Monitoring Report MY03

Cedar Branch Restoration Site
Monitoring Year 03
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: 2020
Date Submitted: December 2020

Mitigation Project Name	**Cedar Branch Restoration Site**	**USACE Action ID**	**2003-21395**
DMS ID	**97009**	**DWR Permit**	**2015-0904**
River Basin	**Yadkin**	**Date Project Instituted**	**7/15/2015**
Cataloging Unit	**03040103**	**Date Prepared**	**4/21/2020**
County	**Randolph**	**Stream/Wet. Service Area**	**Yadkin 03040103**

Signature & Date of Official Approving Credit Release

1 - For NCDMS, no credits are released during the first milestone

2 - For NCDMS projects, the initial credit release milestone occurs automatically when the as-built report (baseline monitoring report) has been made available to the IRT by posting it to the DMS portal, provided the following have been met:

1) Approved of 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.

Credit Release Milestone	**Warm Stream Credits**						
Project Credits	**Scheduled Releases %**	**Proposed Releases %**	**Proposed Released #**	**Not Approved # Releases**	**Approved Credits**	**Anticipated Release Year**	**Actual Release Date**
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - Year 0 / As-Built	30.00%	30.00%	1,860.000	0.000	1,860.000	2018	8/20/2018
3 - Year 1 Monitoring	10.00%	10.00%	620.000	0.000	620.000	2019	4/26/2019
4 - Year 2 Monitoring	10.00%	10.00%	620.000	0.000	620.000	2020	4/21/2020
5 - Year 3 Monitoring	10.00%					2021	
6 - Year 4 Monitoring	5.00%					2022	
7 - Year 5 Monitoring	10.00%					2023	
8 - Year 6 Monitoring	5.00%					2024	
9 - Year 7 Monitoring	10.00%					2025	
Stream Bankfull Standard	10.00%	10.00%	620.000	0.000	620.000	2020	4/21/2020
			Totals	0.000	2,480.000		

Total Gross Credits	6,200.000
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	3,720.000
Total Percentage Released	60.00%
Remaining Unreleased Credits	2,480.000

Notes

Contingencies (if any)

Project Quantities

Mitigation Type	**Restoration Type**	**Physical Quantity**
Warm Stream	Restoration	5,230.000
Warm Stream	Enhancement I	901.000
Warm Stream	Enhancement II	912.000

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County	**Randolph**	**Stream/Wet. Service Area**	**Yadkin 03040103**

Debits

							Stream Restoration Credits
Beginning Balance (mitigation credits)							**6,200.000**
Released Credits							**3,720.000**
Unrealized Credits							**0.000**
Owning Program	**Req. Id**	**TIP #**	**Project Name**	**USACE Permit #**	**DWR Permit #**	**DCM Permit #**	
NCDOT Stream & Wetland ILF Program	REQ-007227	R-2536	US 64 - Asheboro Bypass	2002-01260	2016-0299		2,480.000
Total Credits Debited							**2,480.000**
Remaining Available balance (Released credits)							**1,240.000**
Remaining balance (Unreleased credits)							**2,480.000**

Monitoring and Design Firm

Prepared by:

KCI Associates of North Carolina
4505 Falls of Neuse Road
Suite 400
Raleigh, NC 27609
(919) 783-9214

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

KCI ASSOCIATES OF NORTH CAROLINA, PA

ENGINEERS • SCIENTISTS • SURVEYORS • CONSTRUCTION MANAGERS
4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 (919) 783-9214 (919) 783-9266 Fax

MEMORANDUM

Date: January 28, 2021

To: Matthew Reid, DMS Project Manager

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

Subject: Cedar Branch Stream Restoration Site
MY-03 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-03 Baseline Monitoring Report comments from NCDMS received on January 20, 2021, for the Cedar Branch Stream Restoration Site.

Did KCI conduct any invasive species treatment or beaver removal on site during MY3? If so, please add short discussion and dates to Table 2.

- *No invasive treatments or beaver removals have occurred on site. An invasive treatment of the site is planned for the spring of 2021 and will be documented in the MY04 report. A mention of this planned treatment has been added to the report.*

Does KCI plan to replant and reseed the bare area noted between T1-1 and T1? Please add a short discussion of any planned remedial action in Monitoring Results section.

- *This area has a healthy herbaceous layer (see Veg Plot 1 photo) and so no reseeding is required for this area. The area does have some woody stems, but at a lower density than the rest of the site. A decision about whether the area needs a supplemental planting of woody stems will be made during MY04.*

Table 5: All reaches scored 100% and there were no problems indicated on the site. This is impressive considering the intense storms received in 2020 and the 15 bankfull events documented during MY3. This will likely raise questions during the 2021 credit release meeting with the IRT. Please be prepared to discuss.

- *KCI is prepared to discuss this. The stream has held up very well to the many large flows it has experienced and there are no areas of erosion, aggradation or other problem areas to report. The only issues the site has experienced so far are the small area of lower woody stem density mentioned above and the invasive species, which will be treated this coming spring.*

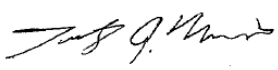
Bankfull photo on page 70 is from 2018. Please update with a current photo from 2020 or remove. Update photo number on Table 10 as necessary.

- *This photo has been updated to one taken in 2020.*

Electronic Deliverable: Please submit the low stem density and invasive species features that were included in the CCPV with final submittal.

- *These have been added to the electronic deliverables.*

Sincerely,



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

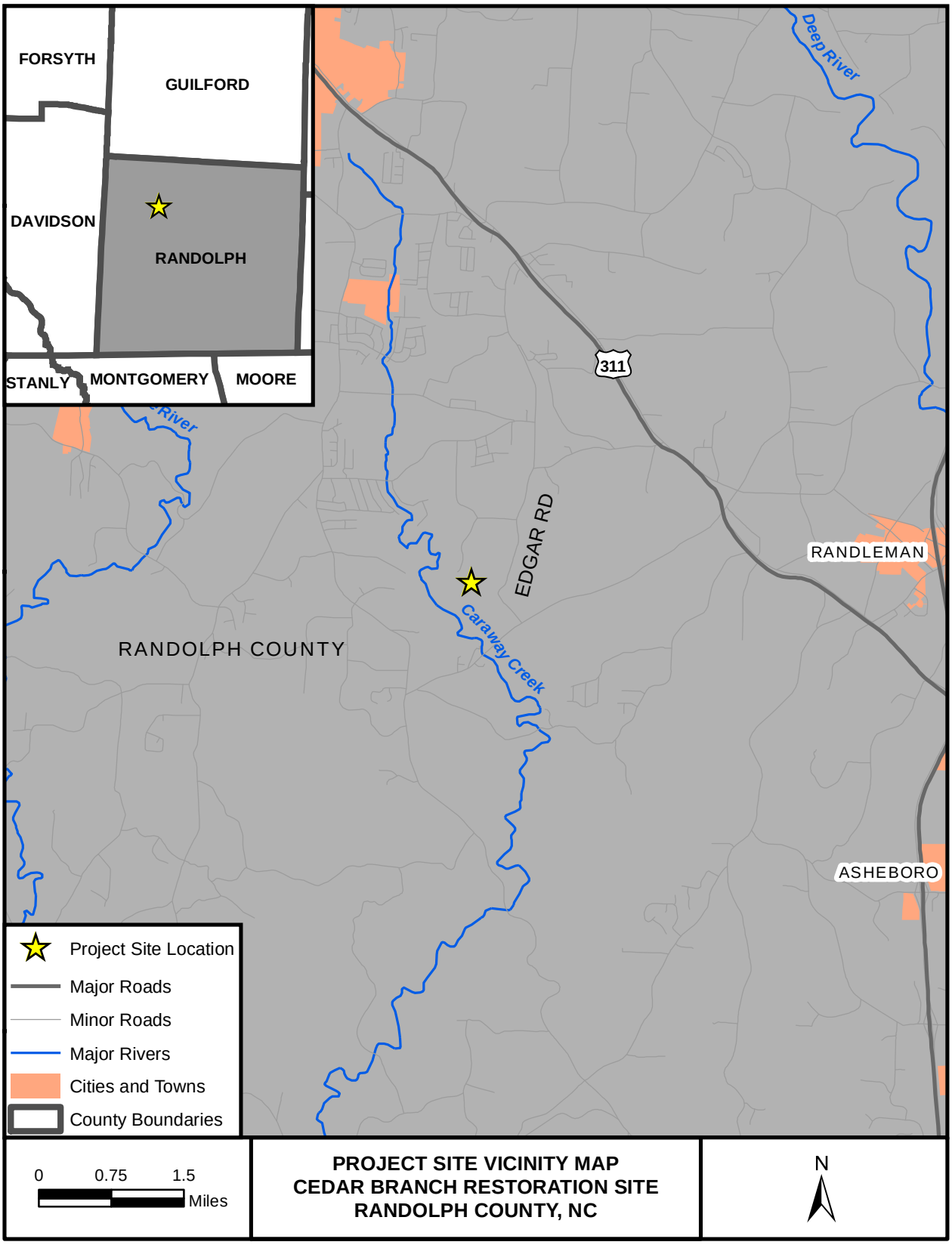
The third-year vegetation monitoring was completed on August 5, 2020. The site averaged 738 planted stems/acre across all 13 plots. Twelve of the thirteen plots had greater than 320 planted stems/acre, Including volunteers, the site averaged 781 total stems/acre. In general the site is well vegetated, with widespread herbaceous coverage and healthy planted stems. A treatment of invasive species growing on site is planned for spring 2021.

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 2020, February, April, May, September, and November experienced above average rainfall, while January, June, July, August, and October experienced average rainfall. The month of March experienced below average rainfall for the site. Overall, the area experienced average rainfall during the 2020 growing season. During the site's third growing season, the groundwater monitoring well on T1 achieved 55 days (23.3%) of continuous saturation within twelve inches of the soil surface, while the two wells on T3 achieved 119 days (50.9%) and 13 days (5.3%). 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 15 bankfull events in 2020. All three stream flow gauges recorded at least 30 consecutive days of flow. T1 recorded a maximum of 142 consecutive days of flow, while T1-1 and T3 both recorded a maximum of 65 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 189 consecutive days, T1-1 had flow for a maximum of 63 consecutive days, and T3 had flow for a maximum of 174 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 and the cameras are occasionally obscured by vegetation.

The longitudinal profile was not repeated for the third-year monitoring because there were no concerns about bed elevation adjustments. The third-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



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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
Vegetation Monitoring	*April 10, 2018*	
Stream Survey	*April 11, 2018*	
Year 1 Monitoring	January 2019	January 2019
Vegetation Monitoring	*November 5, 2018*	
Stream Survey	*January 14, 2019*	
Crossing Repair(outside easement)	May 2019	
Year 2 Monitoring	July 2019	December 2019
Vegetation Monitoring	*July 9, 2019*	
Stream Survey	*June 26, 2019*	
Year 3 Monitoring	July 2020	December 2020
Vegetation Monitoring	*July 31, 2020*	
Stream Survey	*June 30, 2020*	

Table 3. Project Contacts **Cedar Branch Restoration Site, DMS Project #97009**	
Design Firm	KCI Associates of North Carolina 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 4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266

