					5.0	5.4	4.9					3.4	3.5	3.2				
Bankfull Bank Height Ratio	-	-	-					1.0	1.1	1.0					1.0	0.9	1.0				
d50 (mm)	-	-	-					40	18	29					57	50	48				
Dimension and Substrate	Cross-Section 10 (Riffle) Station 252+25, T4							Cross-Section 11 (Pool) Station 225+97, T4							Cross-Section 12 (Riffle) Station 226+04, T4						
	666.93							656.55							656.12						
Baseline Bankfull Elevation:	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	7.0	8.7	7.2					10.2	9.6	10.0					6.7	6.9	7.0				
Floodprone Width (ft)	>30	>30	>30					-	-	-					>30	>30	>30				
Bankfull Mean Depth (ft)	0.5	0.4	0.5					1.1	1.1	1.1					0.5	0.5	0.5				
Bankfull Max Depth (ft)	0.8	1.0	1.0					2.1	2.0	2.0					0.8	0.8	0.9				
Bankfull Cross-Sectional Area (ft ²)	3.3	3.3	3.3					10.8	10.8	10.8					3.5	3.5	3.5				
Total Cross-Sectional Area (ft ²)	3.3	3.0	2.4					10.8	11.9	11.6					3.5	3.8	3.1				
Bankfull Width/Depth Ratio	14.9	23.0	15.7					-	-	-					12.9	13.6	14.1				
Bankfull Entrenchment Ratio	5.1	4.1	5.0					-	-	-					4.7	4.6	4.5				
Bankfull Bank Height Ratio	1.0	0.9	1.0					-	-	-					1.0	1.0	1.0				
d50 (mm)	42	36	6					-	-	-					45	32	22				

Bank Height Ratios are calculated based on the baseline (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section parameters are calculated based on the current year's low bank height.

**Table 9. Cross-Section Morphology Data Tables
Cedar Branch Stream Restoration Site, DMS Project #97009**

Dimension and Substrate	Cross-Section 13 (Riffle) Station 35+12, UTCC							Cross-Section 14 (Riffle) Station 41+94, UTCC							Cross-Section 15 (Pool) Station 42+58, UTCC						
	645.24							637.94							637.43						
Baseline Bankfull Elevation:	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	12.7	13.8	13.1					15.3	13.9	13.8					22.5	20.7	21.4				
Floodprone Width (ft)	>50	>50	>50					>40	>40	>40					-	-	-				
Bankfull Mean Depth (ft)	0.8	0.7	0.7					0.8	0.9	0.9					1.6	1.7	1.7				
Bankfull Max Depth (ft)	1.4	1.4	1.5					1.7	1.7	1.7					3.4	3.3	3.2				
Bankfull Cross-Sectional Area (ft ²)	9.6	9.6	9.6					12.8	12.8	12.8					35.8	35.8	35.8				
Total Cross-Sectional Area (ft ²)	9.6	7.9	7.8					12.8	12.6	14.3					35.8	32.8	36.2				
Bankfull Width/Depth Ratio	16.7	19.8	17.8					18.3	15.1	14.8					-	-	-				
Bankfull Entrenchment Ratio	3.8	3.5	3.7					2.8	3.1	3.1					-	-	-				
Bankfull Bank Height Ratio	1.0	1.0	1.0					1.0	1.1	1.0					-	-	-				
d50 (mm)	16	13	61					61	51	42					-	-	-				

Bank Height Ratios are calculated based on the baseline (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section parameters are calculated based on the current year's low bank height.

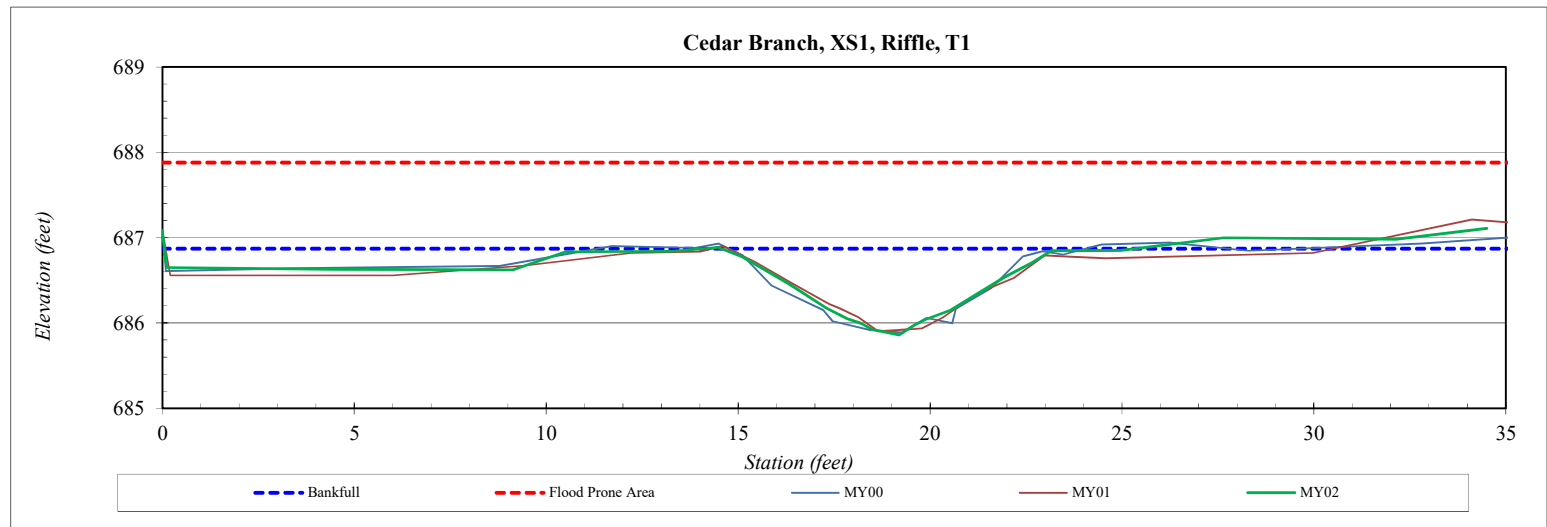
Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS1
Drainage Area (sq mi):	0.05
Date:	6/25/2019
Field Crew:	T. Seelinger, A. Gutierrez



Station	Elevation
0.0	687.08
0.1	686.65
4.5	686.63
9.1	686.62
10.5	686.83
13.3	686.84
14.5	686.89
15.1	686.78
16.3	686.46
17.3	686.17
17.8	686.05
18.2	686.00
18.5	685.92
19.2	685.86
19.6	685.98
19.9	686.04
20.5	686.15
21.9	686.54
22.7	686.71
23.2	686.85
25.0	686.85
27.7	687.00
32.1	686.98
34.5	687.11

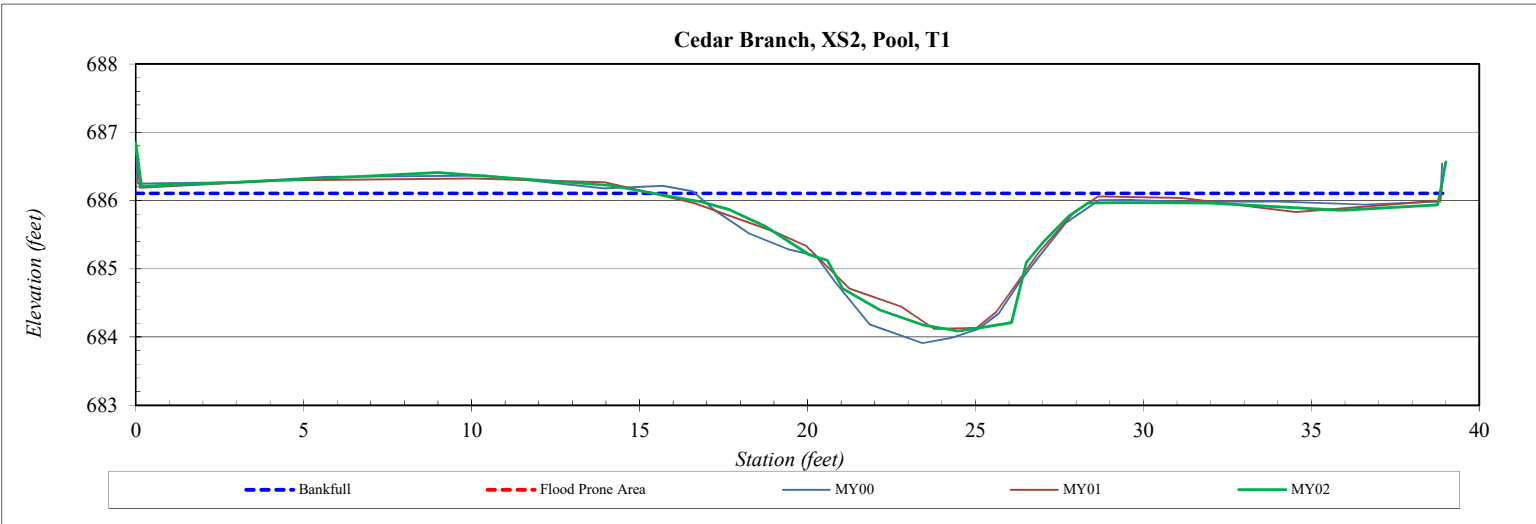
SUMMARY DATA	
Current Bankfull Elevation:	686.87
Bankfull Cross-Sectional Area:	4.6
Total Cross-Sectional Area:	4.4
Bankfull Width:	8.6
Flood Prone Area Elevation:	687.9
Flood Prone Width:	34.5
Max Depth at Bankfull:	1.0
Mean Depth at Bankfull:	0.5
W / D Ratio:	15.9
Entrenchment Ratio:	4.0
Bank Height Ratio:	1.0



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS2
Drainage Area (sq mi):	0.05
Date:	6/25/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	686.84
0.2	686.21
4.9	686.31
9.0	686.41
14.1	686.22
16.8	685.98
17.7	685.86
18.7	685.62
20.1	685.20
20.6	685.12
21.1	684.71
22.2	684.40
23.5	684.17
24.5	684.09
25.2	684.14
26.1	684.21
26.5	685.10
27.0	685.41
27.8	685.77
28.3	685.97
29.4	685.97
31.9	685.96
35.9	685.85
38.8	685.94
39.0	686.57

SUMMARY DATA	
Current Bankfull Elevation:	686.11
Bankfull Cross-Sectional Area:	13.4
Total Cross-Sectional Area:	12.2
Bankfull Width:	12.9
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	2.0
Mean Depth at Bankfull:	1.0
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---

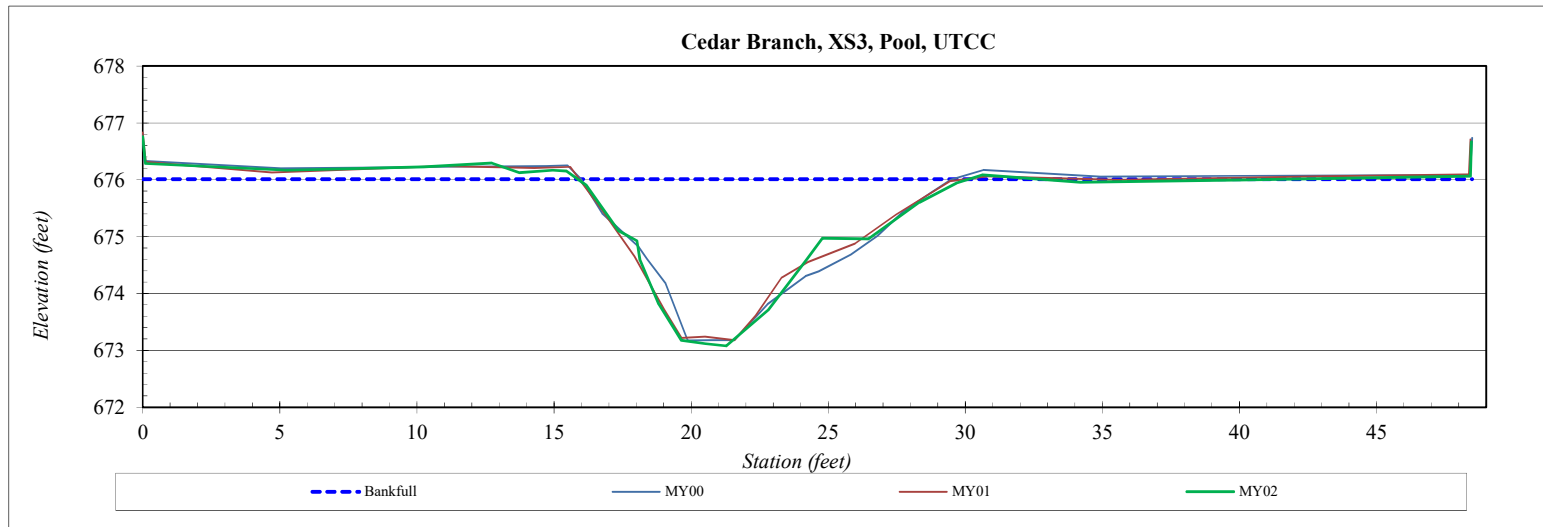


River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS3
Drainage Area (sq mi):	0.21
Date:	6/25/2019
Field Crew:	T. Seelinger, A. Gutierrez



Station	Elevation
0.0	676.76
0.1	676.29
5.3	676.17
10.3	676.23
12.7	676.30
13.8	676.12
15.0	676.17
15.5	676.16
16.2	675.91
17.4	675.11
18.0	674.93
18.1	674.58
18.8	673.81
19.6	673.18
20.5	673.12
21.3	673.08
22.8	673.72
24.2	674.58
24.8	674.97
26.5	674.96
28.3	675.60
29.7	675.94
30.6	676.08
34.2	675.96
40.0	675.99
48.4	676.06
48.5	676.67

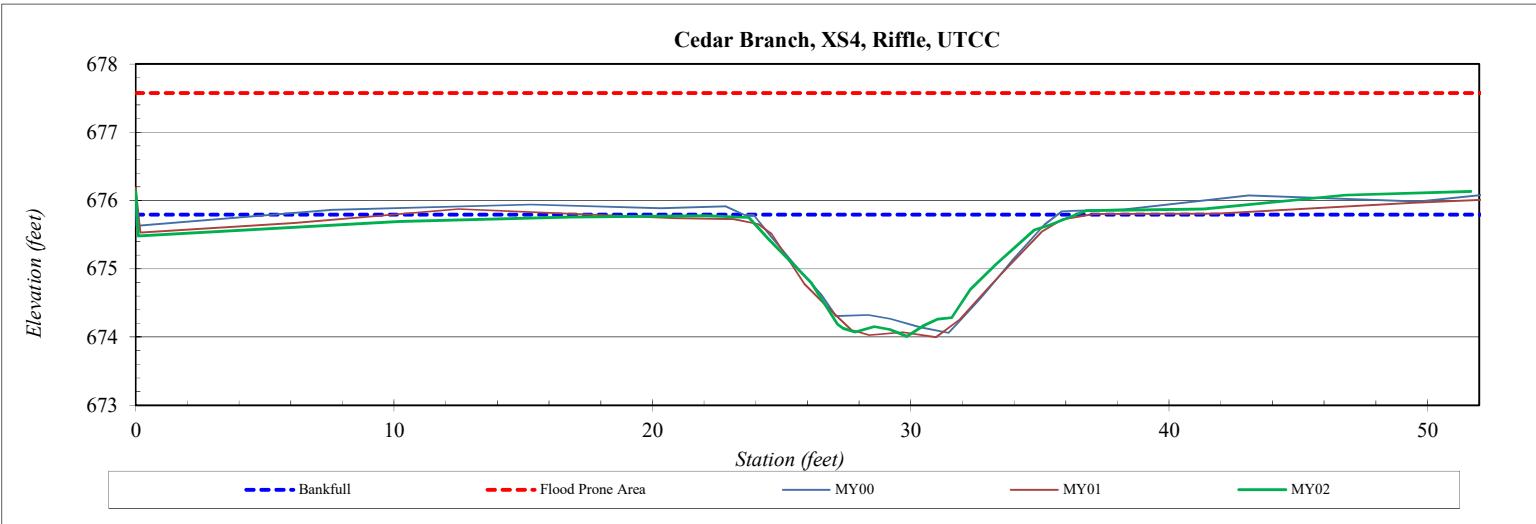
SUMMARY DATA	
Current Bankfull Elevation:	676.01
Bankfull Cross-Sectional Area:	20.2
Total Cross-Sectional Area:	20.2
Bankfull Width:	13.8
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	2.9
Mean Depth at Bankfull:	1.5
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS4
Drainage Area (sq mi):	0.21
Date:	6/25/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	676.14
0.1	675.48
0.1	675.48
10.2	675.69
16.9	675.76
22.1	675.78
23.7	675.75
24.5	675.43
26.1	674.80
27.2	674.19
27.4	674.13
27.8	674.07
28.6	674.15
29.2	674.11
29.9	674.01
30.5	674.17
31.1	674.26
31.6	674.28
32.3	674.70
33.3	675.07
34.8	675.57
35.4	675.64
36.8	675.85
41.3	675.87
46.8	676.08
51.7	676.13