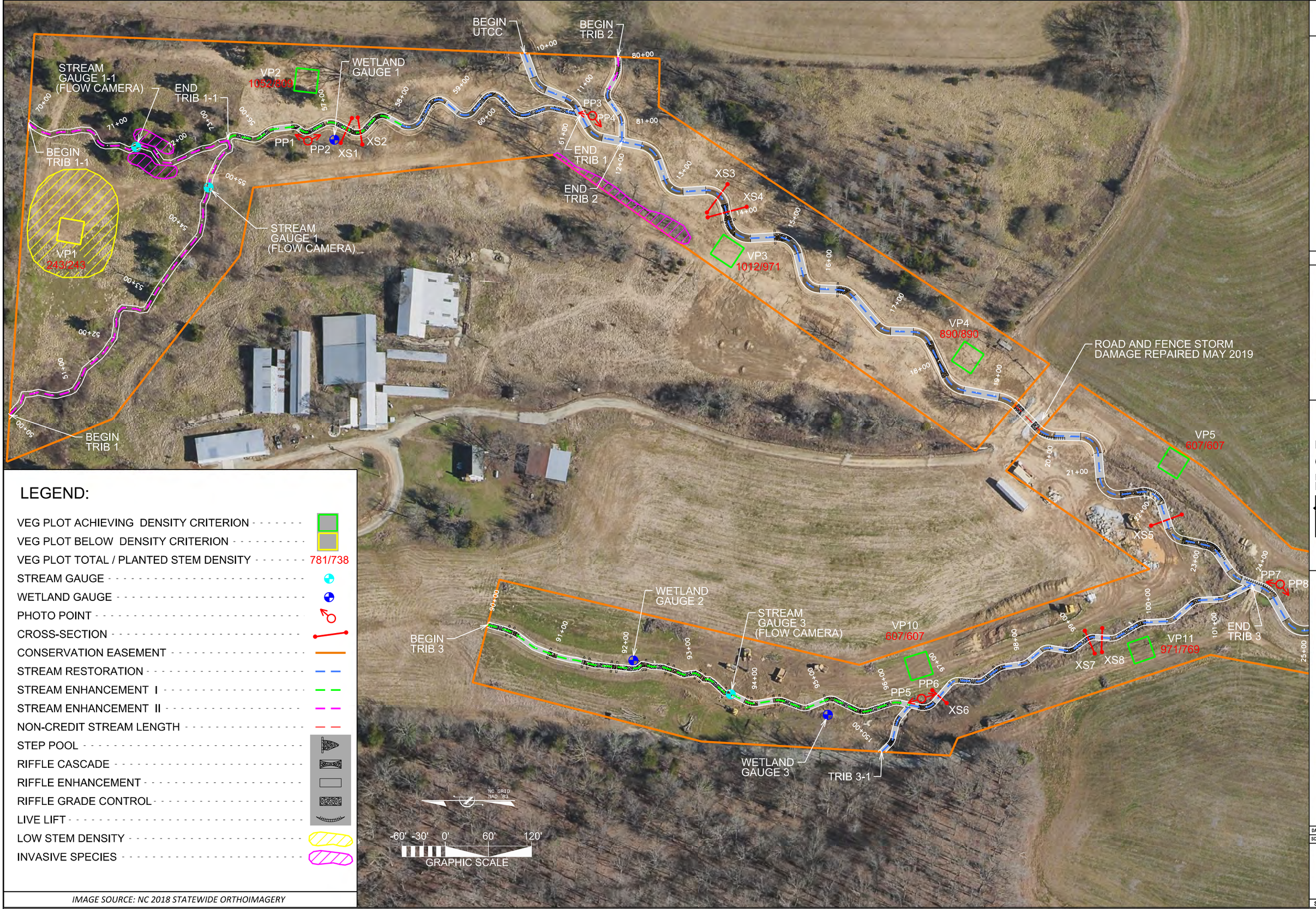
Table 4. Project Information Cedar Branch Restoration Site, DMS Project #97009						
Project Name	Cedar Branch Restoration Site					
County	Randolph County					
Project Area (acres)	21.3 acres					
Project Coordinates (lat. and long.)	35.823878° N, -79.90855° W					
Project Watershed Summary Information						
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 — 781/738
- 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

NCDEQ – DIVISION OF MITIGATION SERVICES

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RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH STREAM RESTORATION SITE MONITORING YEAR 3

RANDOLPH COUNTY, NORTH CAROLINA

DATE: DEC 2020
SCALE: GRAPHIC

CURRENT CONDITION PLAN VIEW

LEGEND:

- VEG PLOT ACHIEVING DENSITY CRITERION
- VEG PLOT BELOW DENSITY CRITERION
- VEG PLOT TOTAL / PLANTED STEM DENSITY — 781/738
- STREAM GAUGE
- WETLAND GAUGE
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- RIFFLE ENHANCEMENT
- RIFFLE GRADE CONTROL
- LIVE LIFT
- LOW STEM DENSITY
- INVASIVE SPECIES

IMAGE SOURCE: NC 2018 STATEWIDE ORTHOIMAGERY

REVISIONS

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CEDAR BRANCH STREAM RESTORATION SITE MONITORING YEAR 3

RANDOLPH COUNTY, NORTH CAROLINA

DATE: DEC 2020

SCALE: GRAPHIC

CURRENT CONDITION PLAN VIEW

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. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	48	48			100%
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	47	47			100%
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem 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%
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 NOT 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.	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 not 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 ≥ 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. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	14	14			100%
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	14	14			100%
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem 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%
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 NOT 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 not 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 ≥ 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. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	4	4			100%
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	3	3			100%
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem 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%
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 NOT 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 not 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 ≥ 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. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	27	27			100%
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	37	37			100%
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem 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%
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 NOT 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.	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 not 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 ≥ 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. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	19	19			100%
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	22	22			100%
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem 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%
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 NOT 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.	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 not 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 ≥ 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-03 – 11/6/20

PP2 – MY-00 – 4/18/18

PP2 – MY-03 – 11/6/20

PP3– MY-00 – 4/18/18

PP3 – MY-03 – 11/6/20

PP4 – MY-00 – 4/18/18

PP4 – MY-03 – 11/6/20

PP5 – MY-00 – 4/18/18

PP5 – MY-03 – 11/6/20

PP6– MY-00 – 4/18/18

PP6– MY-03 – 11/6/20

PP7 – MY-00 – 4/18/18

PP7 – MY-03 – 11/6/20

PP8 – MY-00 – 4/18/18

PP8 – MY-03 – 11/6/20

PP9– MY-00 – 4/18/18

PP9– MY-03 – 11/6/20

PP10 – MY-00 – 4/18/18

PP10 – MY-03 – 11/6/20

PP11 – MY-00 – 4/18/18

PP11 – MY-03 – 11/6/20

PP12– MY-00 – 4/18/18

PP12– MY-03 – 11/6/20

Vegetation Monitoring Plot Photos

Vegetation Plot 1 – MY-00 – 4/10/18

Vegetation Plot 1 – MY-03 – 7/30/20

Vegetation Plot 2 – MY-00 – 4/10/18

Vegetation Plot 2 – MY-03 – 7/30/20

Vegetation Plot 3 – MY-00 – 4/10/18

Vegetation Plot 3 – MY-03 – 7/30/20

Vegetation Plot 4 – MY-00 – 4/10/18

Vegetation Plot 4 – MY-03 – 7/30/20

Vegetation Plot 5 – MY-00 – 4/11/18

Vegetation Plot 5 – MY-03 – 7/30/20

Vegetation Plot 6 – MY-00 – 4/11/18

Vegetation Plot 6 – MY-03 – 8/5/20

Vegetation Plot 7 – MY-00 – 4/11/18

Vegetation Plot 7 – MY-03 – 8/5/20

Vegetation Plot 8 – MY-00 – 4/11/18

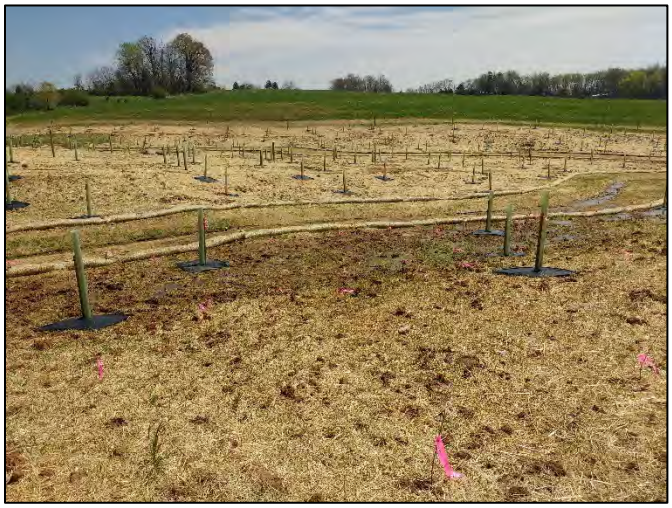
Vegetation Plot 8 – MY-03 – 8/5/20

Vegetation Plot 9 – MY-00 – 4/11/18

Vegetation Plot 9 – MY-03 – 8/5/20

Vegetation Plot 10 – MY-00 – 4/10/18

Vegetation Plot 10 – MY-03 – 7/31/20



Vegetation Plot 11 – MY-00 – 4/10/18

Vegetation Plot 11 – MY-03 – 7/31/20

Vegetation Plot 12 – MY-00 – 4/11/18

Vegetation Plot 12 – MY-03 – 8/5/20

Vegetation Plot 13 – MY-00 – 4/11/18

Vegetation Plot 13 – MY-03 – 8/5/20

APPENDIX C

Vegetation Plot Data

Table 7. Stem Count by Plot and Species
Cedar Branch Restoration Site, DMS Project #97009

	Current Plot Data MY03 (2020)													
	Plot 01		Plot 02		Plot 03		Plot 04		Plot 05		Plot 06		Plot 07	
Species	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**
American Elm (*Ulmus americana*)														
Baccharis (*Baccharis hamifolia*)														
Black Walnut (*Juglans nigra*)						1								
Black Willow (*Salix nigra*)														
Eastern Sycamore (*Platanus occidentalis*)				1	6	6	4	4	3	3	10	10	5	5
Green Ash (*Fraxinus pennsylvanica*)					6	6	9	9	8	8	3	3	2	2
Oak (*Quercus sp.*)														
Persimmon (*Diospyros virginiana)*	2	2		1										
Pin Oak (*Quercus palustris*)	1	1	3	3										
River Birch (Betula nigra)					2	2					3	3		
Silver Willow (*Salix sericea*)														
Smooth Sumac (*Rhus glabra*)														
Swamp Chestnut Oak (*Quercus michauxii*)					7	7	6	6	1	1	9	9	4	4
Sweet Gum (*Liquidambar styraciflua*)				2										
Tulip Poplar (*Liriodendron tulipifera*)			6	8			3	3	1	1			1	1
Unknown														
White Oak (*Quercus alba*)	2	2	4	4										
Willow Oak (*Quercus phellos*)	1	1	7	7	3	3			2	2				
Stem count	6	6	20	26	24	25	22	22	15	15	25	25	12	12
size (ares)	1		1		1		1		1		1		1	
size (ACRES)	0.025		0.025		0.025		0.025		0.025		0.025		0.025	
Species count	4	4	4	7	5	6	4	4	5	5	4	4	4	4
Stems per ACRE	243	243	809	1052	971	1012	890	890	607	607	1012	1012	486	486

Table 7. Stem Count by Plot and Species
Cedar Branch Restoration Site, DMS Project #97009

	Current Plot Data MY03 (2020)											
	Plot 08		Plot 09		Plot 10		Plot 11		Plot 12		Plot 13	
Species	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**
American Elm (*Ulmus americana*)												1
Baccharis (*Baccharis hamifolia*)								1				
Black Walnut (*Juglans nigra*)												
Black Willow (*Salix nigra*)								3				
Eastern Sycamore (*Platanus occidentalis*)	4	4	6	7	8	8						
Green Ash (*Fraxinus pennsylvanica*)	6	6	1	1	2	2						
Oak (*Quercus sp.*)												
Persimmon (*Diospyros virginiana)*							2	2			8	8
Pin Oak (*Quercus palustris*)							1	1				
River Birch (Betula nigra)	6	6	3	3	2	2						
Silver Willow (*Salix sericea*)								1				
Smooth Sumac (*Rhus glabra*)												
Swamp Chestnut Oak (*Quercus michauxii*)	11	11	4	4	1	1	1	1	3	3	5	5
Sweet Gum (*Liquidambar styraciflua*)												
Tulip Poplar (*Liriodendron tulipifera*)			4	4	1	1	2	2			1	1
Unknown												
White Oak (*Quercus alba*)							9	9			5	5
Willow Oak (*Quercus phellos*)	2	2			1	1	4	4	9	9	1	1
Stem count	29	29	18	19	15	15	19	24	12	12	20	21
size (ares)	1		1		1		1		1		1	
size (ACRES)	0.025		0.025		0.025		0.025		0.025		0.025	
Species count	5	5	5	5	6	6	6	9	2	2	5	6
Stems per ACRE	1174	1174	728	769	607	607	769	971	486	486	809	850

Table 7. Stem Count by Plot and Species
Cedar Branch Restoration Site, DMS Project #97009

	Annual Means							
	MY03 (2020)		MY02 (2019)		MY01 (2018)		MY00 (2018)	
Species	Planted	Total	Planted	Total	Planted	Total	Planted	Total
American Elm (*Ulmus americana*)		1		1				
Baccharis (*Baccharis hamifolia*)		1						
Black Walnut (*Juglans nigra*)		1		1				
Black Willow (*Salix nigra*)		3		3		1		
Eastern Sycamore (*Platanus occidentalis*)	46	48	46	48	46	46		
Green Ash (*Fraxinus pennsylvanica*)	37	37	37	37	36	38		
Oak (*Quercus sp.*)							30	30
Persimmon (*Diospyros virginiana)*	12	13	12	13	8	8		
Pin Oak (*Quercus palustris*)	5	5	5	5	5	5		
River Birch (Betula nigra)	16	16	16	16	16	16	6	6
Silver Willow (*Salix sericea*)		1		1		1		
Smooth Sumac (*Rhus glabra*)						1		
Swamp Chestnut Oak (*Quercus michauxii*)	52	52	52	52	68	68		
Sweet Gum (*Liquidambar styraciflua*)		2						
Tulip Poplar (*Liriodendron tulipifera*)	19	21	19	21	31	31	13	13
Unknown							280	280
White Oak (*Quercus alba*)	20	20	20	20				
Willow Oak (*Quercus phellos*)	30	30	30	30	31	31	1	1
Stem count	237	251	237	248	241	246	330	330
size (ares)	13		13		13		13	
size (ACRES)	0.321		0.321		0.321		0.321	
Species count	9	15	9	13	8	11	5	5
Stems per ACRE	738	781	738	772	750	766	1027	1027

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 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						
Baseline Bankfull Elevation:	666.60							665.93							657.32						
	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	9.8				11.8	13.5	12.9	13.4				13.5	13.6	13.8	15.0			
Floodprone Width (ft)	>40	>40	>40	>40				-	-	-	-				-	-	-	-			
Bankfull Mean Depth (ft)	0.5	0.6	0.5	0.5				1.1	1.0	1.0	0.9				1.5	1.5	1.5	1.3			
Bankfull Max Depth (ft)	1.0	1.0	1.0	1.1				2.1	2.0	2.0	2.1				2.8	2.8	2.9	2.8			
Bankfull Cross-Sectional Area (ft^2)	4.6	4.6	4.6	4.6				13.4	13.4	13.4	13.4				20.2	20.2	20.2	20.2			
Total Cross-Sectional Area (ft^2)	4.6	4.3	4.4	3.9				13.4	11.8	12.2	9.8				20.2	20.0	20.2	20.1			
Bankfull Width/Depth Ratio	17.0	14.8	15.9	20.7				-	-	-	-				-	-	-	-			
Bankfull Entrenchment Ratio	4.2	4.6	4.0	3.8				-	-	-	-				-	-	-	-			
Bankfull Bank Height Ratio	1.0	0.9	1.0	1.0				-	-	-	-				-	-	-	-			
d50 (mm)	24	18	2.5	41				-	-	-	-				-	-	-	-			
	Cross-Section 4 (Riffle) Station 13+85, UTCC							Cross-Section 5 (Riffle) Station 22+44, UTCC							Cross-Section 6 (Riffle) Station 96+69, T3						
Baseline Bankfull Elevation:	666.93							656.55							656.12						
	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	12.0				14.5	14.3	14.1	14.8				6.0	6.5	5.8	6.7			
Floodprone Width (ft)	>50	>50	>50	>50				>45	>45	>45	>45				>30	>30	>30	>30			
Bankfull Mean Depth (ft)	1.0	1.0	1.0	1.1				1.1	1.1	1.1	1.1				0.5	0.5	0.5	0.5			
Bankfull Max Depth (ft)	1.7	1.7	1.8	1.7				1.7	1.9	1.9	1.8				0.8	1.0	1.0	1.0			
Bankfull Cross-Sectional Area (ft^2)	12.6	12.6	12.6	12.6				15.8	15.8	15.8	15.8				3.1	3.1	3.1	3.1			
Total Cross-Sectional Area (ft^2)	12.6	13.8	12.6	13.3				15.8	15.7	16.6	14.6				3.1	3.2	3.0	3.2			
Bankfull Width/Depth Ratio	11.6	12.3	12.7	11.4				13.3	13.0	12.6	13.9				11.7	13.7	10.8	14.4			
Bankfull Entrenchment Ratio	4.6	4.5	4.1	4.7				3.1	3.2	3.2	3.1				4.4	4.1	4.6	3.9			
Bankfull Bank Height Ratio	1.0	1.0	0.9	0.9				1.0	1.0	1.0	1.0				1.0	0.9	0.9	0.9			
d50 (mm)	33	49	40	18				31	40	69	26				41	41	54	15			

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						
Baseline Bankfull Elevation:	666.60							665.93							657.32						
	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	9.1				6.0	5.6	6.1	5.4				13.2	13.0	13.8	13.6			
Floodprone Width (ft)	-	-	-	-				>30	>30	>30	>30				>40	>40	>40	>40			
Bankfull Mean Depth (ft)	0.7	0.8	0.8	0.8				0.4	0.4	0.4	0.5				1.0	1.0	0.9	1.0			
Bankfull Max Depth (ft)	1.8	1.6	1.7	1.7				0.7	0.9	0.9	0.8				1.8	1.8	2.0	1.9			
Bankfull Cross-Sectional Area (ft^2)	6.9	6.9	6.9	6.9				2.5	2.5	2.5	2.5				13.0	13.0	13.0	13.0			
Total Cross-Sectional Area (ft^2)	6.9	8.7	7.2	7.6				2.5	2.7	2.7	2.3				13.0	12.0	12.7	12.1			
Bankfull Width/Depth Ratio	-	-	-	-				14.1	12.6	14.8	11.5				13.3	12.9	14.7	14.3			
Bankfull Entrenchment Ratio	-	-	-	-				5.0	5.4	4.9	5.7				3.4	3.5	3.2	3.3			
Bankfull Bank Height Ratio	-	-	-	-				1.0	1.1	1.0	1.0				1.0	0.9	1.0	0.9			
d50 (mm)	-	-	-	-				40	18	29	10				57	50	48	34			
	Cross-Section 10 (Riffle) Station 252+25, T4							Cross-Section 11 (Pool) Station 225+97, T4							Cross-Section 12 (Riffle) Station 226+04, T4						
Baseline Bankfull Elevation:	666.93							656.55							656.12						
	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	7.9				10.2	9.6	10.0	9.9				6.7	6.9	7.0	7.3			
Floodprone Width (ft)	>30	>30	>30	>35				-	-	-	-				>30	>30	>30	>30			
Bankfull Mean Depth (ft)	0.5	0.4	0.5	0.4				1.1	1.1	1.1	1.1				0.5	0.5	0.5	0.5			
Bankfull Max Depth (ft)	0.8	1.0	1.0	1.0				2.1	2.0	2.0	2.1				0.8	0.8	0.9	0.8			
Bankfull Cross-Sectional Area (ft^2)	3.3	3.3	3.3	3.3				10.8	10.8	10.8	10.8				3.5	3.5	3.5	3.5			
Total Cross-Sectional Area (ft^2)	3.3	3.0	2.4	2.4				10.8	11.9	11.6	11.6				3.5	3.8	3.1	2.7			
Bankfull Width/Depth Ratio	14.9	23.0	15.7	18.9				-	-	-	-				12.9	13.6	14.1	15.3			
Bankfull Entrenchment Ratio	5.1	4.1	5.0	4.5				-	-	-	-				4.7	4.6	4.5	4.3			
Bankfull Bank Height Ratio	1.0	0.9	1.0	1.0				-	-	-	-				1.0	1.0	1.0	1.0			
d50 (mm)	42	36	6	6				-	-	-	-				45	32	22	24			

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						
Baseline Bankfull Elevation:	645.24							637.94							637.43						
	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	12.5				15.3	13.9	13.8	14.3				22.5	20.7	21.4	20.8			
Floodprone Width (ft)	>50	>50	>50	>50				>40	>40	>40	>40				-	-	-	-			
Bankfull Mean Depth (ft)	0.8	0.7	0.7	0.8				0.8	0.9	0.9	0.9				1.6	1.7	1.7	1.7			
Bankfull Max Depth (ft)	1.4	1.4	1.5	1.5				1.7	1.7	1.7	1.7				3.4	3.3	3.2	3.2			
Bankfull Cross-Sectional Area (ft^2)	9.6	9.6	9.6	9.6				12.8	12.8	12.8	12.8				35.8	35.8	35.8	35.8			
Total Cross-Sectional Area (ft^2)	9.6	7.9	7.8	8.5				12.8	12.6	14.3	12.2				35.8	32.8	36.2	32.8			
Bankfull Width/Depth Ratio	16.7	19.8	17.8	16.3				18.3	15.1	14.8	16.0				-	-	-	-			
Bankfull Entrenchment Ratio	3.8	3.5	3.7	3.9				2.8	3.1	3.1	3.0				-	-	-	-			
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0				1.0	1.1	1.0	1.2				-	-	-	-			
d50 (mm)	16	13	61	13				61	51	42	23				-	-	-	-			

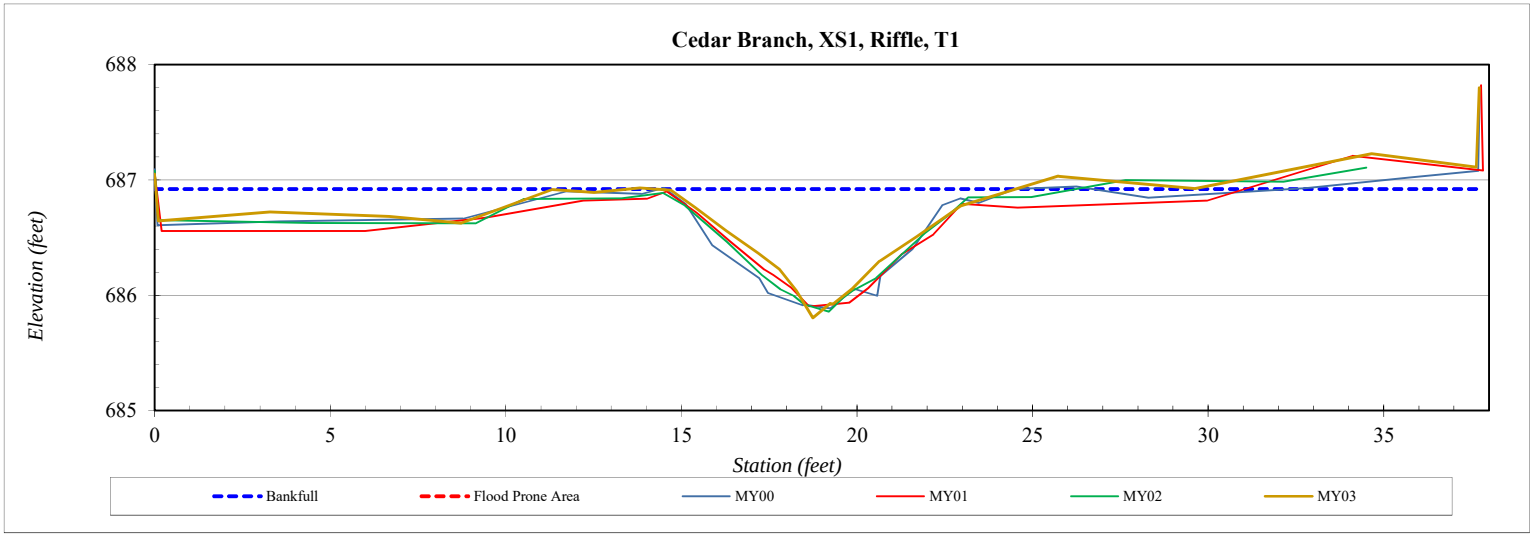
Bank Height Ratios are calculated based on the baseline (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section parameters are calculated based on the current year's low bank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

Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS1
Drainage Area (sq mi):	0.05
Date:	6/30/2020
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	687.05
0.1	686.65
3.3	686.72
6.7	686.68
8.7	686.63
11.3	686.92
12.5	686.89
13.8	686.93
14.7	686.91
15.4	686.76
16.3	686.56
17.2	686.37
17.8	686.23
18.3	686.04
18.7	685.81
19.2	685.93
19.3	685.92
19.9	686.06
20.6	686.30
21.7	686.51
23.0	686.78
25.7	687.04
25.8	687.03
29.6	686.93
34.7	687.23
37.6	687.11
37.7	687.80

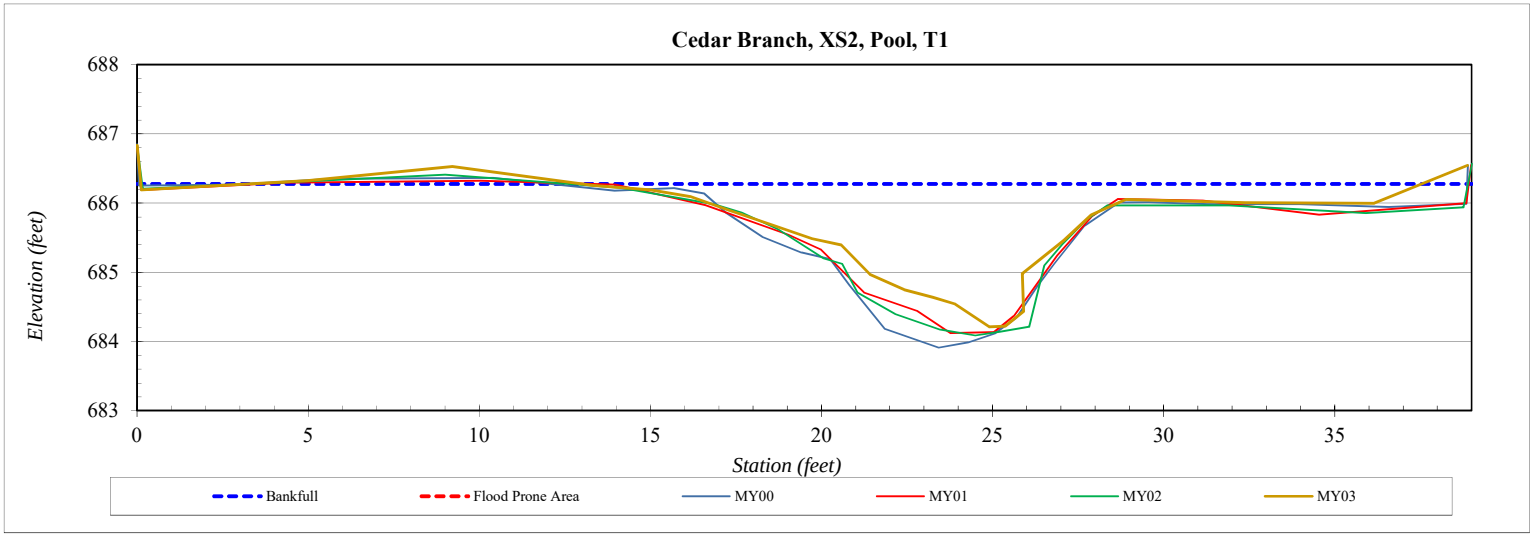
SUMMARY DATA	
Current Bankfull Elevation:	686.92
Bankfull Cross-Sectional Area:	4.6
Total Cross-Sectional Area:	3.9
Bankfull Width:	9.8
Flood Prone Area Elevation:	688.0
Flood Prone Width:	37.7
Max Depth at Bankfull:	1.1
Mean Depth at Bankfull:	0.5
W / D Ratio:	20.7
Entrenchment Ratio:	3.8
Bank Height Ratio:	1.0