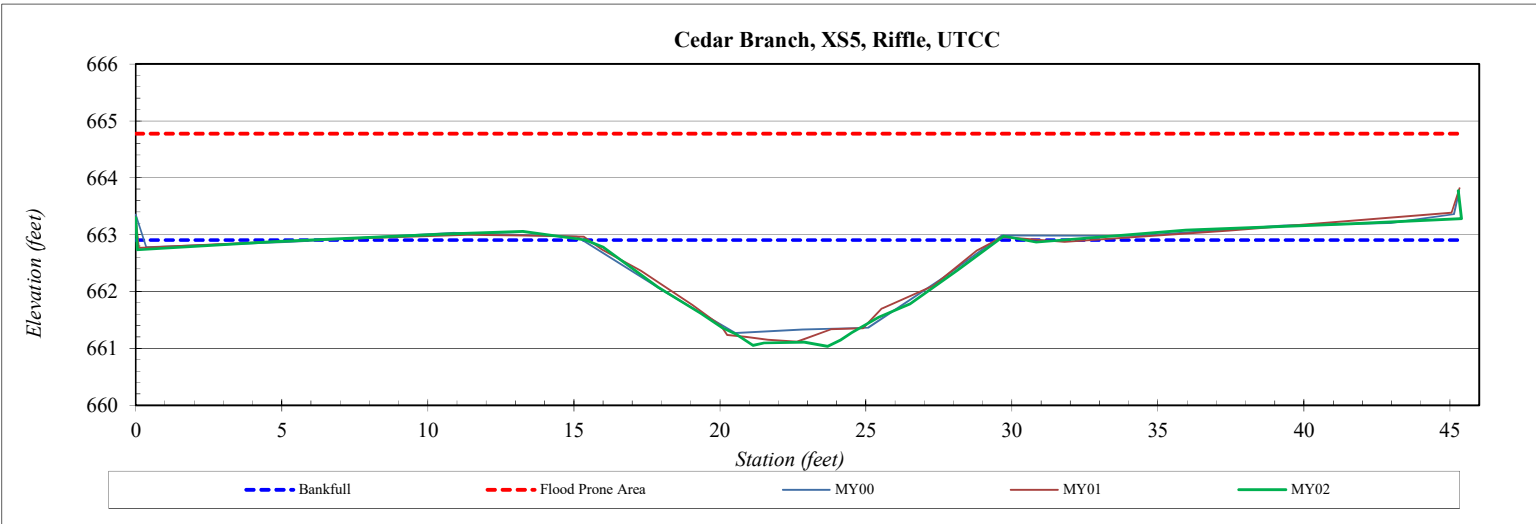
SUMMARY DATA	
Current Bankfull Elevation:	675.79
Bankfull Cross-Sectional Area:	12.6
Total Cross-Sectional Area:	12.6
Bankfull Width:	12.7
Flood Prone Area Elevation:	677.6
Flood Prone Width:	51.7
Max Depth at Bankfull:	1.8
Mean Depth at Bankfull:	1.0
W / D Ratio:	12.7
Entrenchment Ratio:	4.1
Bank Height Ratio:	0.9



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS5
Drainage Area (sq mi):	0.21
Date:	6/25/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	663.30
0.1	662.73
4.7	662.88
10.7	663.01
13.3	663.06
15.4	662.91
16.0	662.78
17.9	662.08
19.3	661.62
20.1	661.36
20.6	661.24
21.1	661.05
21.5	661.10
22.9	661.11
23.7	661.04
24.1	661.15
24.5	661.28
25.4	661.55
26.5	661.78
28.1	662.37
29.7	662.97
30.8	662.87
36.0	663.08
41.6	663.19
45.4	663.28
45.3	663.77

SUMMARY DATA	
Current Bankfull Elevation:	662.90
Bankfull Cross-Sectional Area:	15.8
Total Cross-Sectional Area:	16.6
Bankfull Width:	14.1
Flood Prone Area Elevation:	664.8
Flood Prone Width:	45.3
Max Depth at Bankfull:	1.9
Mean Depth at Bankfull:	1.1
W / D Ratio:	12.6
Entrenchment Ratio:	3.2
Bank Height Ratio:	1.0

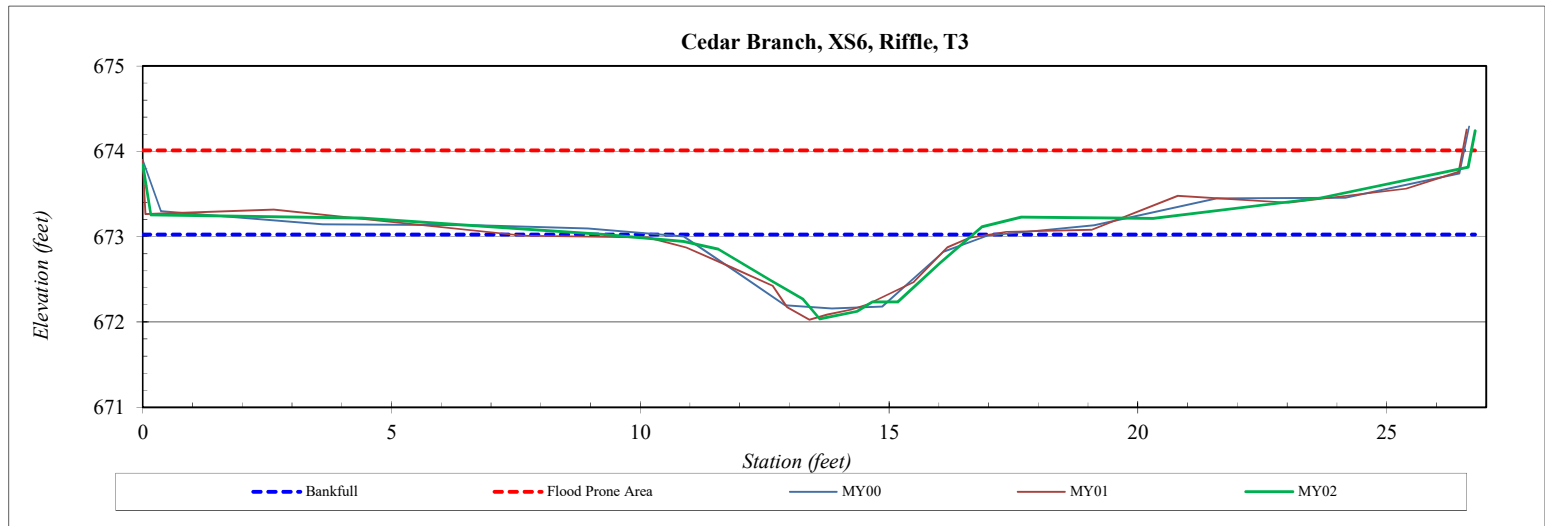


River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS6
Drainage Area (sq mi):	0.04
Date:	6/25/2019
Field Crew:	T. Seelinger, A. Gutierrez



Station	Elevation
0.0	673.85
0.2	673.26
4.4	673.22
9.3	673.03
10.9	672.94
11.6	672.86
12.6	672.49
13.3	672.27
13.6	672.04
14.4	672.13
14.7	672.24
15.2	672.23
16.0	672.70
16.9	673.12
17.7	673.23
20.3	673.21
23.7	673.45
26.6	673.82
26.8	674.24

SUMMARY DATA	
Current Bankfull Elevation:	673.02
Bankfull Cross-Sectional Area:	3.1
Total Cross-Sectional Area:	3.0
Bankfull Width:	5.8
Flood Prone Area Elevation:	674.0
Flood Prone Width:	26.7
Max Depth at Bankfull:	1.0
Mean Depth at Bankfull:	0.5
W / D Ratio:	10.8
Entrenchment Ratio:	4.6
Bank Height Ratio:	0.9

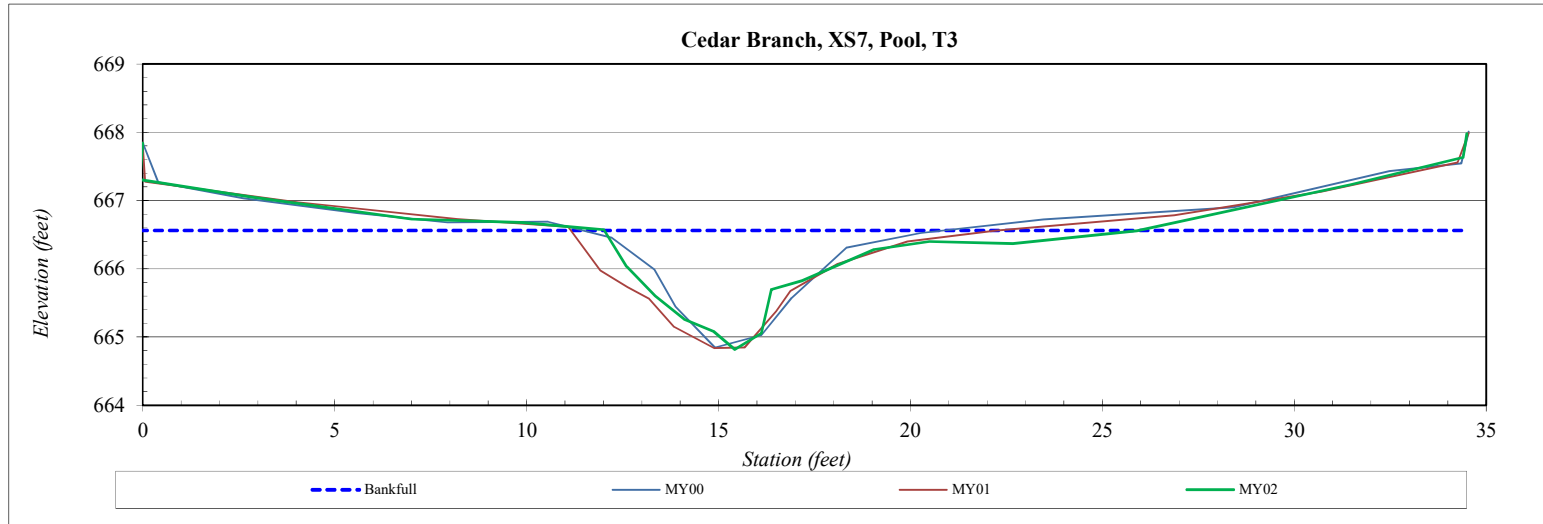


River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS7
Drainage Area (sq mi):	0.04
Date:	6/25/2019
Field Crew:	T. Seelinger, A. Gutierrez



Station	Elevation
0.0	667.84
-0.1	667.31
2.8	667.05
7.0	666.73
9.9	666.68
11.6	666.59
12.0	666.57
12.6	666.03
13.4	665.60
14.1	665.26
14.9	665.08
15.4	664.82
16.1	665.06
16.4	665.70
17.2	665.83
19.1	666.28
20.5	666.40
22.7	666.37
25.9	666.56
31.5	667.23
34.4	667.64
34.5	667.98

SUMMARY DATA	
Current Bankfull Elevation:	666.56
Bankfull Cross-Sectional Area:	6.9
Total Cross-Sectional Area:	7.2
Bankfull Width:	8.5
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	0.8
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---

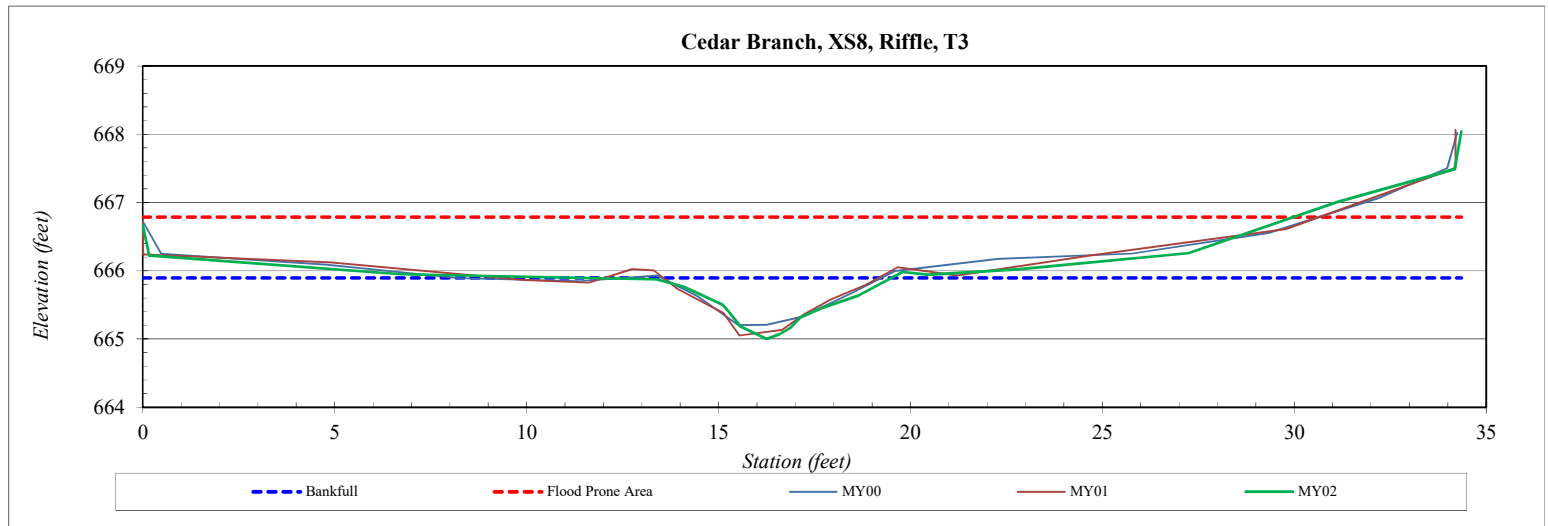


River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS8
Drainage Area (sq mi):	0.04
Date:	6/25/2019
Field Crew:	T. Seelinger, A. Gutierrez



Station	Elevation
0.0	666.67
0.2	666.22
6.7	665.95
11.3	665.90
13.4	665.87
14.1	665.77
15.1	665.50
15.3	665.40
15.6	665.18
16.3	665.00
16.6	665.07
16.9	665.16
17.1	665.32
17.7	665.45
18.6	665.64
19.8	665.98
20.5	665.94
22.8	666.02
27.2	666.26
31.1	667.01
34.2	667.49
34.3	668.04

SUMMARY DATA	
Current Bankfull Elevation:	665.89
Bankfull Cross-Sectional Area:	2.5
Total Cross-Sectional Area:	2.7
Bankfull Width:	6.1
Flood Prone Area Elevation:	666.8
Flood Prone Width:	30.0
Max Depth at Bankfull:	0.9
Mean Depth at Bankfull:	0.4
W / D Ratio:	14.8
Entrenchment Ratio:	4.9
Bank Height Ratio:	1.0

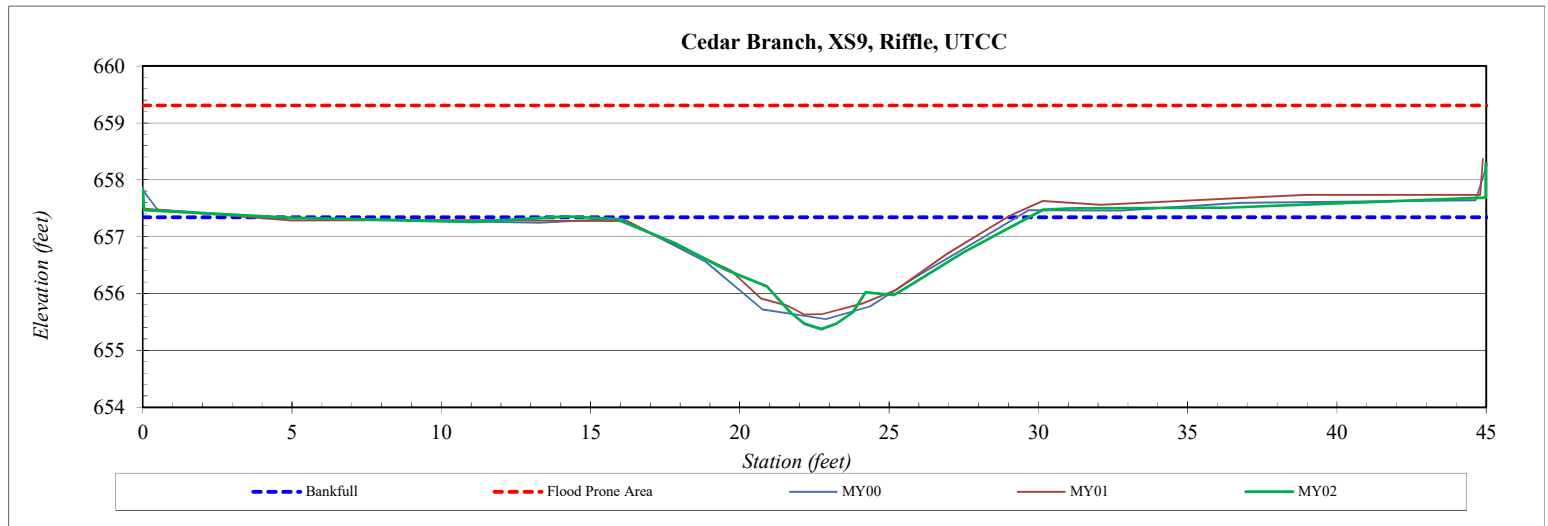


River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS9
Drainage Area (sq mi):	0.28
Date:	6/26/2019
Field Crew:	T. Seelinger, A. Gutierrez



Station	Elevation
0.0	657.86
0.0	657.47
4.9	657.33
11.1	657.26
14.2	657.36
15.8	657.31
17.8	656.88
19.5	656.42
20.9	656.12
21.7	655.66
22.2	655.47
22.7	655.37
23.2	655.47
23.8	655.67
24.2	656.02
25.2	655.98
25.7	656.15
27.5	656.72
30.2	657.47
31.1	657.50
36.3	657.51
45.0	657.69
45.0	658.28

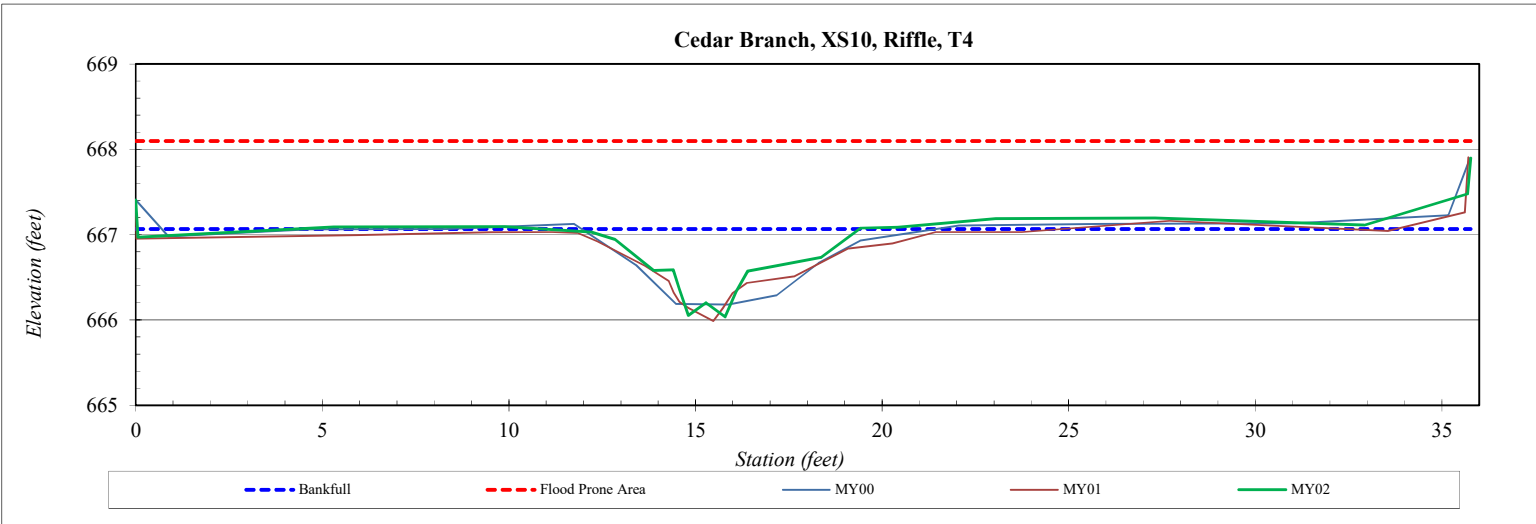
SUMMARY DATA	
Current Bankfull Elevation:	657.34
Bankfull Cross-Sectional Area:	13.0
Total Cross-Sectional Area:	12.7
Bankfull Width:	13.8
Flood Prone Area Elevation:	659.3
Flood Prone Width:	45.0
Max Depth at Bankfull:	2.0
Mean Depth at Bankfull:	0.9
W / D Ratio:	14.7
Entrenchment Ratio:	3.2
Bank Height Ratio:	1.0



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS10
Drainage Area (sq mi):	0.05
Date:	6/26/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	667.41
0.1	666.97
5.3	667.09
9.9	667.09
12.2	667.03
12.8	666.94
13.9	666.58
14.4	666.59
14.6	666.37
14.8	666.05
15.3	666.20
15.8	666.04
16.1	666.34
16.4	666.57
17.1	666.63
18.4	666.73
19.4	667.08
20.4	667.09
23.0	667.19
27.3	667.19
32.9	667.11
35.7	667.48
35.8	667.90

SUMMARY DATA	
Current Bankfull Elevation:	667.07
Bankfull Cross-Sectional Area:	3.3
Total Cross-Sectional Area:	2.4
Bankfull Width:	7.2
Flood Prone Area Elevation:	668.1
Flood Prone Width:	35.8
Max Depth at Bankfull:	1.0
Mean Depth at Bankfull:	0.5
W / D Ratio:	15.7
Entrenchment Ratio:	5.0
Bank Height Ratio:	1.0

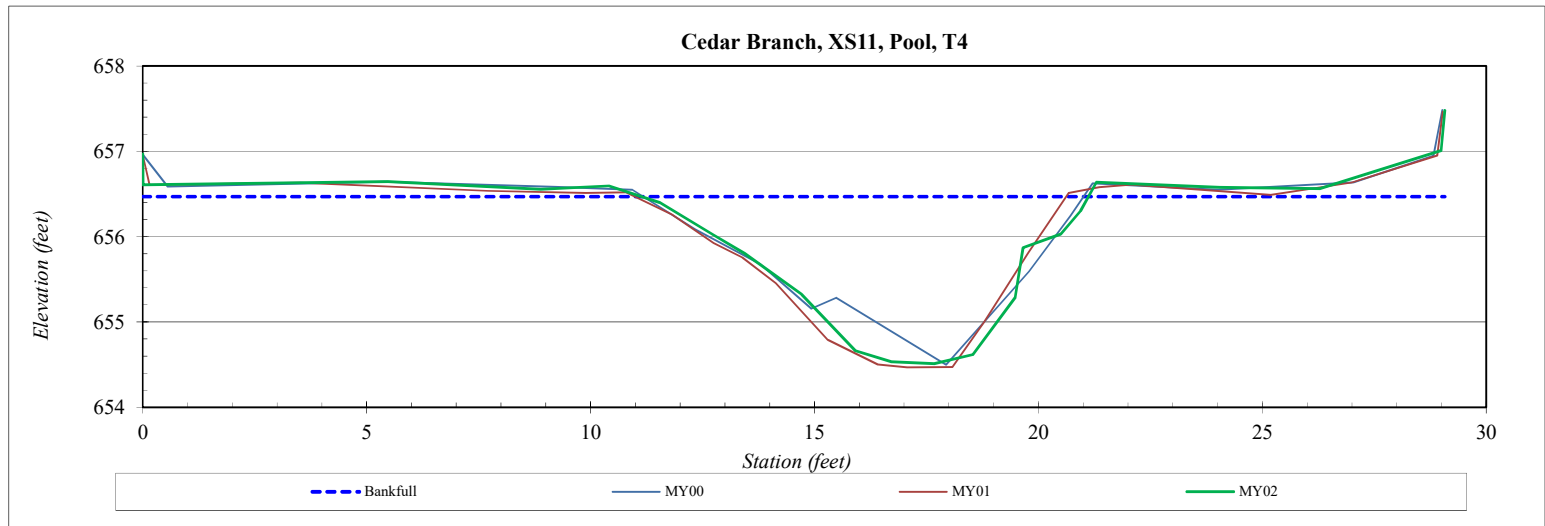


River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS11
Drainage Area (sq mi):	0.05
Date:	6/26/2019
Field Crew:	T. Seelinger, A. Gutierrez



Station	Elevation
0.0	656.97
0.0	656.61
5.5	656.64
8.9	656.56
10.4	656.59
11.6	656.40
12.7	656.02
13.4	655.80
14.7	655.32
15.9	654.66
16.7	654.53
17.7	654.51
18.5	654.62
19.5	655.29
19.7	655.87
20.5	656.03
20.9	656.30
21.3	656.64
24.1	656.58
26.3	656.56
29.0	657.01
29.1	657.48

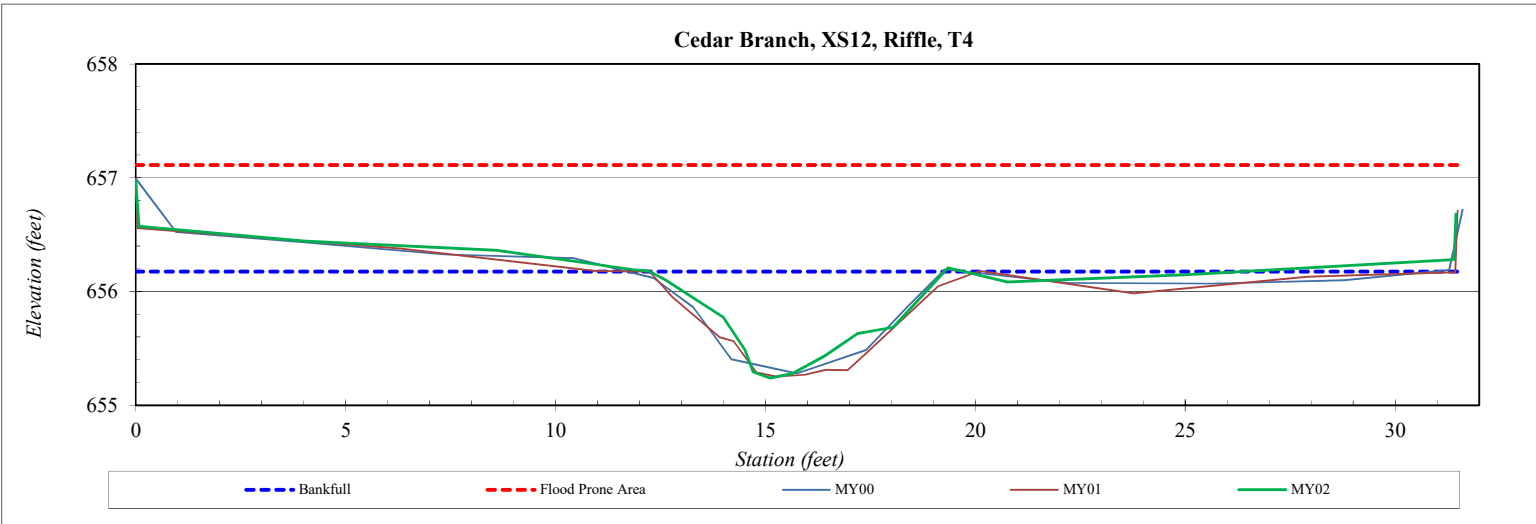
SUMMARY DATA	
Current Bankfull Elevation:	656.47
Bankfull Cross-Sectional Area:	10.8
Total Cross-Sectional Area:	11.6
Bankfull Width:	10.0
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	2.0
Mean Depth at Bankfull:	1.1
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS12
Drainage Area (sq mi):	0.05
Date:	6/26/2019
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	656.97
0.1	656.57
4.0	656.44
8.6	656.36
11.9	656.19
12.2	656.18
12.6	656.10
14.0	655.78
14.5	655.48
14.7	655.29
15.1	655.24
15.6	655.28
16.4	655.44
17.2	655.63
18.0	655.69
19.3	656.21
20.8	656.08
25.1	656.15
31.4	656.28
31.4	656.68

SUMMARY DATA	
Current Bankfull Elevation:	656.18
Bankfull Cross-Sectional Area:	3.5
Total Cross-Sectional Area:	3.1
Bankfull Width:	7.0
Flood Prone Area Elevation:	657.1
Flood Prone Width:	31.4
Max Depth at Bankfull:	0.9
Mean Depth at Bankfull:	0.5
W / D Ratio:	14.1
Entrenchment Ratio:	4.5
Bank Height Ratio:	1.0

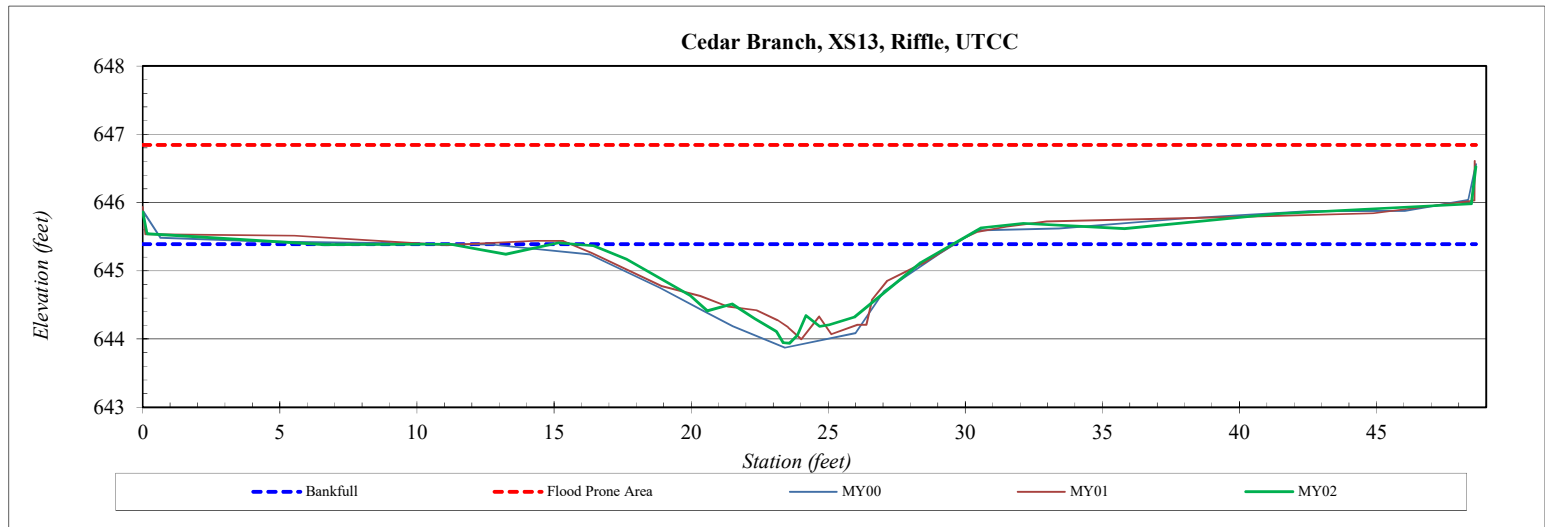


River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS13
Drainage Area (sq mi):	0.41
Date:	6/26/2019
Field Crew:	T. Seelinger, A. Gutierrez