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS2
Drainage Area (sq mi):	0.05
Date:	6/30/2020
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	686.84
0.1	686.19
5.0	686.32
9.2	686.53
13.3	686.26
15.0	686.19
16.2	686.10
17.3	685.90
18.5	685.69
19.7	685.49
20.6	685.39
21.4	684.97
22.4	684.75
23.3	684.64
23.9	684.54
24.9	684.21
25.4	684.22
25.9	684.43
25.9	684.98
27.1	685.46
27.9	685.83
28.9	686.05
32.4	686.01
36.2	686.00
38.9	686.54

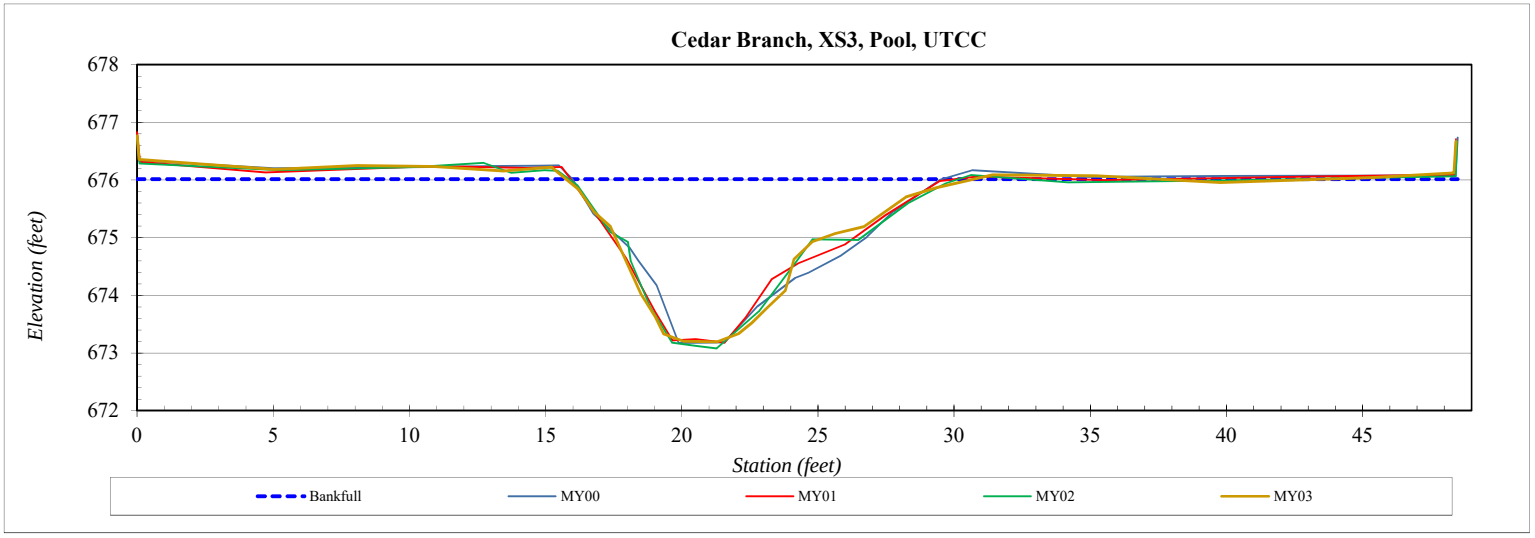
SUMMARY DATA	
Current Bankfull Elevation:	686.28
Bankfull Cross-Sectional Area:	13.4
Total Cross-Sectional Area:	9.8
Bankfull Width:	15.6
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	2.1
Mean Depth at Bankfull:	0.9
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS3
Drainage Area (sq mi):	0.21
Date:	6/30/2020
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	676.77
0.1	676.36
5.1	676.19
8.1	676.25
10.9	676.23
13.4	676.16
15.2	676.23
16.2	675.85
16.8	675.45
17.4	675.20
18.5	674.02
19.0	673.63
19.3	673.32
20.0	673.20
21.3	673.19
22.1	673.33
22.6	673.53
23.1	673.77
23.8	674.08
24.1	674.62
24.8	674.93
25.6	675.07
26.7	675.19
28.2	675.71
29.4	675.87
31.4	676.09
35.2	676.08
39.8	675.96
45.3	676.04
48.4	676.13
48.4	676.67

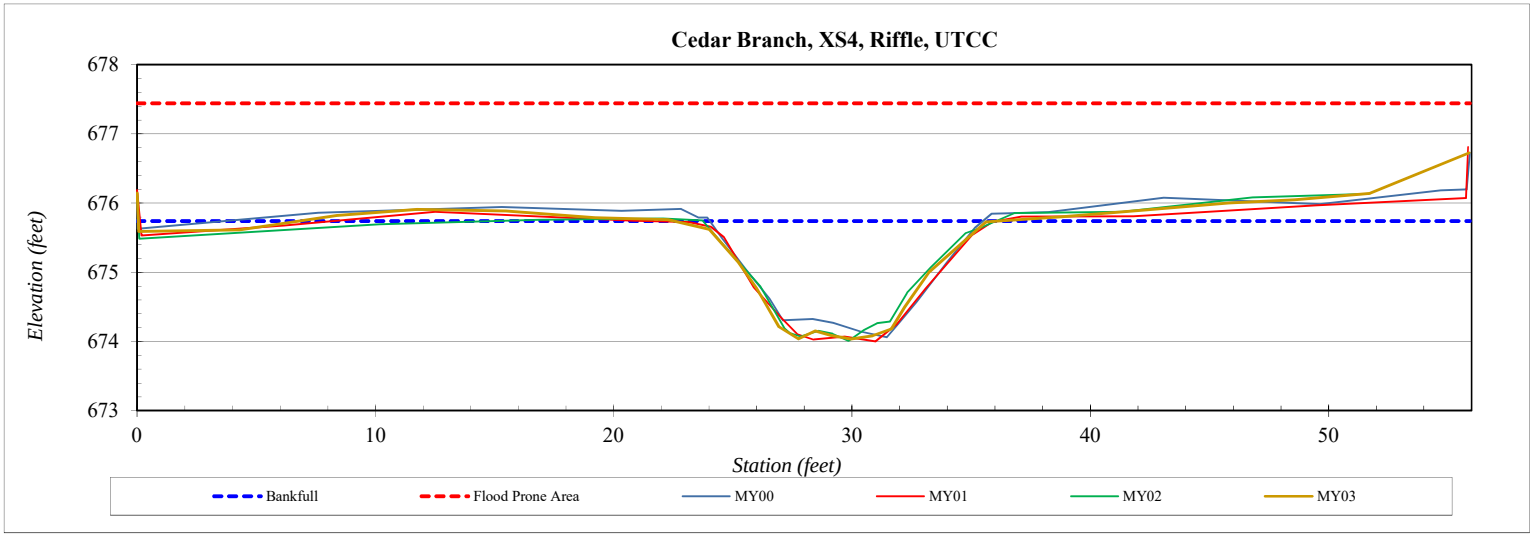
SUMMARY DATA	
Current Bankfull Elevation:	676.02
Bankfull Cross-Sectional Area:	20.2
Total Cross-Sectional Area:	20.1
Bankfull Width:	15.0
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	2.8
Mean Depth at Bankfull:	1.3
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS4
Drainage Area (sq mi):	0.21
Date:	6/30/2020
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	676.15
0.1	675.59
4.3	675.61
8.4	675.82
11.8	675.91
15.5	675.89
19.2	675.79
22.3	675.76
24.0	675.62
25.2	675.15
26.0	674.77
26.9	674.21
27.8	674.04
28.5	674.15
29.1	674.09
30.0	674.04
30.9	674.08
31.7	674.18
32.2	674.50
33.2	675.00
35.6	675.73
38.8	675.80
42.1	675.90
45.8	676.00
48.6	676.05
51.7	676.14
55.9	676.73

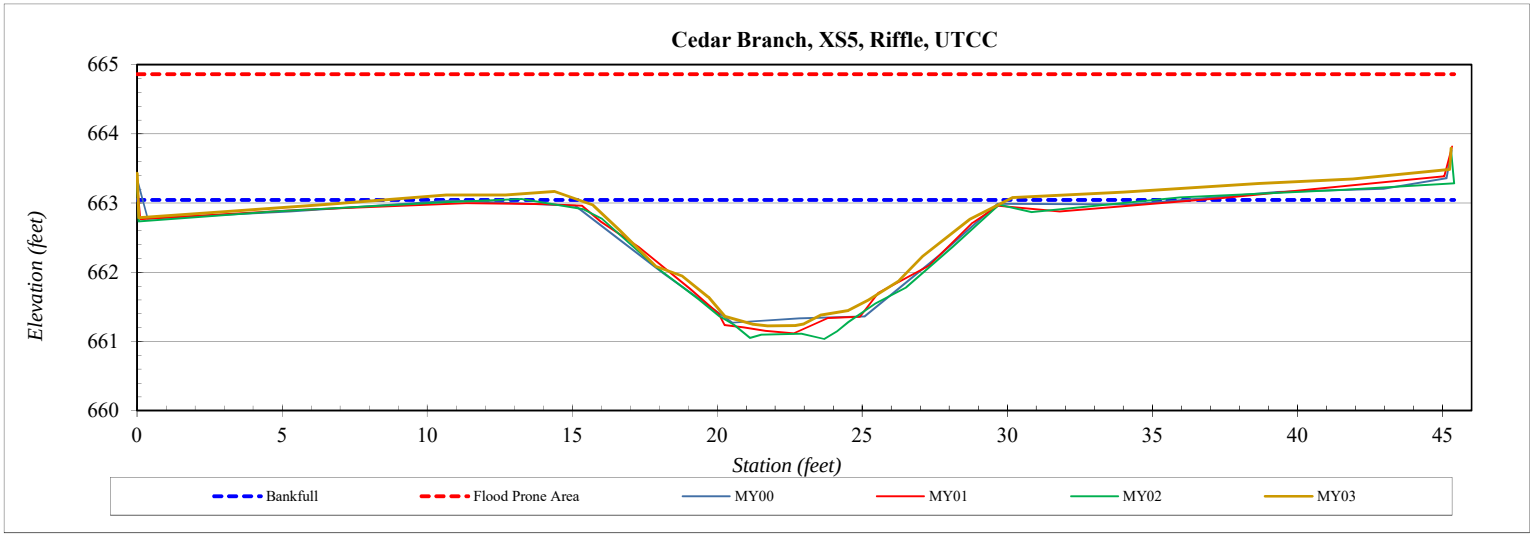
SUMMARY DATA	
Current Bankfull Elevation:	675.74
Bankfull Cross-Sectional Area:	12.6
Total Cross-Sectional Area:	13.3
Bankfull Width:	12.0
Flood Prone Area Elevation:	677.4
Flood Prone Width:	55.9
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	1.1
W / D Ratio:	11.4
Entrenchment Ratio:	4.7
Bank Height Ratio:	0.9



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS5
Drainage Area (sq mi):	0.21
Date:	6/30/2020
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	663.43
0.1	662.79
2.7	662.87
6.6	662.98
10.7	663.12
12.7	663.12
14.4	663.17
15.7	662.97
16.7	662.60
17.9	662.08
18.8	661.94
19.7	661.64
20.2	661.36
21.2	661.25
21.7	661.23
22.7	661.23
23.0	661.25
23.6	661.38
24.5	661.45
25.2	661.59
26.3	661.88
27.1	662.23
28.7	662.76
30.2	663.08
34.0	663.16
38.7	663.29
41.9	663.35
45.2	663.49
45.3	663.79