Station	Elevation
0.0	645.86
0.2	645.54
6.6	645.38
11.2	645.39
13.2	645.24
15.2	645.41
16.4	645.37
17.6	645.17
20.0	644.64
20.6	644.41
21.5	644.51
22.3	644.30
23.1	644.11
23.4	643.95
23.6	643.94
23.9	644.06
24.2	644.34
24.7	644.19
25.0	644.21
26.0	644.32
28.4	645.12
30.6	645.63
32.1	645.70
35.8	645.62
41.4	645.84
48.5	645.98
48.6	646.53

SUMMARY DATA	
Current Bankfull Elevation:	645.39
Bankfull Cross-Sectional Area:	9.6
Total Cross-Sectional Area:	7.8
Bankfull Width:	13.1
Flood Prone Area Elevation:	646.8
Flood Prone Width:	48.6
Max Depth at Bankfull:	1.5
Mean Depth at Bankfull:	0.7
W / D Ratio:	17.8
Entrenchment Ratio:	3.7
Bank Height Ratio:	1.0

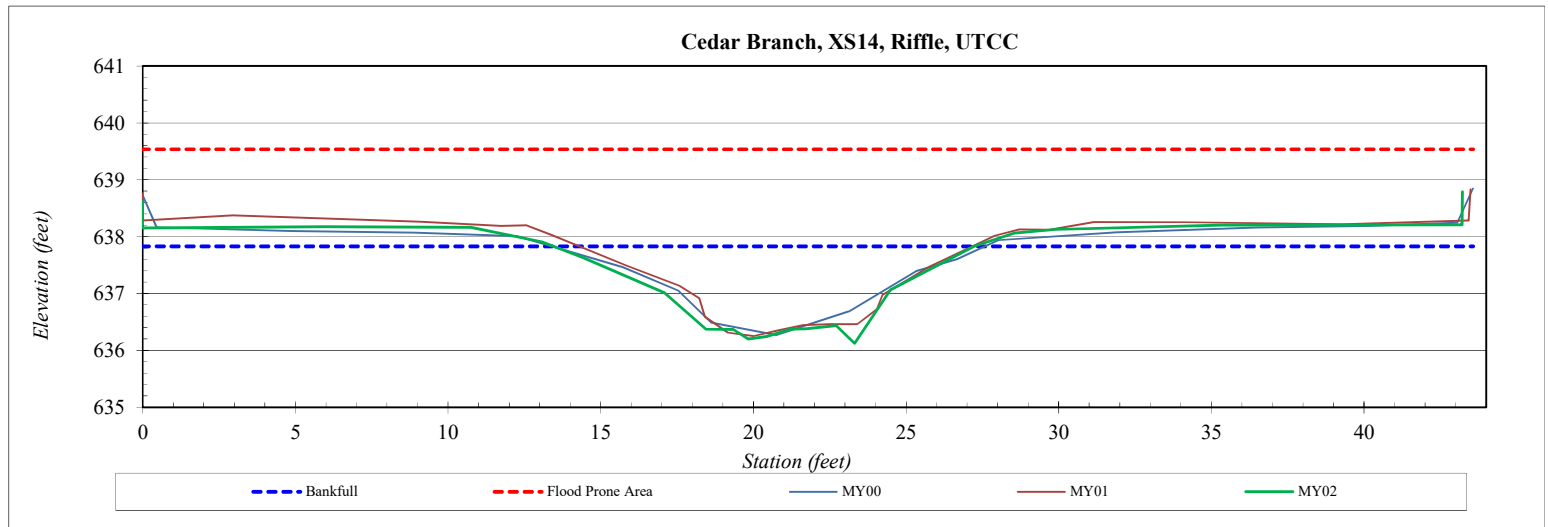


River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS14
Drainage Area (sq mi):	0.41
Date:	6/26/2019
Field Crew:	T. Seelinger, A. Gutierrez



Station	Elevation
0.0	638.62
0.0	638.15
5.9	638.18
10.8	638.16
13.1	637.91
14.4	637.63
17.1	637.01
18.5	636.37
19.3	636.37
19.8	636.20
20.4	636.24
21.2	636.38
21.7	636.38
22.7	636.44
23.3	636.13
24.5	637.06
27.2	637.83
28.5	638.06
29.9	638.13
35.3	638.20
43.2	638.21
43.2	638.79

SUMMARY DATA	
Current Bankfull Elevation:	637.83
Bankfull Cross-Sectional Area:	12.8
Total Cross-Sectional Area:	14.3
Bankfull Width:	13.8
Flood Prone Area Elevation:	639.5
Flood Prone Width:	43.2
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	0.9
W / D Ratio:	14.8
Entrenchment Ratio:	3.1
Bank Height Ratio:	1.0

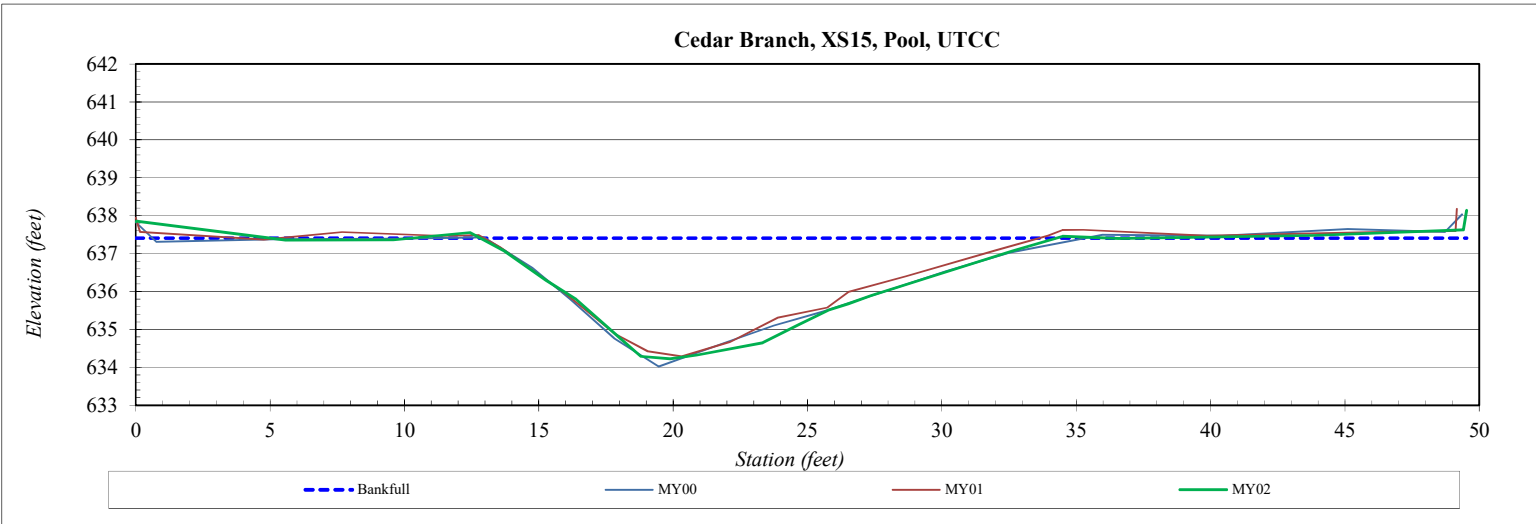


River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS15
Drainage Area (sq mi):	0.41
Date:	6/26/2019
Field Crew:	T. Seelinger, A. Gutierrez

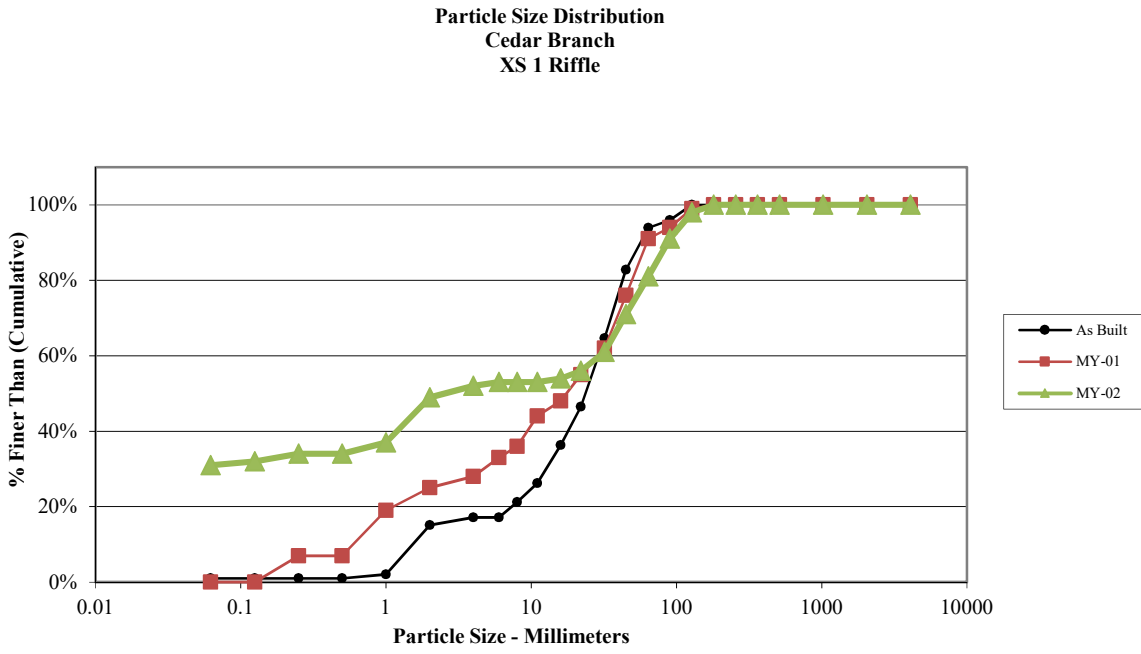


Station	Elevation
0.0	637.84
0.0	637.86
5.6	637.35
9.6	637.36
12.4	637.55
13.7	637.07
15.3	636.30
16.4	635.80
18.0	634.79
18.8	634.29
19.9	634.22
20.9	634.33
23.3	634.65
24.7	635.13
25.8	635.51
26.5	635.67
27.4	635.89
29.7	636.41
32.6	637.07
34.5	637.46
36.6	637.40
43.9	637.48
49.4	637.62
49.5	638.14

SUMMARY DATA	
Current Bankfull Elevation:	637.41
Bankfull Cross-Sectional Area:	35.8
Total Cross-Sectional Area:	36.2
Bankfull Width:	21.4
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	3.2
Mean Depth at Bankfull:	1.7
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---



Cross-Section 1 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	31
Very Fine	.062 - .125	S	1
Fine	.125 - .25	A	2
Medium	.25 - .50	N	
Coarse	.50 - 1	D	3
Very Coarse	1 - 2	S	12
Very Fine	2 - 4		3
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	5
Very Coarse	32 - 45	S	10
Very Coarse	45 - 64		10
Small	64 - 90	C	10
Small	90 - 128	O	7
Large	128 - 180	B	2
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100
Note:			

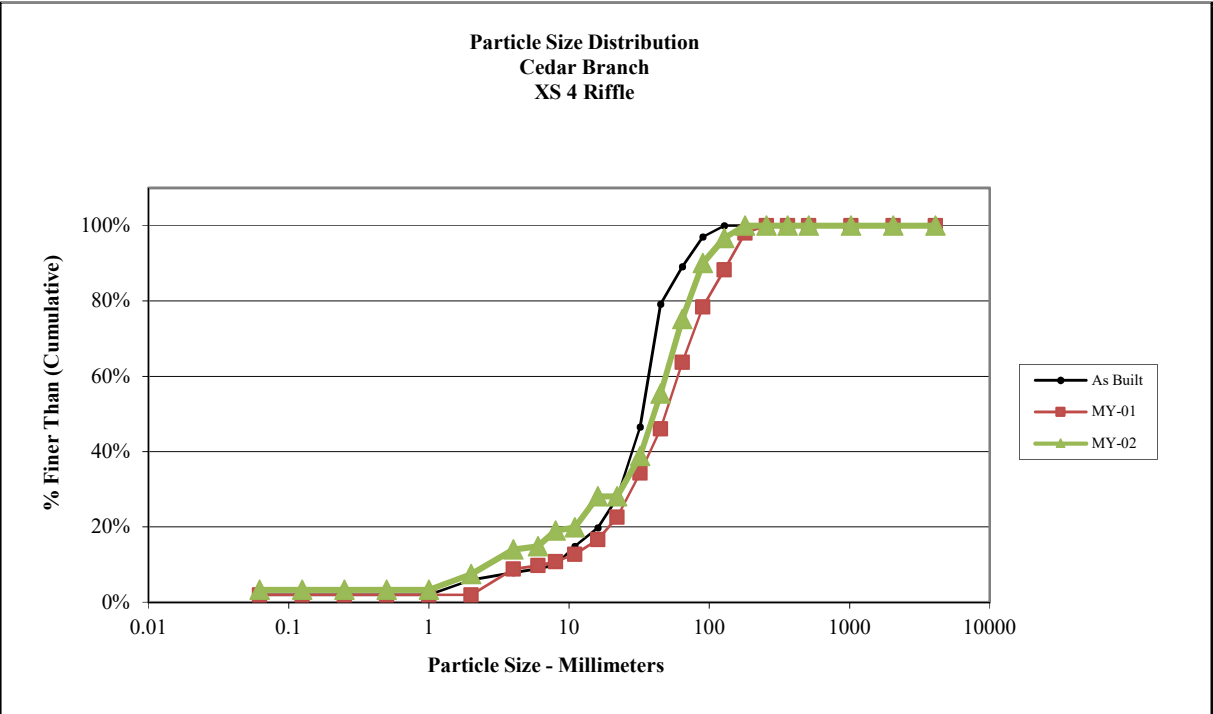


Size (mm)	
D16	0.062
D35	0.63
D50	2.5
D65	37
D84	71
D95	110

Size Distribution	
mean	2.1
dispersion	34.4
skewness	-0.04

Type	
silt/clay	31%
sand	18%
gravel	32%
cobble	19%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 4 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	4
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	5
Very Fine	2 - 4		8
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	5
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	10
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	13
Very Coarse	32 - 45	S	20
Very Coarse	45 - 64		24
Small	64 - 90	C	18
Small	90 - 128	O	8
Large	128 - 180	B	4
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	121



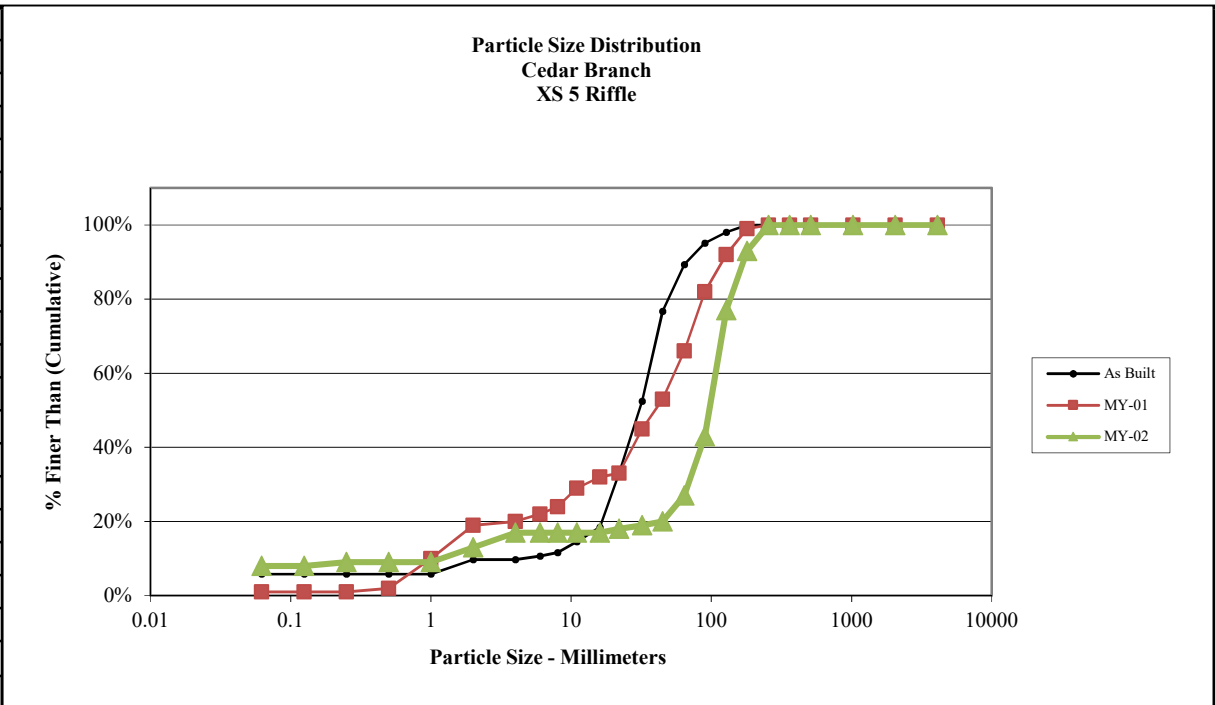
Size (mm)	
D16	6.5
D35	28
D50	40
D65	53
D84	78
D95	120

Size Distribution	
mean	22.5
dispersion	4.1
skewness	-0.24

Type	
silt/clay	3%
sand	4%
gravel	68%
cobble	25%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Note:

Cross-Section 5 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	8
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	1
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	4
Very Fine	2 - 4		4
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	1
Coarse	22.6 - 32	L	1
Very Coarse	32 - 45	S	7
Very Coarse	45 - 64		16
Small	64 - 90	C	34
Small	90 - 128	O	16
Large	128 - 180	B	7
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100
Note:			

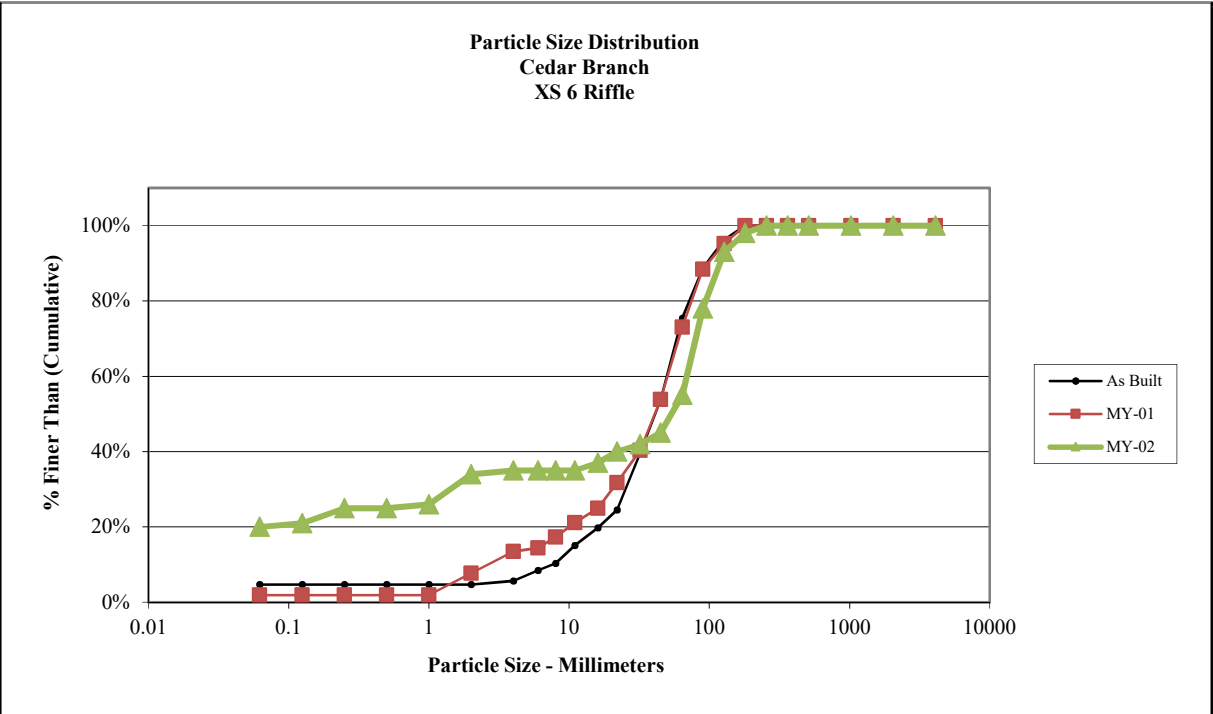


Size (mm)	
D16	3.4
D35	54
D50	69
D65	80
D84	100
D95	140

Size Distribution	
mean	18.4
dispersion	10.9
skewness	-0.47

Type	
silt/clay	8%
sand	5%
gravel	30%
cobble	57%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 6 Riffle -MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	20
Very Fine	.062 - .125	S	1
Fine	.125 - .25	A	4
Medium	.25 - .50	N	
Coarse	.50 - 1	D	1
Very Coarse	1 - 2	S	8
Very Fine	2 - 4		1
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	2
Coarse	16 - 22.6	E	3
Coarse	22.6 - 32	L	2
Very Coarse	32 - 45	S	3
Very Coarse	45 - 64		10
Small	64 - 90	C	23
Small	90 - 128	O	15
Large	128 - 180	B	5
Large	180 - 256	L	2
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100



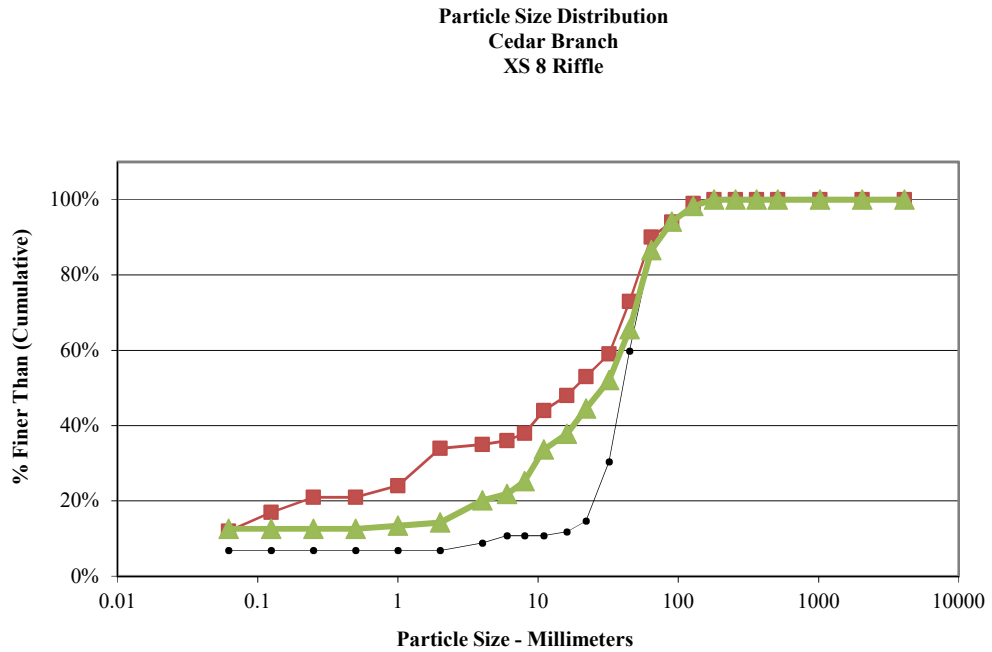
Note:

Size (mm)	
D16	0.062
D35	6
D50	54
D65	74
D84	100
D95	150

Size Distribution	
mean	2.5
dispersion	436.4
skewness	-0.75

Type	
silt/clay	20%
sand	14%
gravel	21%
cobble	45%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 8 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	15
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	1
Very Coarse	1 - 2	S	1
Very Fine	2 - 4		7
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	4
Medium	8 - 11.3	A	10
Medium	11.3 - 16	V	5
Coarse	16 - 22.6	E	8
Coarse	22.6 - 32	L	9
Very Coarse	32 - 45	S	16
Very Coarse	45 - 64		25
Small	64 - 90	C	9
Small	90 - 128	O	5
Large	128 - 180	B	2
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	119
Note:			

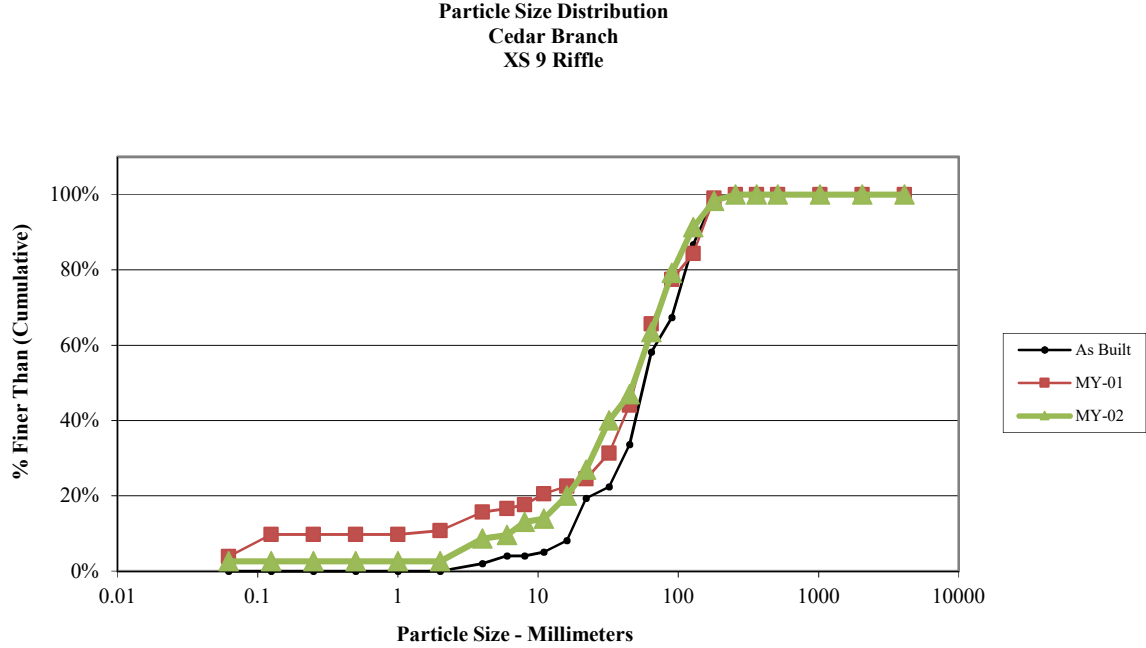


Size (mm)	
D16	2.4
D35	12
D50	29
D65	44
D84	61
D95	97

Size Distribution	
mean	12.1
dispersion	7.1
skewness	-0.32

Type	
silt/clay	13%
sand	2%
gravel	72%
cobble	13%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 9 Riffle -MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	3
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		7
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	4
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	7
Coarse	16 - 22.6	E	8
Coarse	22.6 - 32	L	15
Very Coarse	32 - 45	S	8
Very Coarse	45 - 64		19
Small	64 - 90	C	18
Small	90 - 128	O	14
Large	128 - 180	B	8
Large	180 - 256	L	2
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	115



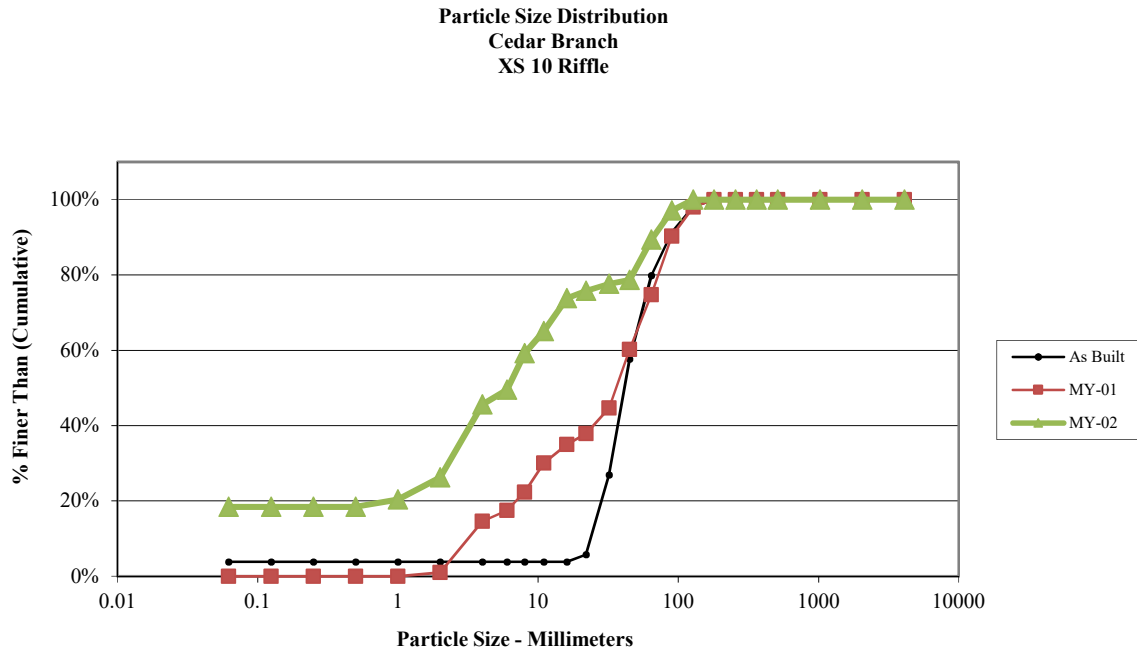
Note:

Size (mm)	
D16	13
D35	28
D50	48
D65	66
D84	100
D95	150

Size Distribution	
mean	36.1
dispersion	2.9
skewness	-0.13

Type	
silt/clay	3%
sand	0%
gravel	61%
cobble	37%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 10 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	19
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	2
Very Coarse	1 - 2	S	6
Very Fine	2 - 4		20
Fine	4 - 5.7	G	4
Fine	5.7 - 8	R	10
Medium	8 - 11.3	A	6
Medium	11.3 - 16	V	9
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	2
Very Coarse	32 - 45	S	1
Very Coarse	45 - 64		11
Small	64 - 90	C	8
Small	90 - 128	O	3
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	103
Note:			