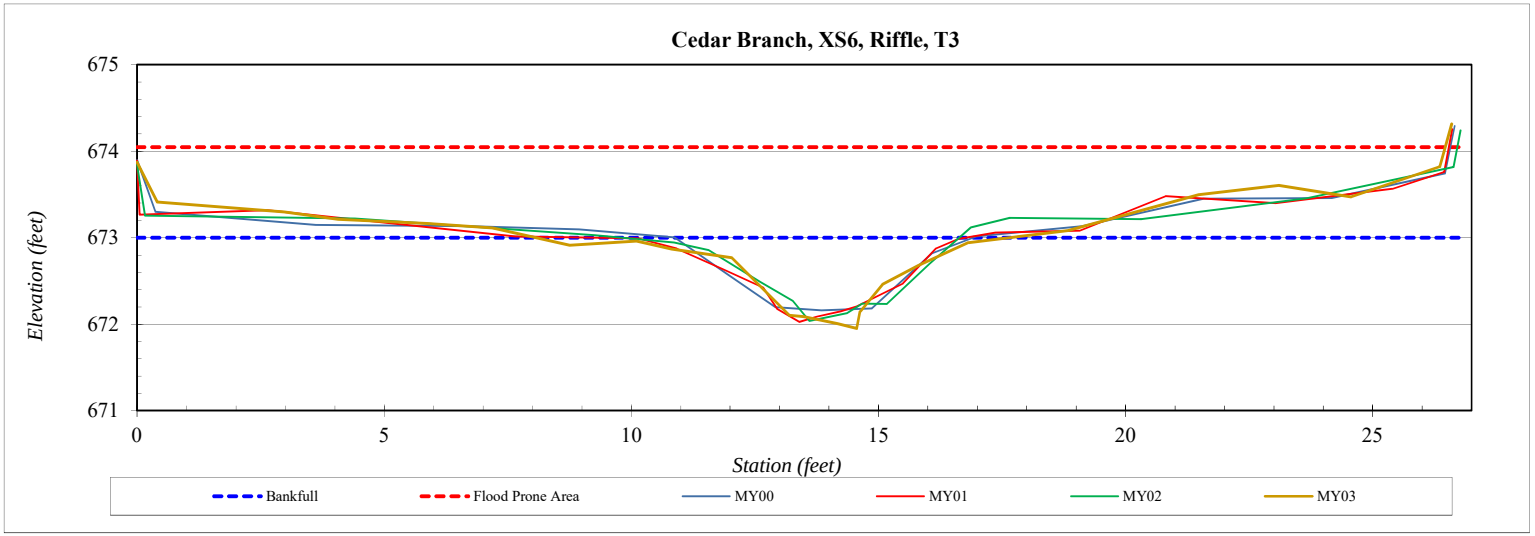
SUMMARY DATA	
Current Bankfull Elevation:	663.04
Bankfull Cross-Sectional Area:	15.8
Total Cross-Sectional Area:	14.6
Bankfull Width:	14.8
Flood Prone Area Elevation:	664.9
Flood Prone Width:	45.3
Max Depth at Bankfull:	1.8
Mean Depth at Bankfull:	1.1
W / D Ratio:	13.9
Entrenchment Ratio:	3.1
Bank Height Ratio:	1.0



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS6
Drainage Area (sq mi):	0.04
Date:	6/30/2020
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	673.87
0.4	673.41
3.0	673.30
4.1	673.21
5.9	673.17
7.2	673.11
8.8	672.91
10.1	672.96
10.8	672.87
12.0	672.77
13.2	672.10
13.5	672.09
14.2	672.01
14.6	671.95
14.6	672.14
15.1	672.46
15.8	672.68
16.8	672.94
18.8	673.09
21.5	673.50
23.1	673.61
24.6	673.47
26.4	673.82
26.6	674.32

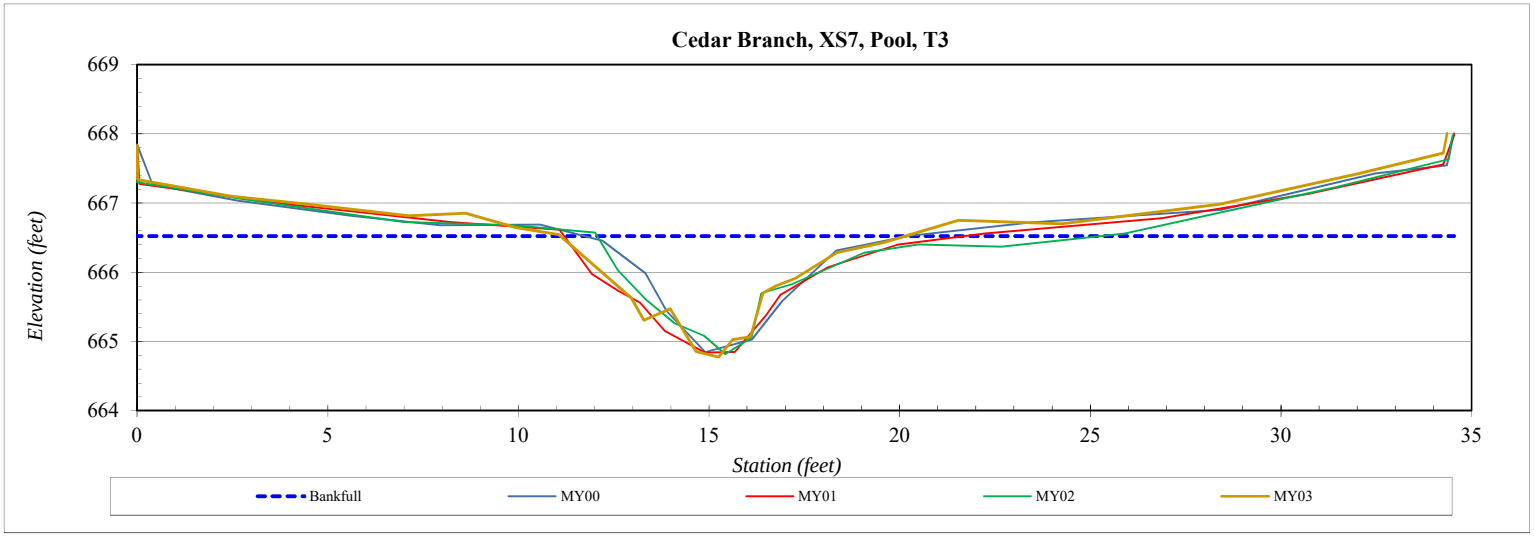
SUMMARY DATA	
Current Bankfull Elevation:	673.00
Bankfull Cross-Sectional Area:	3.1
Total Cross-Sectional Area:	3.2
Bankfull Width:	6.7
Flood Prone Area Elevation:	674.0
Flood Prone Width:	26.5
Max Depth at Bankfull:	1.0
Mean Depth at Bankfull:	0.5
W / D Ratio:	14.4
Entrenchment Ratio:	3.9
Bank Height Ratio:	0.9



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS7
Drainage Area (sq mi):	0.04
Date:	6/30/2020
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	667.83
0.0	667.34
2.5	667.10
4.5	666.99
7.1	666.82
8.6	666.86
9.9	666.65
11.1	666.54
13.0	665.63
13.3	665.30
14.0	665.47
14.7	664.86
15.3	664.77
15.6	665.03
16.1	665.07
16.4	665.70
16.8	665.80
17.2	665.90
18.4	666.29
19.6	666.43
21.5	666.75
24.2	666.70
28.4	666.98
32.0	667.42
34.3	667.72
34.4	668.01

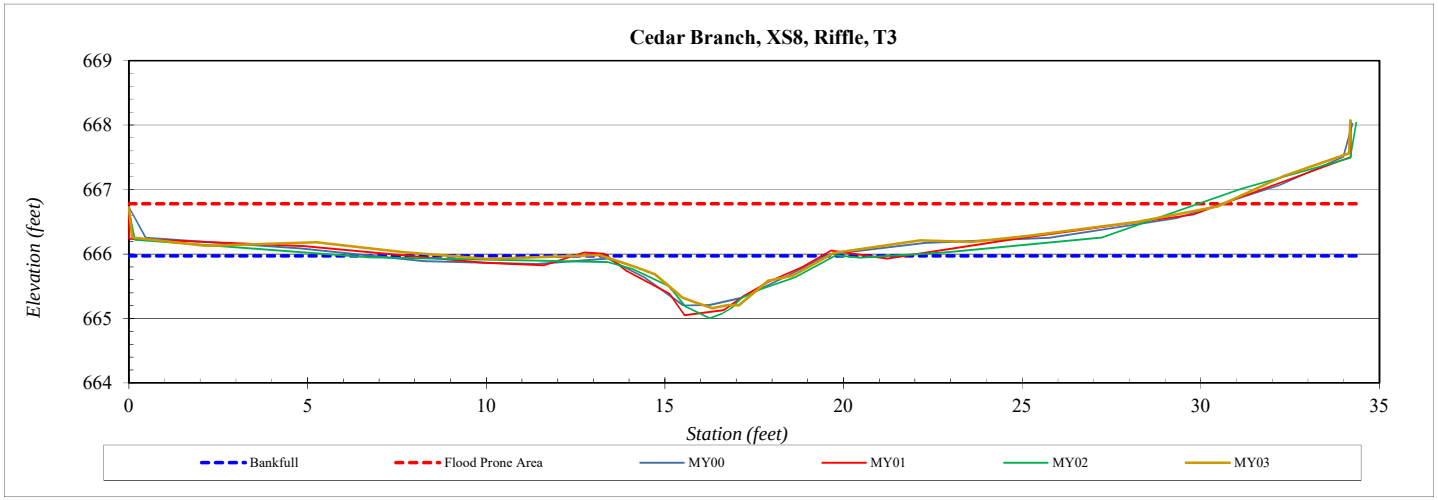
SUMMARY DATA	
Current Bankfull Elevation:	666.52
Bankfull Cross-Sectional Area:	6.9
Total Cross-Sectional Area:	7.6
Bankfull Width:	9.1
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	0.8
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS8
Drainage Area (sq mi):	0.04
Date:	6/30/2020
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	666.73
0.1	666.26
2.1	666.13
5.2	666.18
7.7	666.03
10.0	665.92
13.2	665.98
14.2	665.80
14.7	665.69
15.5	665.33
15.8	665.27
16.3	665.16
16.8	665.21
17.1	665.20
17.9	665.59
18.6	665.67
19.8	666.02
22.2	666.21
23.6	666.19
25.2	666.28
28.2	666.50
30.5	666.74
32.3	667.21
34.1	667.56
34.2	668.07

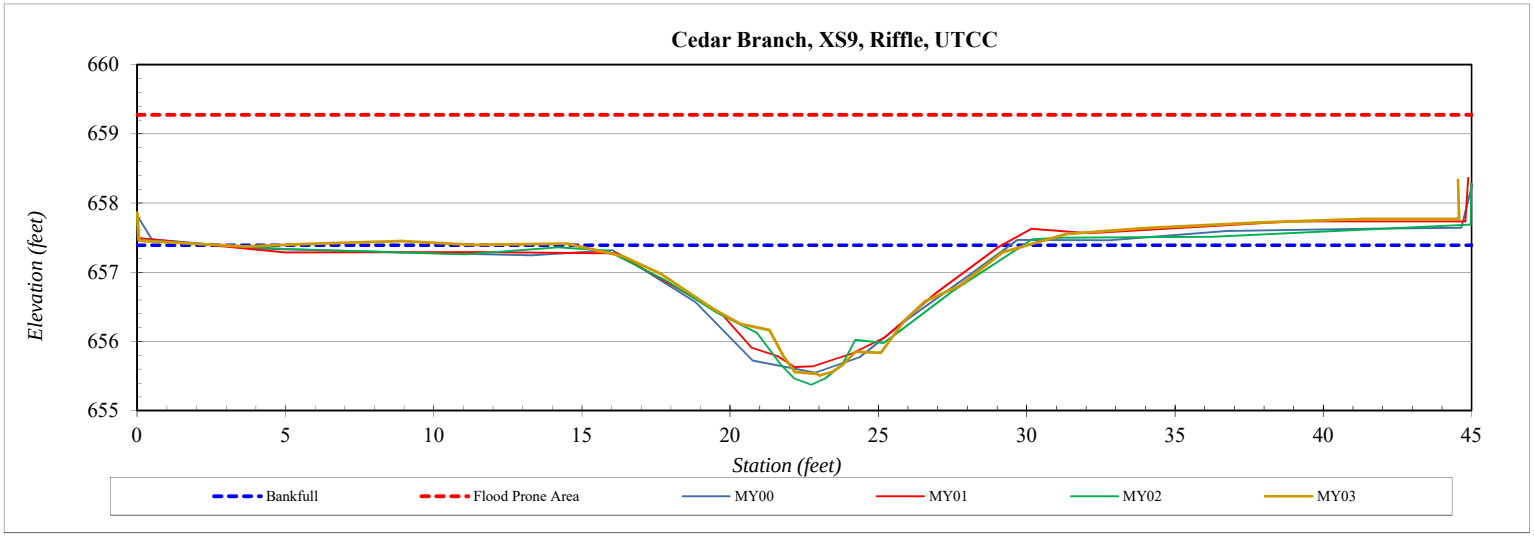
SUMMARY DATA	
Current Bankfull Elevation:	665.97
Bankfull Cross-Sectional Area:	2.5
Total Cross-Sectional Area:	2.3
Bankfull Width:	5.4
Flood Prone Area Elevation:	666.8
Flood Prone Width:	30.6
Max Depth at Bankfull:	0.8
Mean Depth at Bankfull:	0.5
W / D Ratio:	11.5
Entrenchment Ratio:	5.7
Bank Height Ratio:	1.0



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS9
Drainage Area (sq mi):	0.28
Date:	6/30/2020
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	657.86
0.1	657.46
3.6	657.37
5.7	657.41
8.9	657.45
11.4	657.40
14.5	657.42
16.4	657.23
17.7	656.97
18.7	656.67
19.4	656.46
20.3	656.26
21.3	656.17
21.8	655.78
22.2	655.56
22.9	655.53
23.0	655.51
23.4	655.56
23.8	655.67
24.2	655.85
25.1	655.84
25.8	656.29
26.6	656.58
27.7	656.80
29.2	657.29
31.3	657.55
33.9	657.64
37.9	657.72
41.4	657.77
44.6	657.77
44.5	658.33

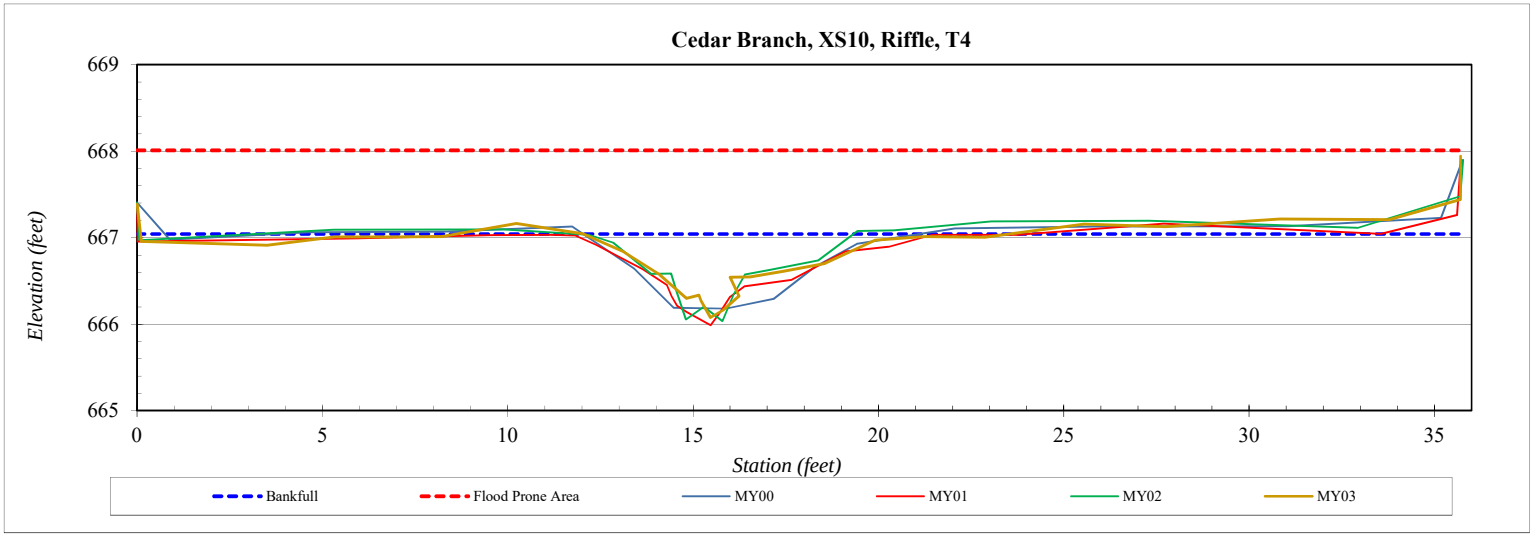
SUMMARY DATA	
Current Bankfull Elevation:	657.39
Bankfull Cross-Sectional Area:	13.0
Total Cross-Sectional Area:	12.1
Bankfull Width:	13.6
Flood Prone Area Elevation:	659.3
Flood Prone Width:	44.5
Max Depth at Bankfull:	1.9
Mean Depth at Bankfull:	1.0
W / D Ratio:	14.3
Entrenchment Ratio:	3.3
Bank Height Ratio:	0.9



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS10
Drainage Area (sq mi):	0.05
Date:	6/30/2020
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	667.39
0.1	666.96
3.5	666.91
5.3	667.01
6.8	667.01
8.2	667.01
10.2	667.16
12.0	667.05
13.1	666.84
14.1	666.57
14.8	666.30
15.2	666.33
15.2	666.26
15.5	666.08
15.8	666.16
16.2	666.32
16.0	666.54
16.5	666.55
17.5	666.62
18.6	666.70
19.9	666.97
21.2	667.01
22.9	667.01
25.5	667.16
27.7	667.13
30.8	667.22
33.8	667.21
35.7	667.44
35.7	667.94

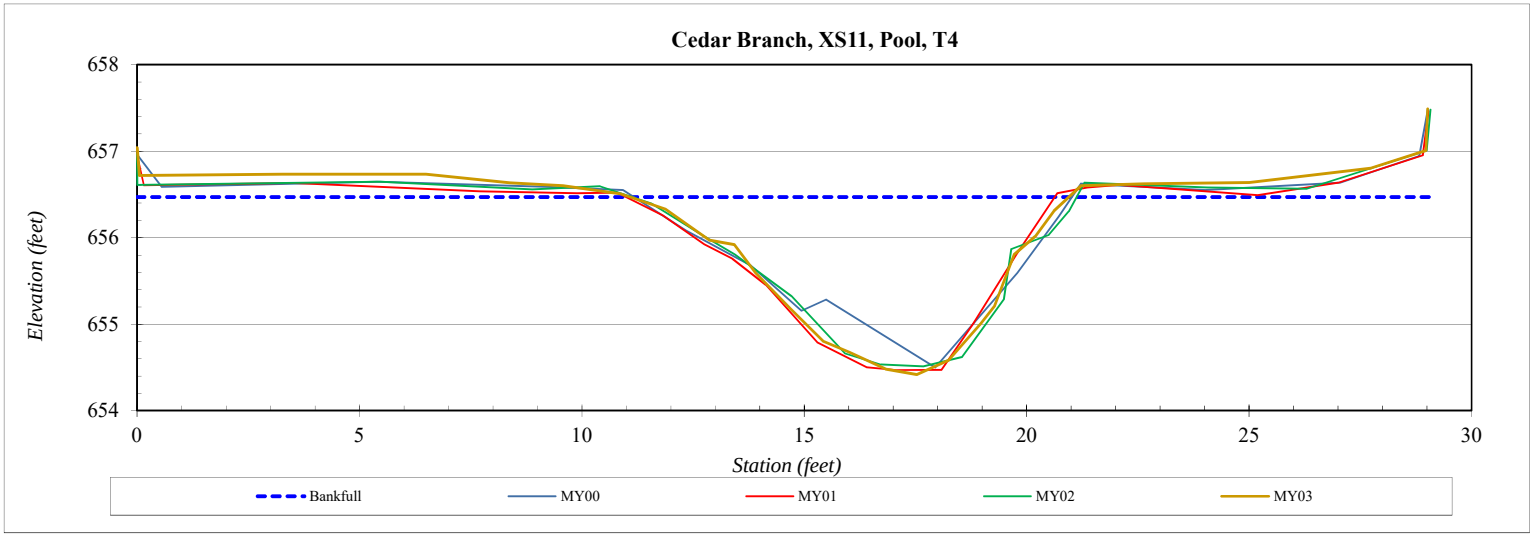
SUMMARY DATA	
Current Bankfull Elevation:	667.04
Bankfull Cross-Sectional Area:	3.3
Total Cross-Sectional Area:	2.4
Bankfull Width:	7.9
Flood Prone Area Elevation:	668.0
Flood Prone Width:	35.7
Max Depth at Bankfull:	1.0
Mean Depth at Bankfull:	0.4
W / D Ratio:	18.9
Entrenchment Ratio:	4.5
Bank Height Ratio:	1.0



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS11
Drainage Area (sq mi):	0.05
Date:	6/30/2020
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	657.04
0.1	656.72
3.3	656.73
6.5	656.74
8.4	656.64
9.6	656.60
10.9	656.51
11.9	656.33
12.9	655.97
13.4	655.92
13.9	655.59
14.7	655.17
15.4	654.80
16.0	654.67
16.8	654.48
17.5	654.42
18.2	654.58
19.0	655.01
19.3	655.21
19.7	655.81
20.2	656.02
20.6	656.31
21.2	656.60
22.6	656.62
25.0	656.64
27.7	656.81
29.0	657.01
29.0	657.49

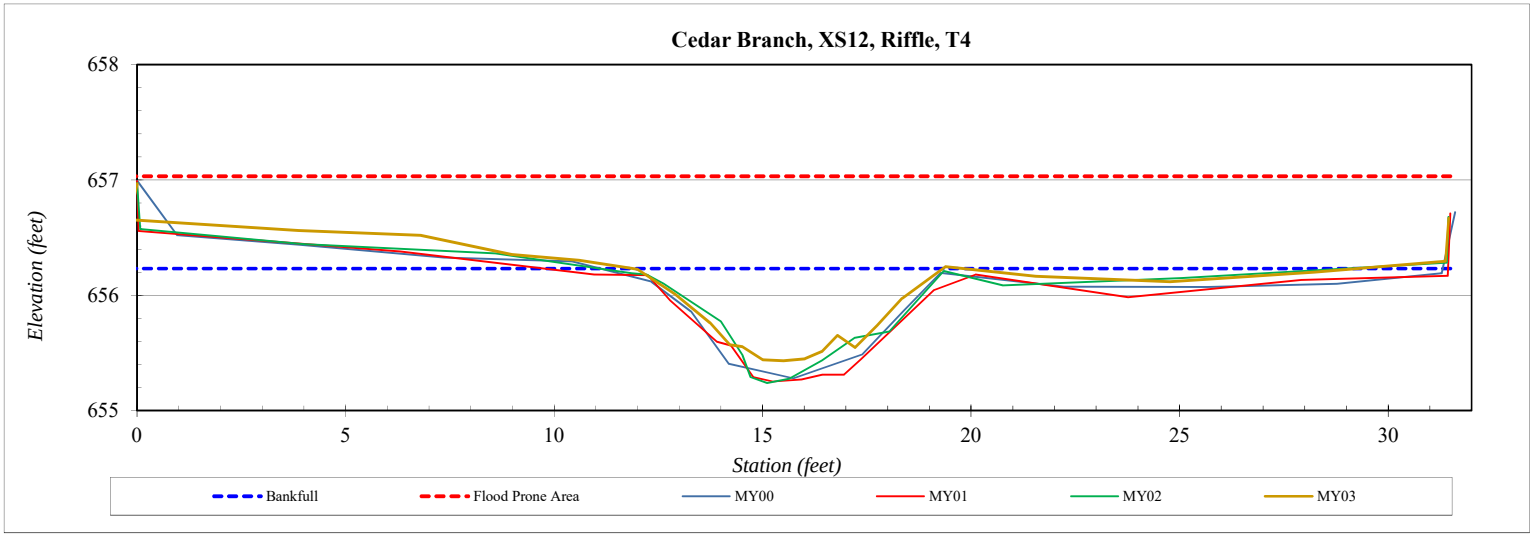
SUMMARY DATA	
Current Bankfull Elevation:	656.47
Bankfull Cross-Sectional Area:	10.8
Total Cross-Sectional Area:	11.6
Bankfull Width:	9.9
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	2.1
Mean Depth at Bankfull:	1.1
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS12
Drainage Area (sq mi):	0.05
Date:	6/30/2020
Field Crew:	T. Seelinger, A. Gutierrez

Station	Elevation
0.0	656.97
-0.2	656.66
3.9	656.56
6.8	656.52
9.0	656.35
10.6	656.30
12.0	656.23
12.9	656.01
13.7	655.76
14.2	655.57
14.5	655.55
15.0	655.44
15.5	655.43
16.0	655.45
16.4	655.51
16.8	655.65
17.2	655.55
17.7	655.74
18.3	655.97
19.4	656.25
21.5	656.17
24.8	656.12
28.2	656.20
31.4	656.30
31.5	656.67