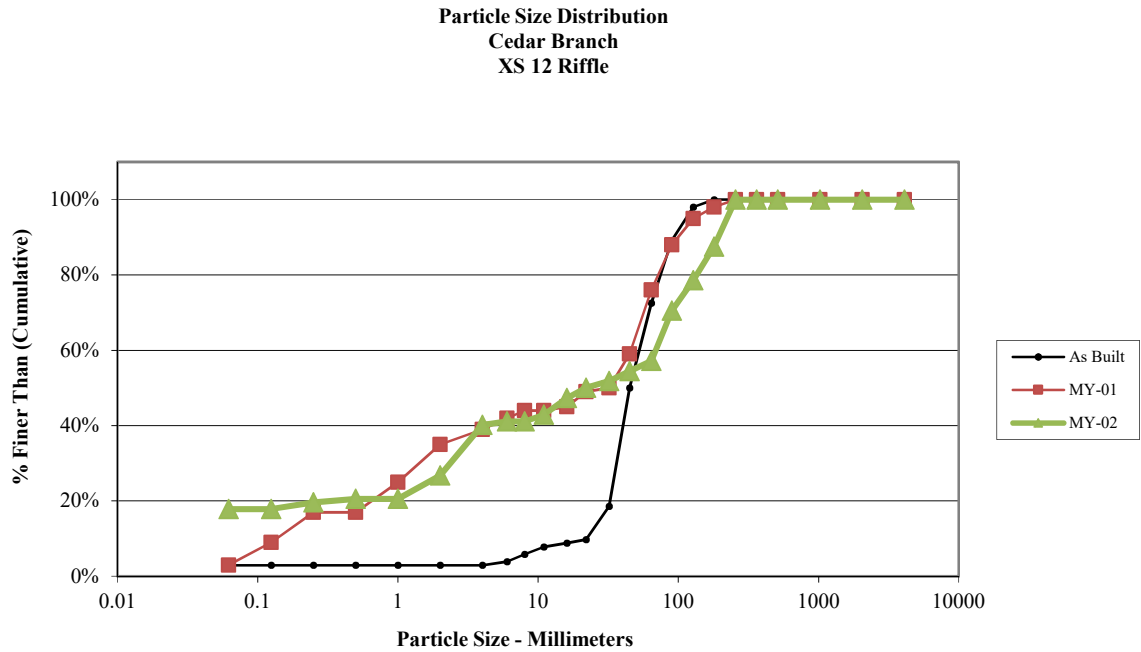


Size (mm)	
D16	0.062
D35	2.7
D50	6.1
D65	11
D84	54
D95	82

Size Distribution	
mean	1.8
dispersion	53.6
skewness	-0.30

Type	
silt/clay	18%
sand	8%
gravel	44%
cobble	11%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 12 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	20
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	2
Medium	.25 - .50	N	1
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	7
Very Fine	2 - 4		15
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	2
Medium	11.3 - 16	V	5
Coarse	16 - 22.6	E	3
Coarse	22.6 - 32	L	2
Very Coarse	32 - 45	S	3
Very Coarse	45 - 64		3
Small	64 - 90	C	15
Small	90 - 128	O	9
Large	128 - 180	B	10
Large	180 - 256	L	14
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	112
Note:			

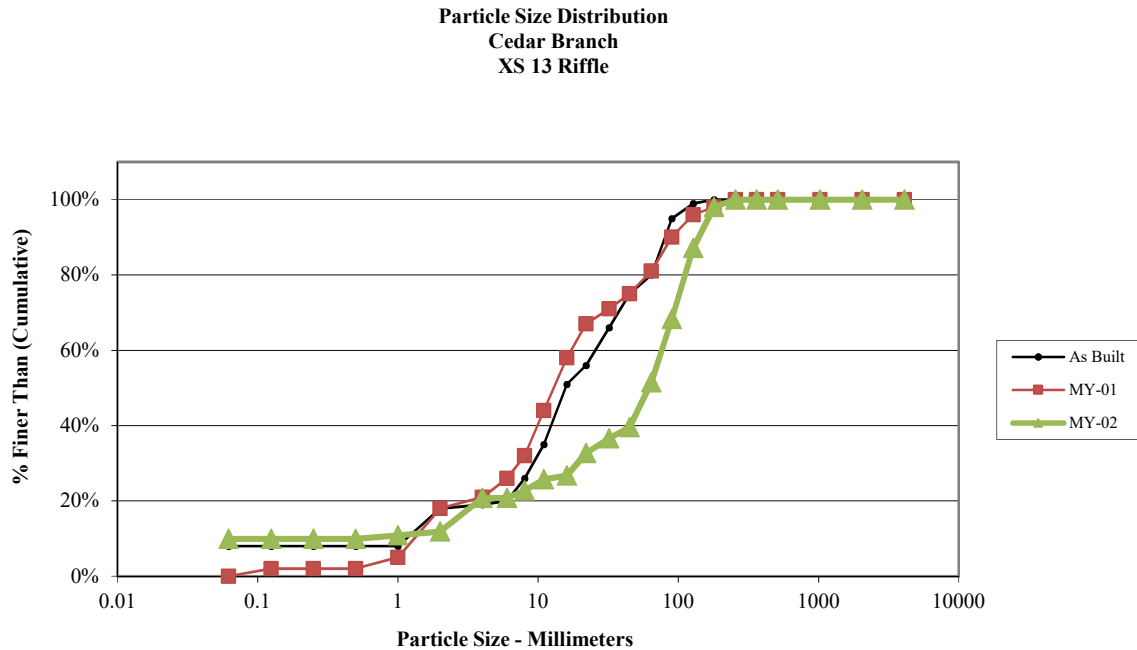


Size (mm)	
D16	0.062
D35	3.1
D50	22
D65	78
D84	160
D95	220

Size Distribution	
mean	3.1
dispersion	181.1
skewness	-0.46

Type	
silt/clay	18%
sand	9%
gravel	30%
cobble	43%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 13 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	10
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	1
Very Coarse	1 - 2	S	1
Very Fine	2 - 4		9
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	6
Coarse	22.6 - 32	L	4
Very Coarse	32 - 45	S	3
Very Coarse	45 - 64		12
Small	64 - 90	C	17
Small	90 - 128	O	19
Large	128 - 180	B	11
Large	180 - 256	L	2
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	101
Note:			

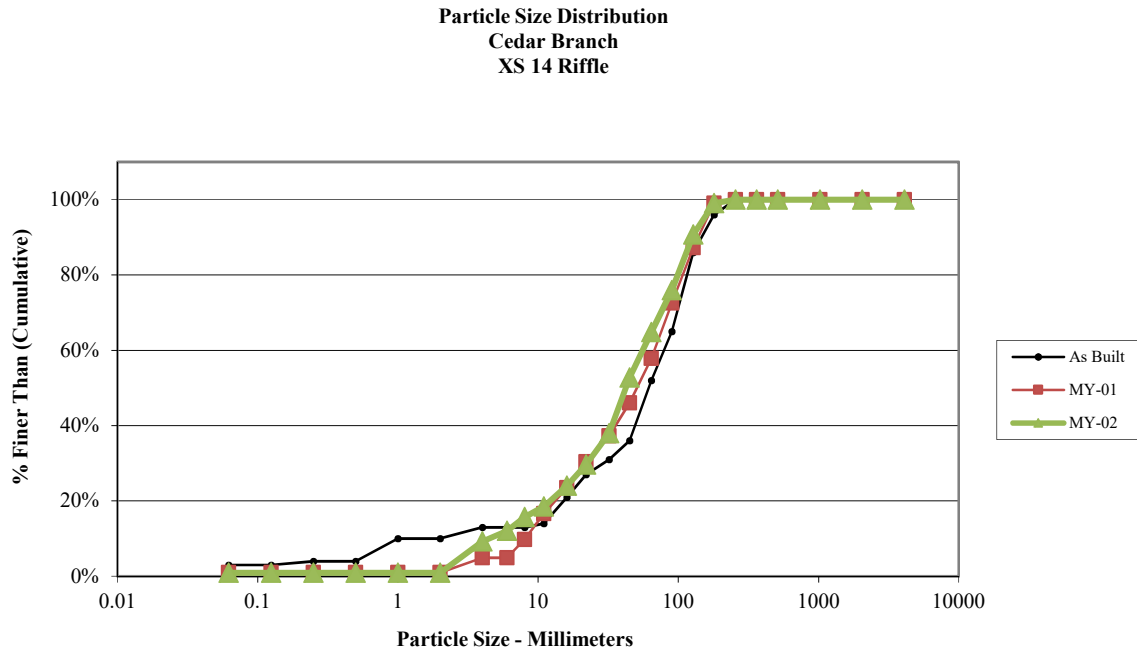


Size (mm)	
D16	2.8
D35	27
D50	61
D65	84
D84	120
D95	160

Size Distribution	
mean	18.3
dispersion	11.9
skewness	-0.41

Type	
silt/clay	10%
sand	2%
gravel	40%
cobble	49%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 14 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	1
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		9
Fine	4 - 5.7	G	3
Fine	5.7 - 8	R	4
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	6
Coarse	16 - 22.6	E	6
Coarse	22.6 - 32	L	9
Very Coarse	32 - 45	S	16
Very Coarse	45 - 64		13
Small	64 - 90	C	12
Small	90 - 128	O	16
Large	128 - 180	B	9
Large	180 - 256	L	1
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	108
Note:			



Size (mm)	
D16	8.2
D35	28
D50	42
D65	64
D84	110
D95	150

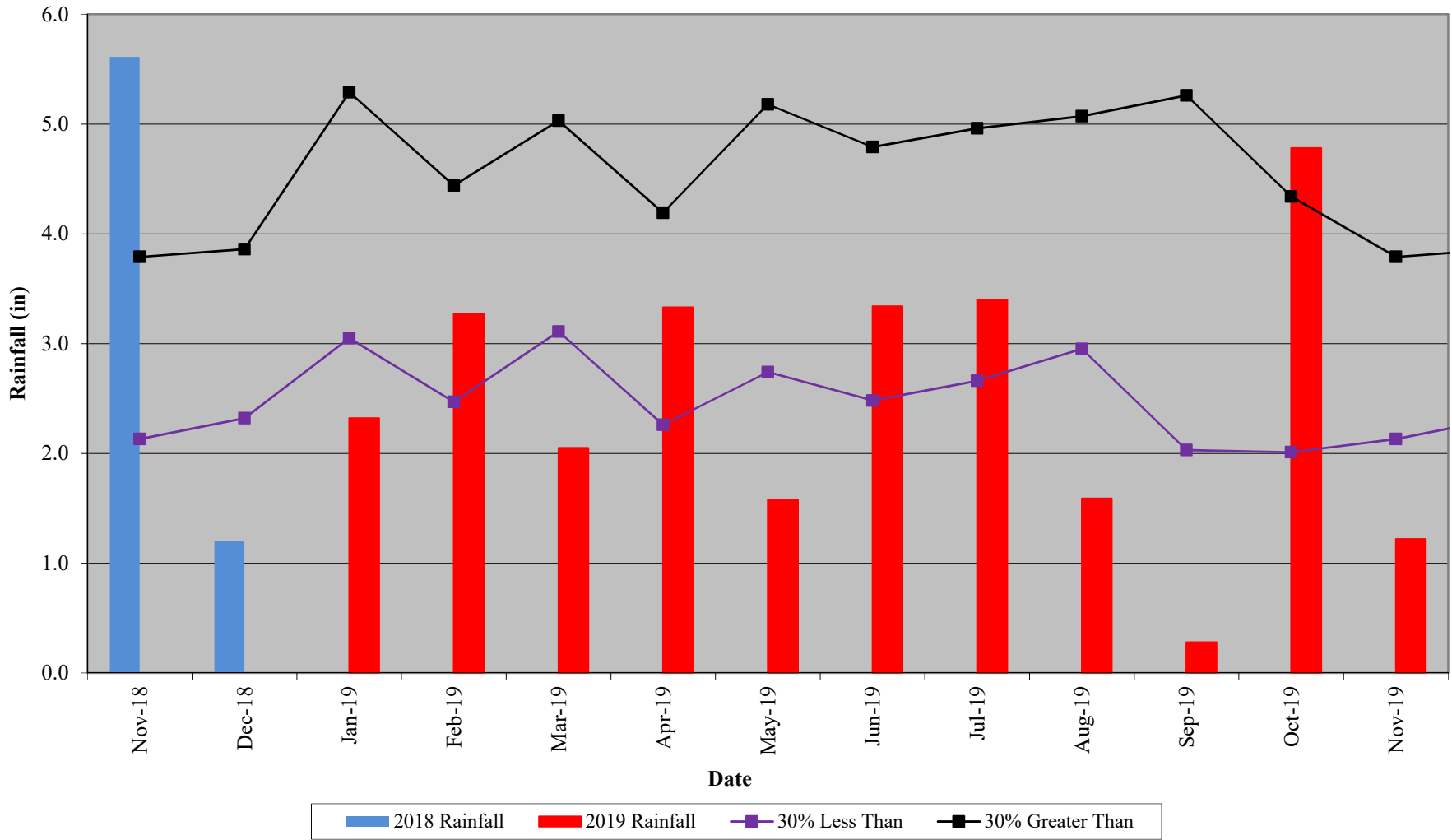
Size Distribution	
mean	30.0
dispersion	3.9
skewness	-0.14

Type	
silt/clay	1%
sand	0%
gravel	64%
cobble	35%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

APPENDIX E

Hydrologic Data

**Cedar Branch Restoration Site
30-70 Percentile Graph
WETS Station Name: Asheboro, NC**



**Table 10. Verification of Bankfull Events
Cedar Branch Restoration Site, DMS Project #97009**

Date of Occurrence	Method	Photo Number
April 26, 2018	Onsite stream gauge	
August 3, 2018	Onsite stream gauge	
August 7, 2018	Onsite stream gauge	
August 22, 2018	Onsite stream gauge	
November 4, 2018	Photos taken on site	1
January 13, 2019	Onsite stream gauge	
January 20, 2019	Onsite stream gauge	
January 24, 2019	Onsite stream gauge	
February 18, 2019	Onsite stream gauge	
February 22, 2019	Onsite stream gauge	
April 8, 2019	Onsite stream gauge	
April 12, 2019	Onsite stream gauge	
April 13, 2019	Onsite stream gauge	
June 7, 2019	Onsite stream gauge	
June 9, 2019	Onsite stream gauge	
June 13, 2019	Onsite stream gauge	
October 31, 2019	Onsite stream gauge	