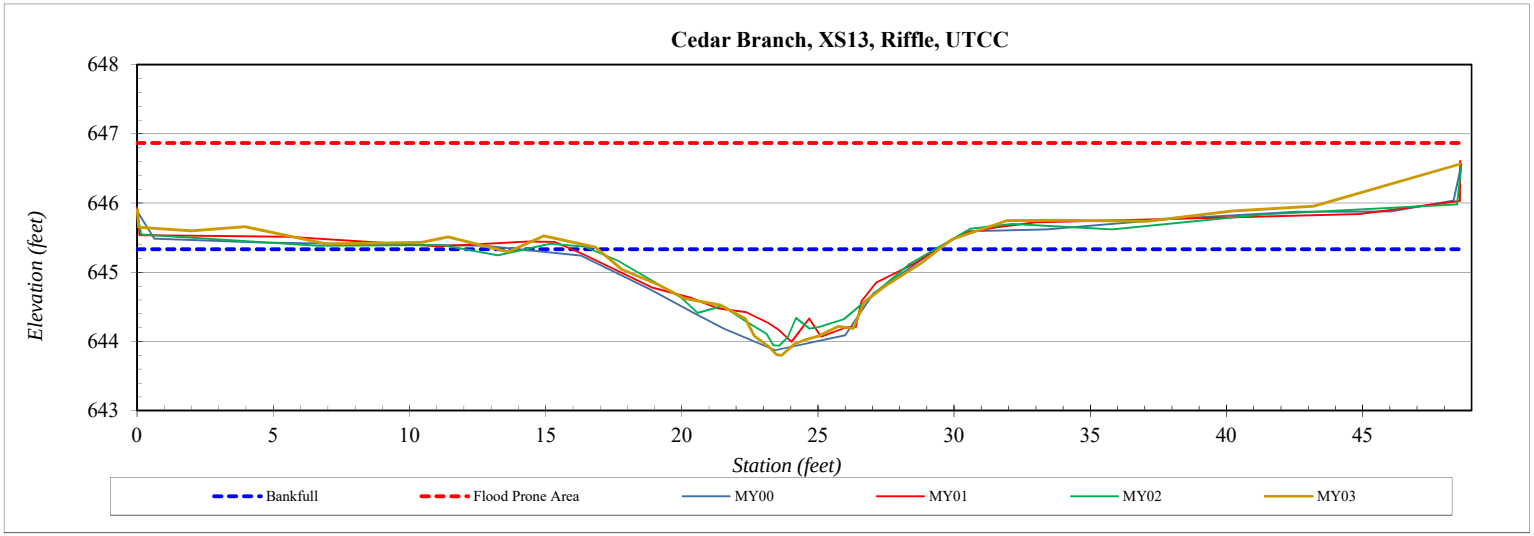
SUMMARY DATA	
Current Bankfull Elevation:	656.23
Bankfull Cross-Sectional Area:	3.5
Total Cross-Sectional Area:	2.7
Bankfull Width:	7.3
Flood Prone Area Elevation:	657.0
Flood Prone Width:	31.5
Max Depth at Bankfull:	0.8
Mean Depth at Bankfull:	0.5
W / D Ratio:	15.3
Entrenchment Ratio:	4.3
Bank Height Ratio:	1.0



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS13
Drainage Area (sq mi):	0.41
Date:	7/1/2020
Field Crew:	K. Bartlett, A. Gutierrez

Station	Elevation
0.0	645.90
0.1	645.65
2.0	645.60
4.0	645.66
7.0	645.41
10.5	645.43
11.4	645.51
13.6	645.29
14.9	645.53
16.8	645.36
17.8	645.04
19.2	644.81
20.1	644.62
21.4	644.53
22.3	644.33
22.7	644.08
23.2	643.93
23.5	643.81
23.7	643.80
24.1	643.96
24.6	644.03
25.0	644.08
25.8	644.22
26.3	644.19
26.7	644.57
27.5	644.80
28.8	645.13
29.9	645.47
32.0	645.75
33.9	645.75
37.1	645.74
40.2	645.89
43.2	645.96
48.6	646.56

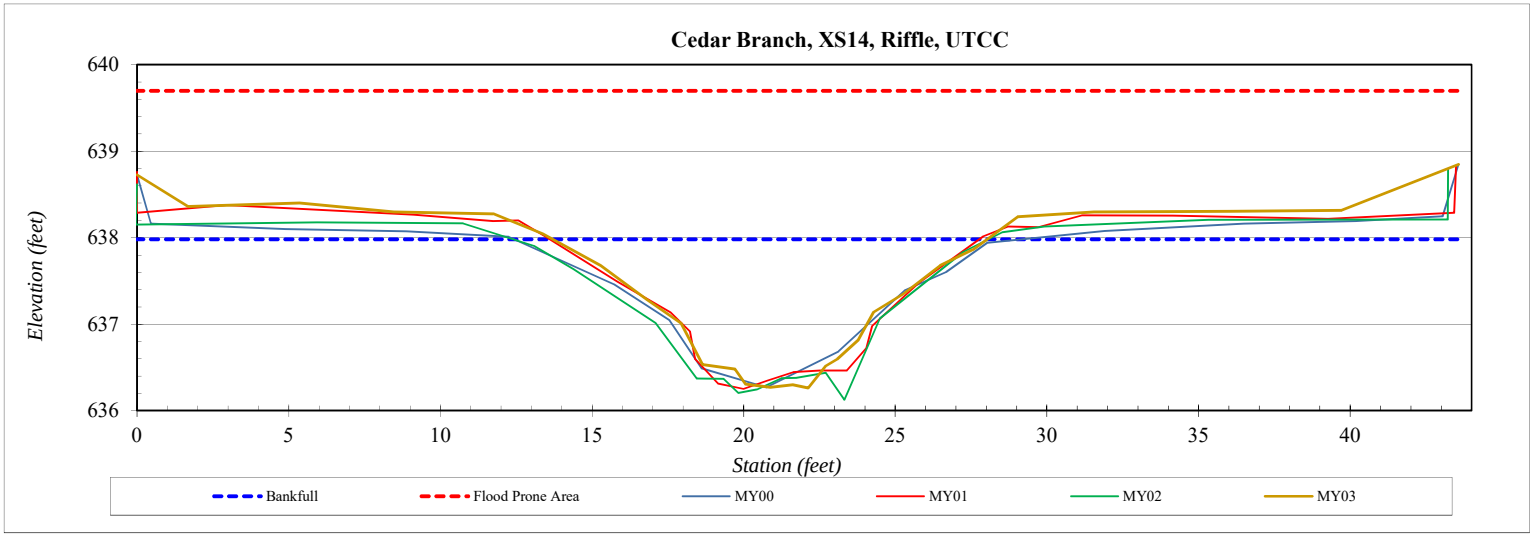
SUMMARY DATA	
Current Bankfull Elevation:	645.33
Bankfull Cross-Sectional Area:	9.6
Total Cross-Sectional Area:	8.5
Bankfull Width:	12.5
Flood Prone Area Elevation:	646.9
Flood Prone Width:	48.6
Max Depth at Bankfull:	1.5
Mean Depth at Bankfull:	0.8
W / D Ratio:	16.3
Entrenchment Ratio:	3.9
Bank Height Ratio:	1.0



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS14
Drainage Area (sq mi):	0.41
Date:	7/1/2020
Field Crew:	K. Bartlett, A. Gutierrez

Station	Elevation
0.0	638.73
1.7	638.36
5.4	638.40
8.5	638.30
11.7	638.28
13.4	638.04
15.3	637.68
16.8	637.28
17.9	637.01
18.6	636.53
19.7	636.48
20.1	636.31
20.9	636.27
21.6	636.30
22.1	636.26
22.7	636.52
23.1	636.60
23.8	636.82
24.3	637.14
25.3	637.35
26.5	637.68
27.6	637.86
29.0	638.24
31.5	638.30
36.0	638.31
39.7	638.32
43.6	638.85

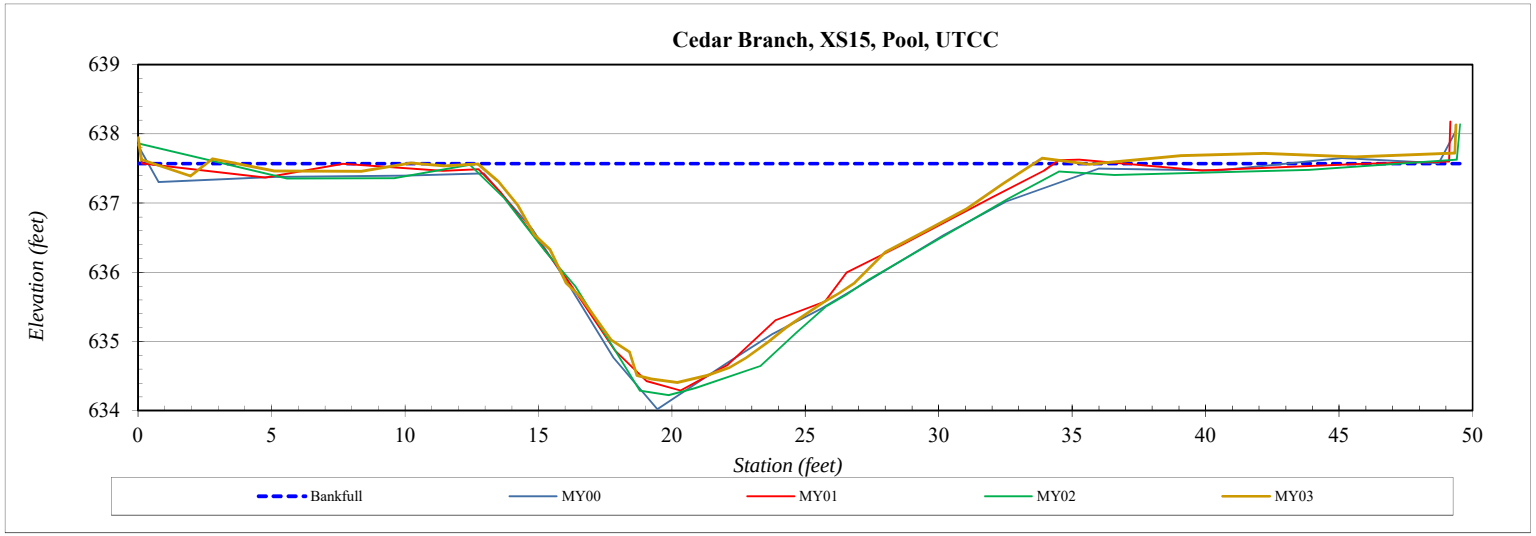
SUMMARY DATA	
Current Bankfull Elevation:	637.98
Bankfull Cross-Sectional Area:	12.8
Total Cross-Sectional Area:	12.2
Bankfull Width:	14.3
Flood Prone Area Elevation:	639.7
Flood Prone Width:	43.6
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	0.9
W / D Ratio:	16.0
Entrenchment Ratio:	3.0
Bank Height Ratio:	1.2



River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS15
Drainage Area (sq mi):	0.41
Date:	7/1/2020
Field Crew:	K. Bartlett, A. Gutierrez

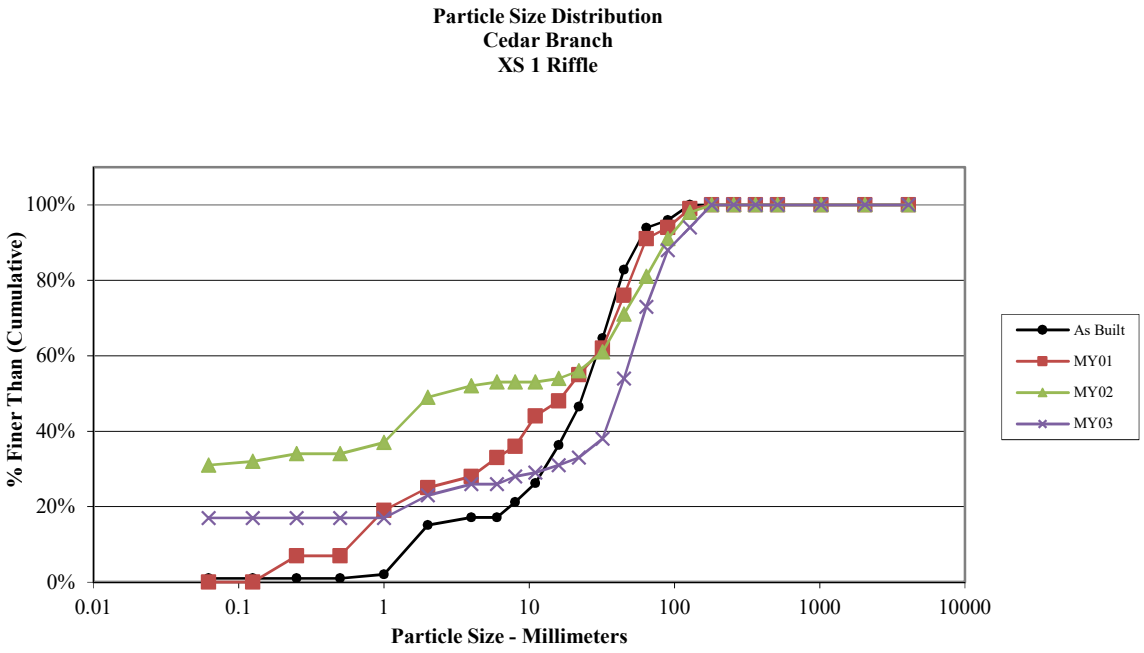
Station	Elevation
0.0	637.95
0.1	637.63
2.0	637.39
2.8	637.64
5.1	637.47
8.4	637.46
10.2	637.58
11.5	637.54
12.7	637.56
13.5	637.32
14.2	636.97
14.8	636.55
15.4	636.33
16.0	635.84
16.6	635.65
17.7	635.02
18.4	634.85
18.7	634.51
19.2	634.46
20.2	634.41
21.3	634.51
22.1	634.62
22.8	634.76
23.6	635.00
24.3	635.20
25.2	635.45
25.7	635.58
26.3	635.69
26.9	635.85
28.0	636.29
29.4	636.57
31.0	636.92
32.4	637.28
33.9	637.65
35.6	637.56
39.1	637.69