Photo 1. Wrack lines above bankfull, 11/5/2018

**Cedar Branch Restoration Site
Hydrograph
Stream Gauge UTCC**

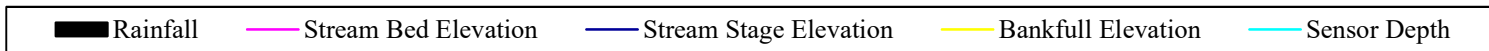
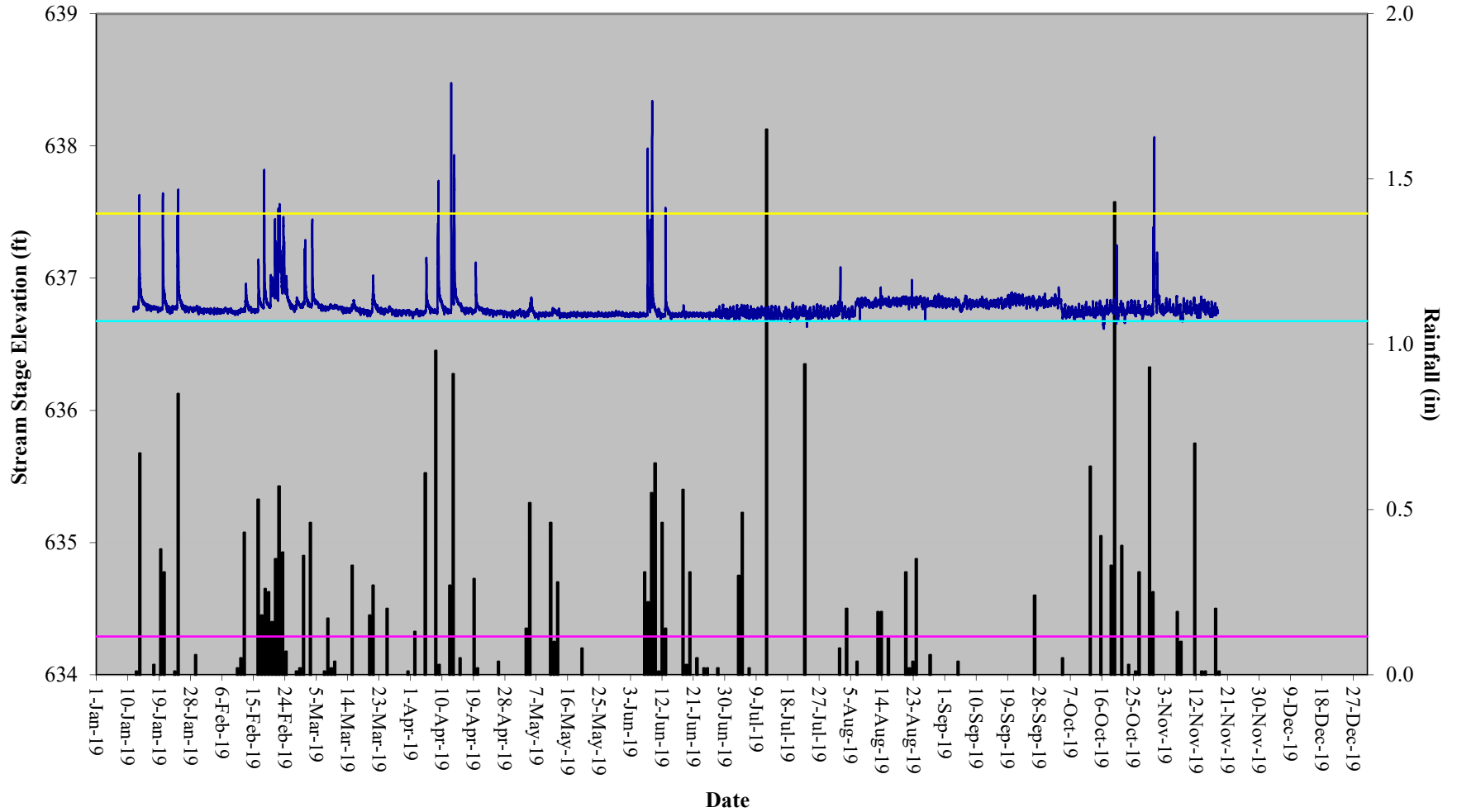


Table 11. Verification of Stream Flow Cedar Branch Restoration Site, DMS Project #97009				
	Gauge		Camera	
Reach	Dates Achieving	Maximum Consecutive Days	Dates Achieving	Maximum Consecutive Days
T1	January 11 – February 25	46	January 1 – September 17	260
T1-1	January 11 – March 17, April 3 – May 8	66	January 21 – May 5	105
T3	January 11 – July 16	187	January 1 – September 9, October 18 – November 16	252

Table 12. Stream Flow Criteria Attainment Cedar Branch Restoration Site, DMS Project #97009							
	Greater than 30 Days of Flow/Max Consecutive Days						
Reach	MY-01 2018	MY-02 2019	MY-03 2020	MY-04 2021	MY-05 2022	MY-06 2023	MY-07 2024
T1 (Gauge)	Yes/60	Yes/46					
T1 (Camera)	Yes/102	Yes/260					
T1-1 (Gauge)	No/16	Yes/66					
T1-1 (Camera)	No/7*	Yes/105					
T3 (Gauge)	Yes/83	Yes/187					
T3 (Camera)	Yes/93	Yes/252					

* camera malfunction



T1 – 7/4/2019



T1 – 9/16/2019



T1-1 – 3/2/2019



T1-1 – 4/2/2019

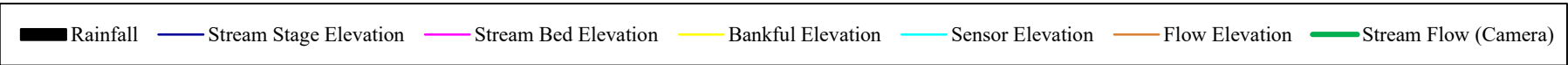
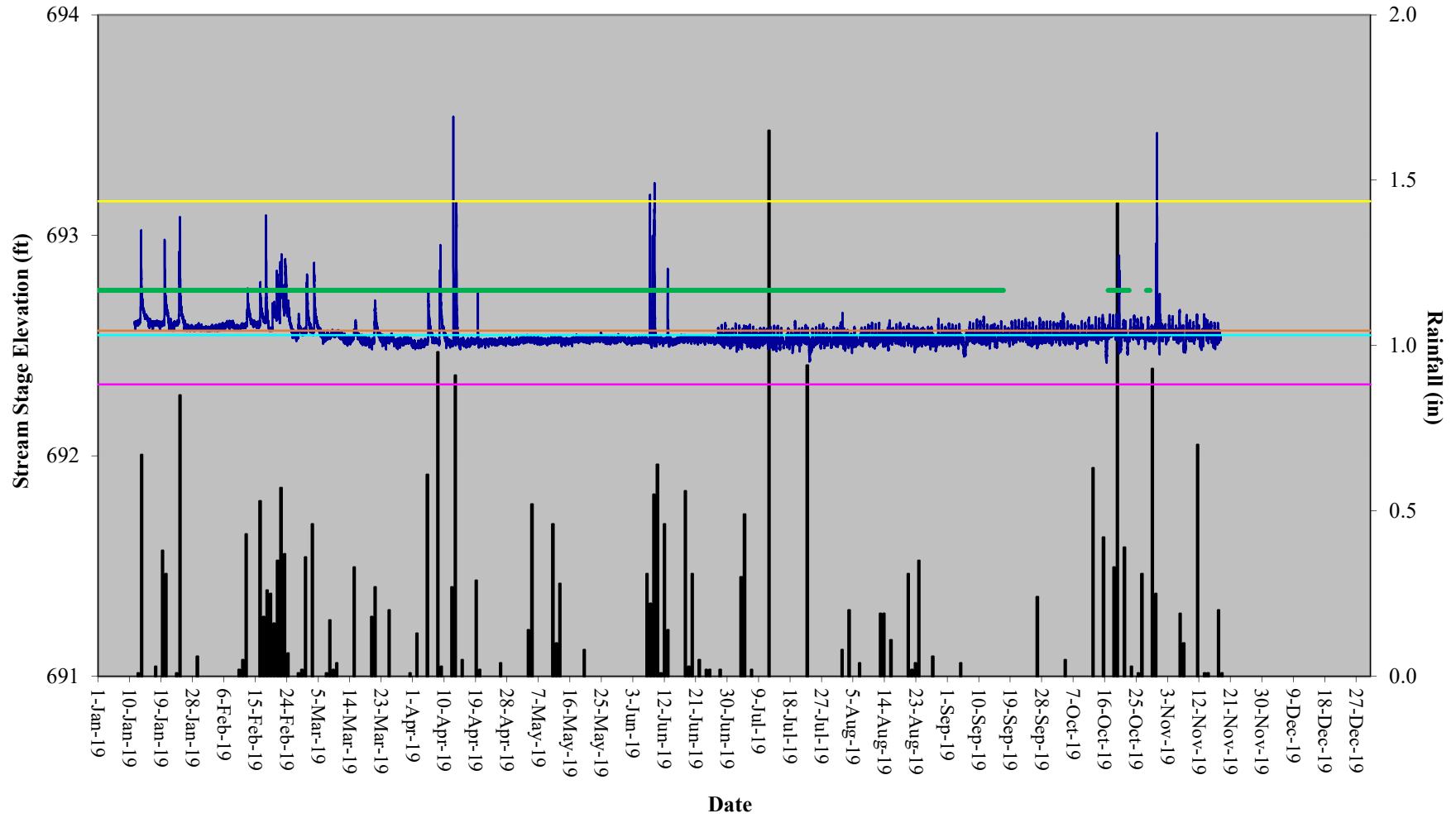


T3 – 4/26/2019

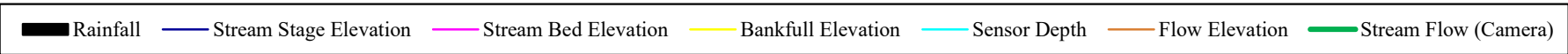
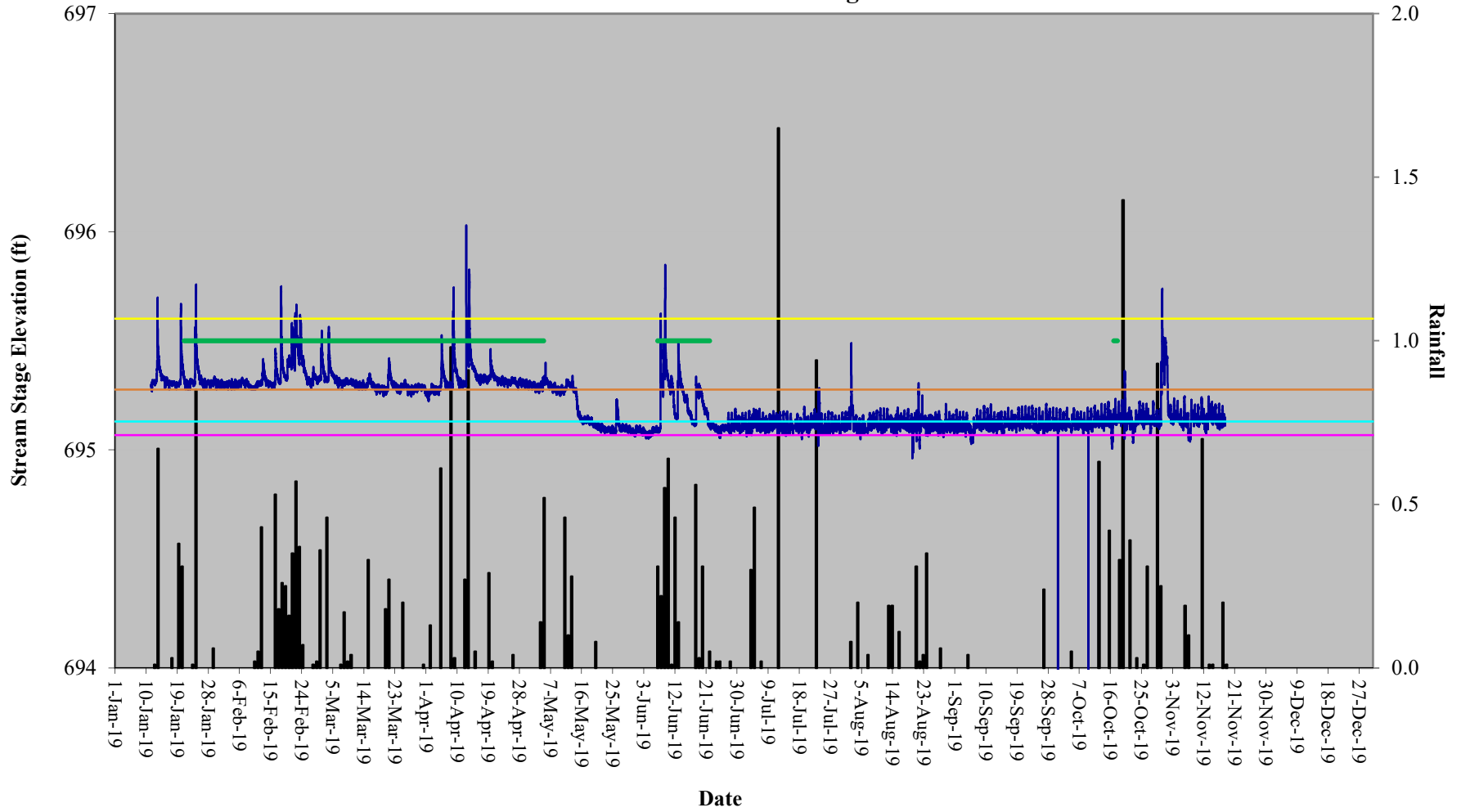


T3 – 8/18/2019

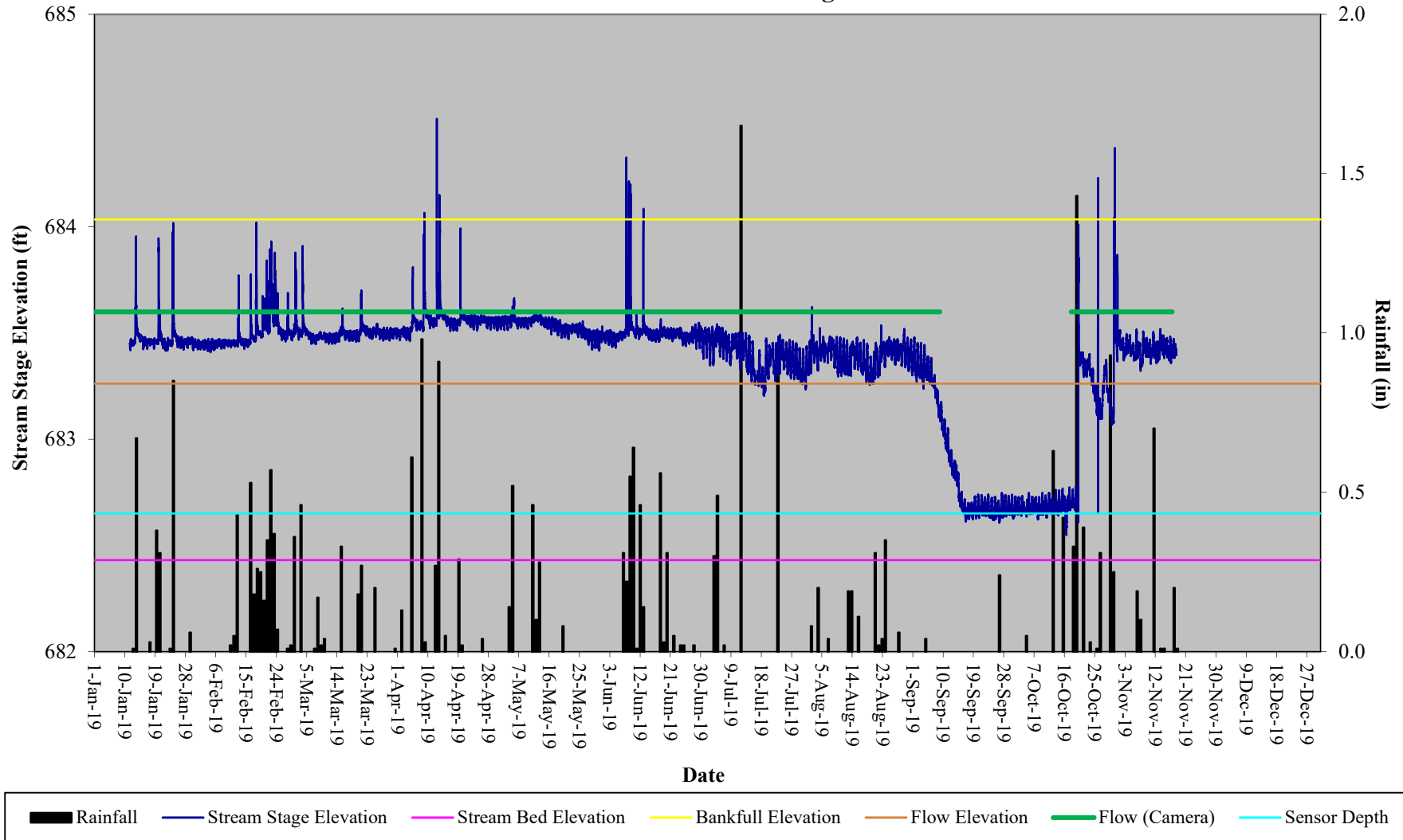
Cedar Branch Restoration Site Hydrograph T1 Stream Flow Gauge



Cedar Branch Restoration Site Hydrograph T1-1 Stream Flow Gauge



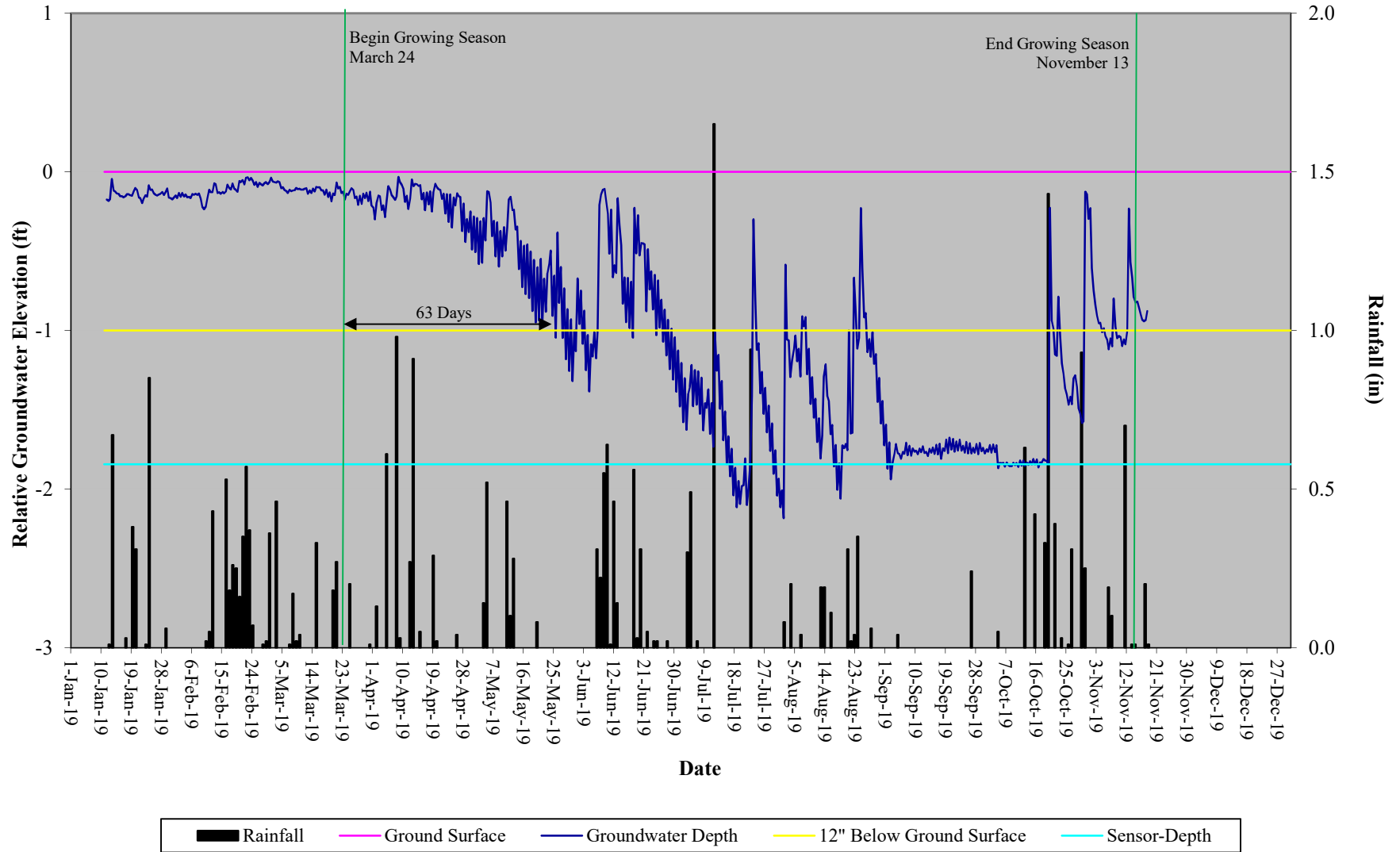
Cedar Branch Restoration Site Hydrograph T3 Stream Flow Gauge



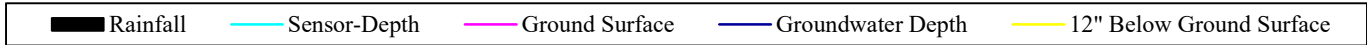
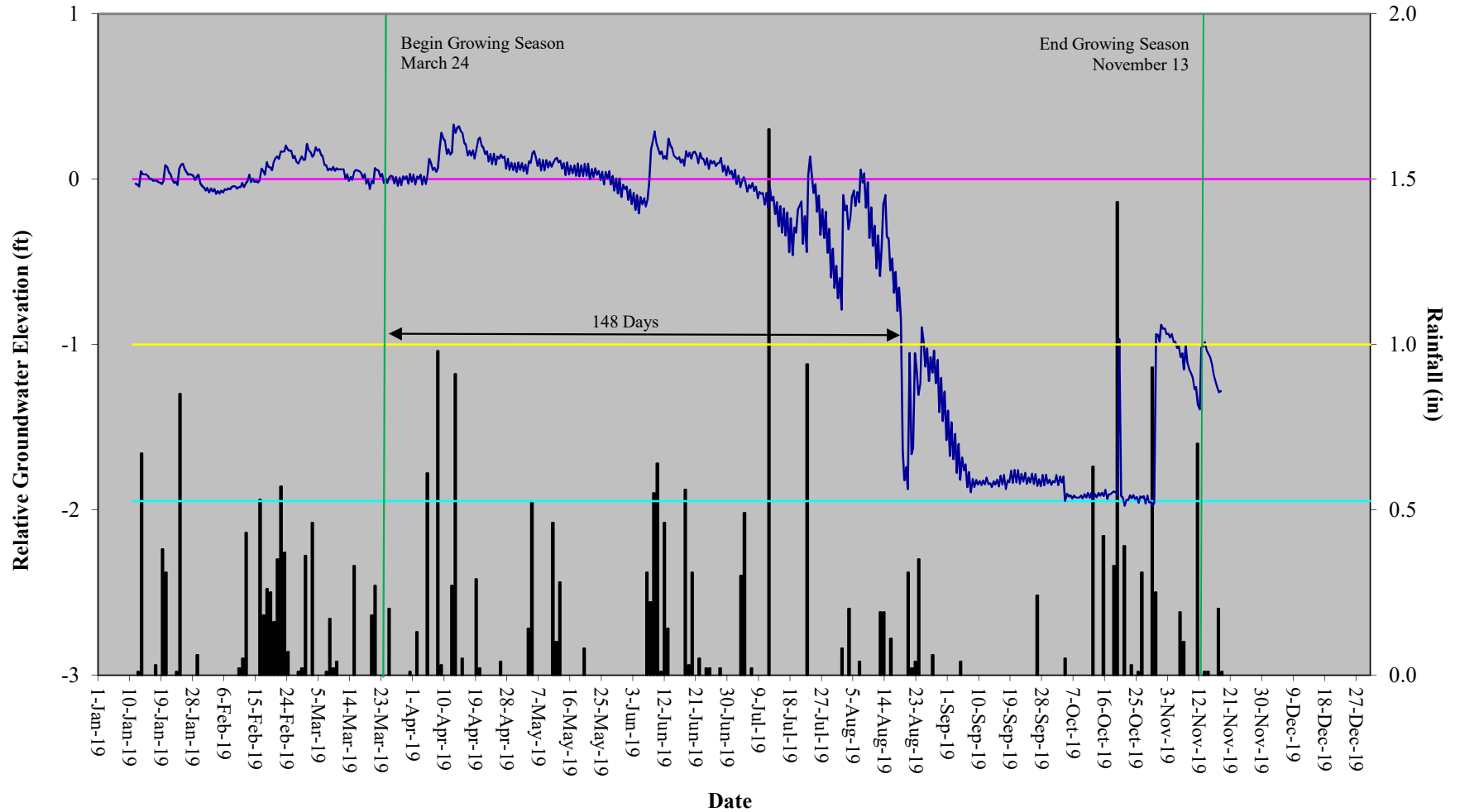
**Table 13. Wetland Hydrology Verification
Cedar Branch Restoration Site, DMS Project #97009**

		Max Consecutive Days During Growing Season (Percentage)						
Gauge #	Location	MY-01 2018	MY-02 2019	MY-03 2020	MY-04 2021	MY-05 2022	MY-06 2023	MY-07 2024
Gauge 1	T1	64 (27.4%)	63 (26.7%)					
Gauge 2	T3	104 (44.4%)	148 (63.2%)					
Gauge 3	T3	21 (9.0%)	26 (10.9%)					

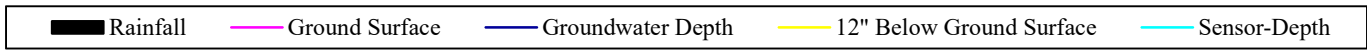
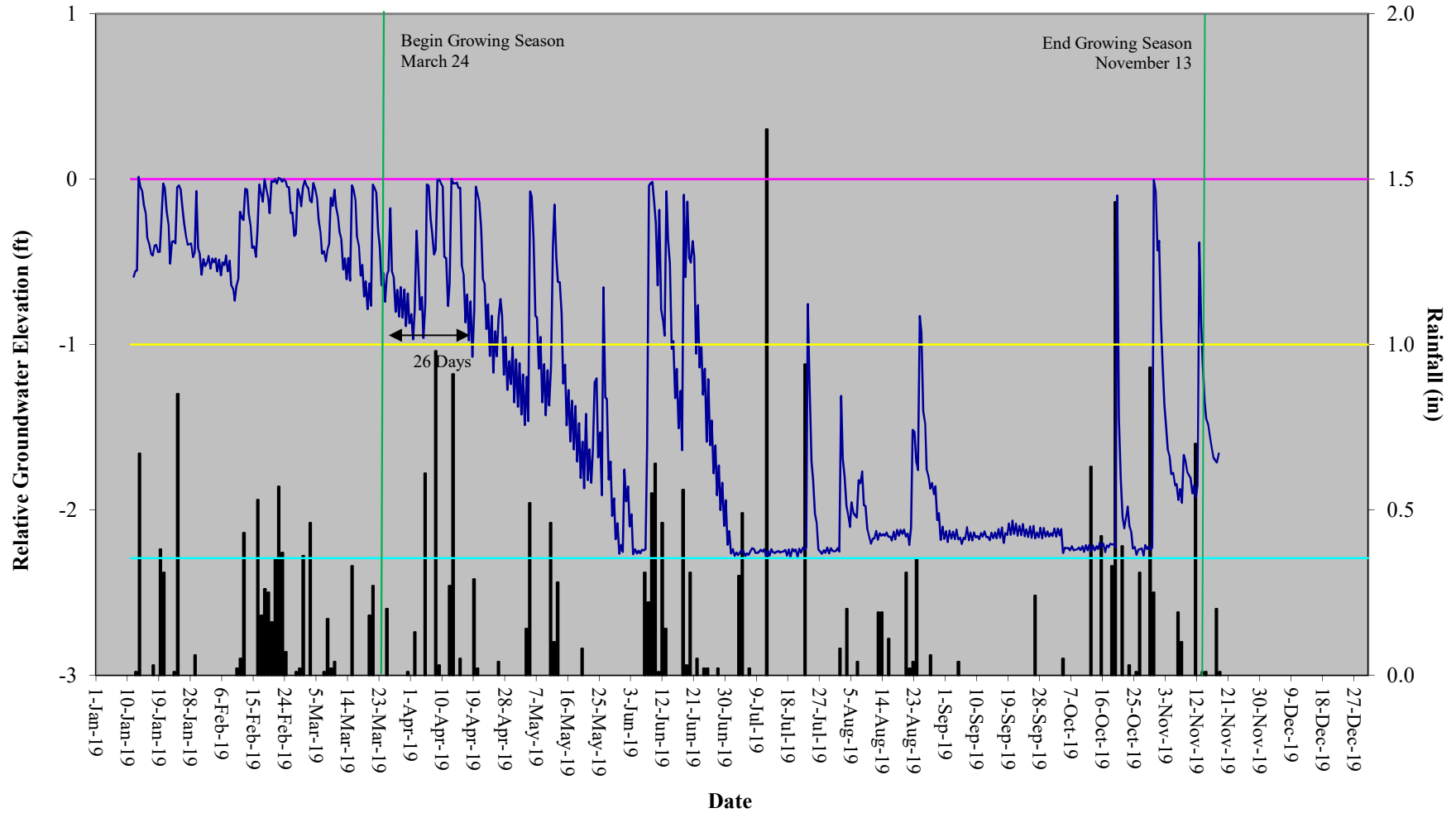
Cedar Branch Restoration Site Hydrograph Wetland Gauge 1



Cedar Branch Restoration Site Hydrograph Wetland Gauge 2



Cedar Branch Restoration Site Hydrograph Wetland Gauge 3



APPENDIX F

Additional Information

Tommy Seelinger

From: Tim Morris
Sent: Friday, August 03, 2018 2:55 PM
To: Tommy Seelinger
Subject: FW: Discrepancy Between As-Built and Mitigation Plan

-----Original Message-----

From: Hughes, Andrea W CIV USARMY CESAW (US) [mailto:Andrea.W.Hughes@usace.army.mil]
Sent: Monday, July 2, 2018 2:45 PM
To: Tim Morris <Tim.Morris@kci.com>
Subject: RE: Discrepancy Between As-Built and Mitigation Plan

For 4 credits? Don't worry about it since it's a reduction. We have too much on our desks right now.

Andrea W. Hughes
Mitigation Project Manager
Regulatory Division, Wilmington District
11405 Falls of Neuse Road
Wake Forest, North Carolina 27587
Phone: (843) 566-3857

-----Original Message-----

From: Tim Morris [mailto:Tim.Morris@kci.com]
Sent: Monday, July 02, 2018 2:43 PM
To: Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>
Subject: [Non-DoD Source] RE: Discrepancy Between As-Built and Mitigation Plan

reduction

-----Original Message-----

From: Hughes, Andrea W CIV USARMY CESAW (US) [mailto:Andrea.W.Hughes@usace.army.mil]
Sent: Monday, July 2, 2018 2:37 PM
To: Tim Morris <Tim.Morris@kci.com>
Subject: RE: Discrepancy Between As-Built and Mitigation Plan

Jeff S is familiar. You have to do a cover page requesting a modification of the credits and include documentation to support your request with the as-built. You are requesting an increase of 4 credits or reduction?

Andrea W. Hughes
Mitigation Project Manager
Regulatory Division, Wilmington District
11405 Falls of Neuse Road
Wake Forest, North Carolina 27587
Phone: (843) 566-3857

-----Original Message-----

From: Tim Morris [mailto:Tim.Morris@kci.com]
Sent: Monday, July 02, 2018 2:19 PM
To: Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>
Subject: [Non-DoD Source] RE: Discrepancy Between As-Built and Mitigation Plan

How do we make that request?

-----Original Message-----

From: Hughes, Andrea W CIV USARMY CESAW (US) [mailto:Andrea.W.Hughes@usace.army.mil]
Sent: Monday, July 2, 2018 2:15 PM
To: Tim Morris <Tim.Morris@kci.com>
Subject: RE: Discrepancy Between As-Built and Mitigation Plan

If you are asking for a change to the mitigation credits proposed in the mitigation plan that was approved, then yes, it is a modification request.

Andrea W. Hughes
Mitigation Project Manager
Regulatory Division, Wilmington District
11405 Falls of Neuse Road
Wake Forest, North Carolina 27587
Phone: (843) 566-3857

-----Original Message-----

From: Tim Morris [mailto:Tim.Morris@kci.com]
Sent: Monday, July 02, 2018 1:59 PM
To: Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>
Subject: [Non-DoD Source] Discrepancy Between As-Built and Mitigation Plan

Andrea - We have a 4 credit disparity (deficit) between our as-built plan and mitigation plan credit numbers on the Cedar Branch job. This is primarily due to two areas where we were avoiding a couple of specimen trees. Will we have to do some kind of formal amendment to our mitigation plan to recognize this discrepancy?