SUMMARY DATA	
Current Bankfull Elevation:	637.57
Bankfull Cross-Sectional Area:	35.8
Total Cross-Sectional Area:	32.8
Bankfull Width:	20.8
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 - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	17
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	6
Very Fine	2 - 4		3
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	2
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	5
Very Coarse	32 - 45	S	16
Very Coarse	45 - 64		19
Small	64 - 90	C	15
Small	90 - 128	O	6
Large	128 - 180	B	6
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:



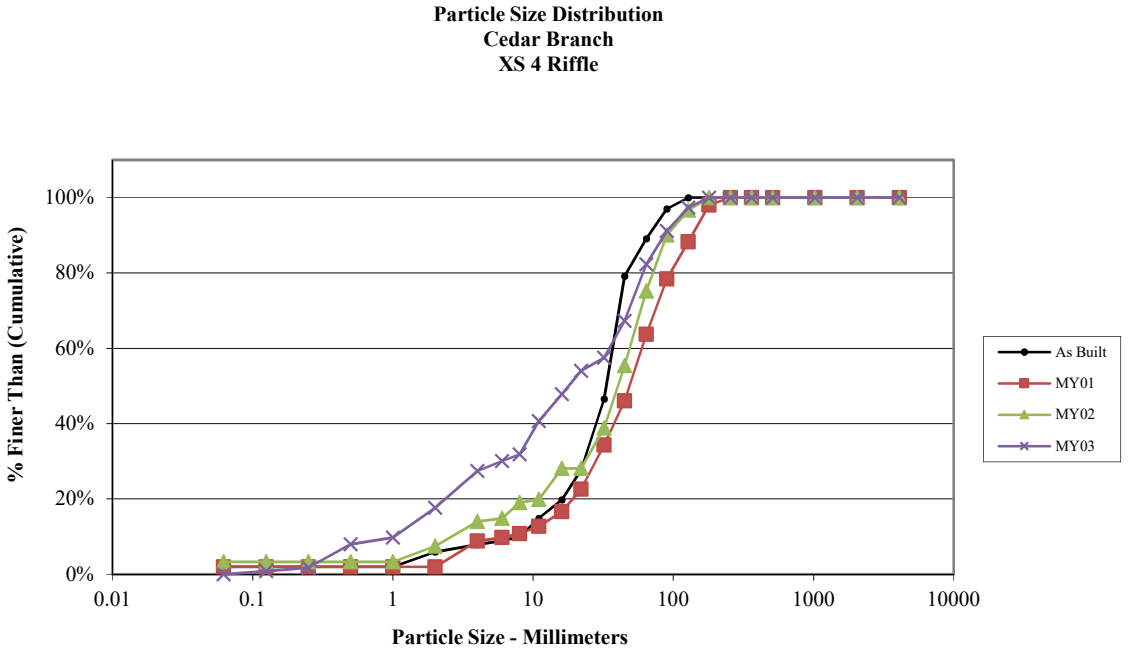
Size (mm)	
D16	0.062
D35	26
D50	41
D65	55
D84	82
D95	140

Size Distribution	
mean	2.3
dispersion	331.6
skewness	-0.71

Type	
silt/clay	17%
sand	6%
gravel	50%
cobble	27%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 4 Riffle - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	1
Fine	.125 - .25	A	1
Medium	.25 - .50	N	7
Coarse	.50 - 1	D	2
Very Coarse	1 - 2	S	9
Very Fine	2 - 4		11
Fine	4 - 5.7	G	3
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	10
Medium	11.3 - 16	V	8
Coarse	16 - 22.6	E	7
Coarse	22.6 - 32	L	4
Very Coarse	32 - 45	S	11
Very Coarse	45 - 64		17
Small	64 - 90	C	10
Small	90 - 128	O	7
Large	128 - 180	B	3
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	113

Note:



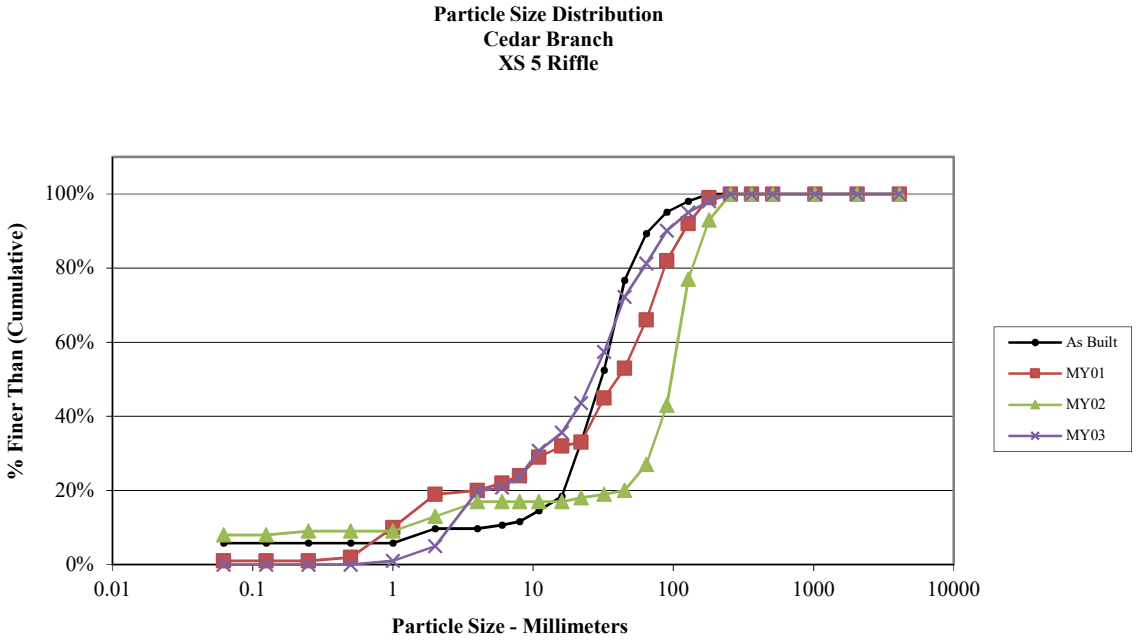
Size (mm)	
D16	1.7
D35	9
D50	18
D65	42
D84	68
D95	110

Size Distribution	
mean	10.8
dispersion	7.2
skewness	-0.18

Type	
silt/clay	0%
sand	18%
gravel	65%
cobble	18%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 5 Riffle - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	1
Very Coarse	1 - 2	S	4
Very Fine	2 - 4		15
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	3
Medium	8 - 11.3	A	7
Medium	11.3 - 16	V	5
Coarse	16 - 22.6	E	8
Coarse	22.6 - 32	L	14
Very Coarse	32 - 45	S	15
Very Coarse	45 - 64		9
Small	64 - 90	C	9
Small	90 - 128	O	5
Large	128 - 180	B	3
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:



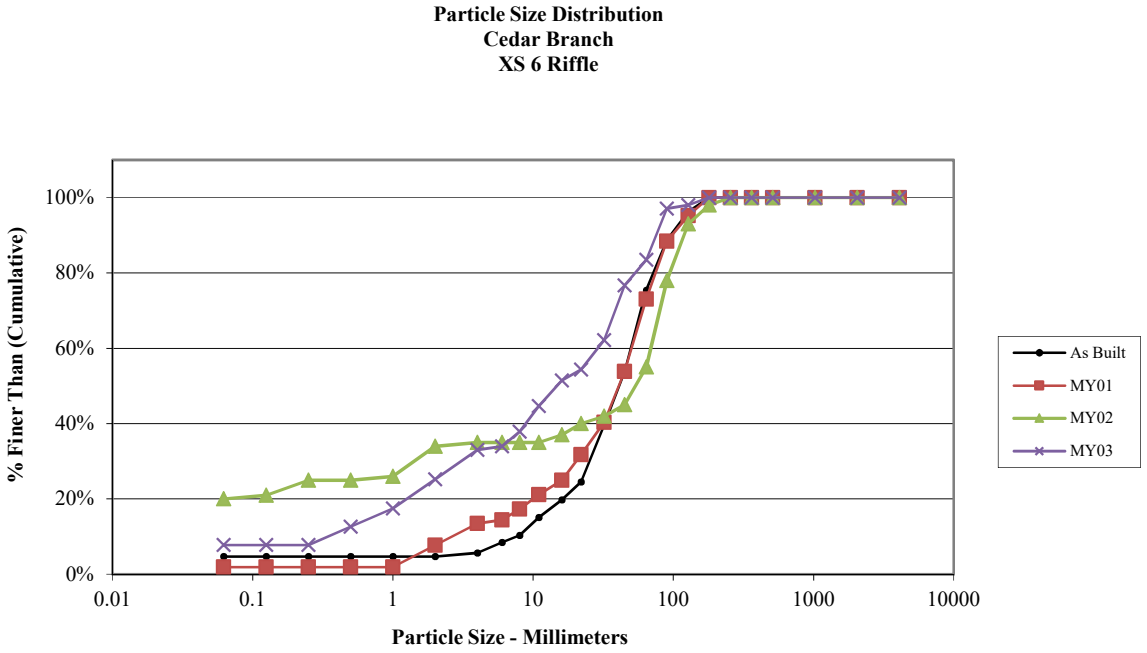
Size (mm)	
D16	3.3
D35	15
D50	26
D65	38
D84	71
D95	130

Size Distribution	
mean	15.3
dispersion	5.3
skewness	-0.20

Type	
silt/clay	0%
sand	5%
gravel	76%
cobble	19%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 6 Riffle -MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	8
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	5
Coarse	.50 - 1	D	5
Very Coarse	1 - 2	S	8
Very Fine	2 - 4		8
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	4
Medium	8 - 11.3	A	7
Medium	11.3 - 16	V	7
Coarse	16 - 22.6	E	3
Coarse	22.6 - 32	L	8
Very Coarse	32 - 45	S	15
Very Coarse	45 - 64		7
Small	64 - 90	C	14
Small	90 - 128	O	1
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	103

Note:



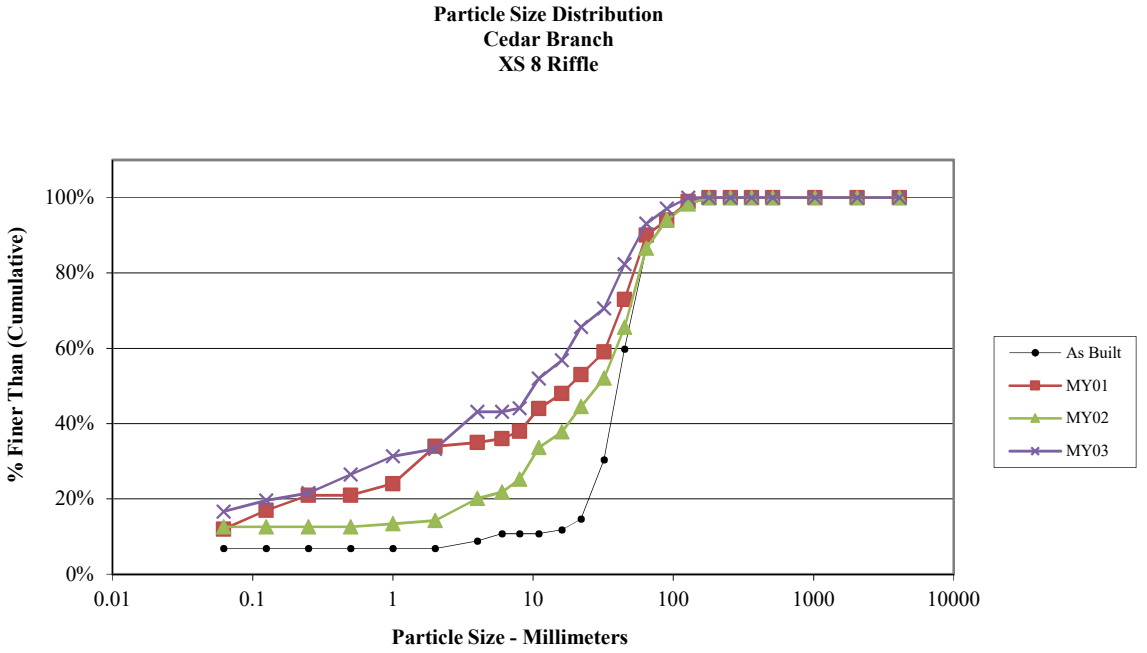
Size (mm)	
D16	0.81
D35	6.5
D50	15
D65	34
D84	65
D95	85

Size Distribution	
mean	7.3
dispersion	11.4
skewness	-0.23

Type	
silt/clay	8%
sand	17%
gravel	58%
cobble	17%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 8 Riffle - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	17
Very Fine	.062 - .125	S	3
Fine	.125 - .25	A	2
Medium	.25 - .50	N	5
Coarse	.50 - 1	D	5
Very Coarse	1 - 2	S	2
Very Fine	2 - 4		10
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	8
Medium	11.3 - 16	V	5
Coarse	16 - 22.6	E	9
Coarse	22.6 - 32	L	5
Very Coarse	32 - 45	S	12
Very Coarse	45 - 64		11
Small	64 - 90	C	4
Small	90 - 128	O	2
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	101

Note:



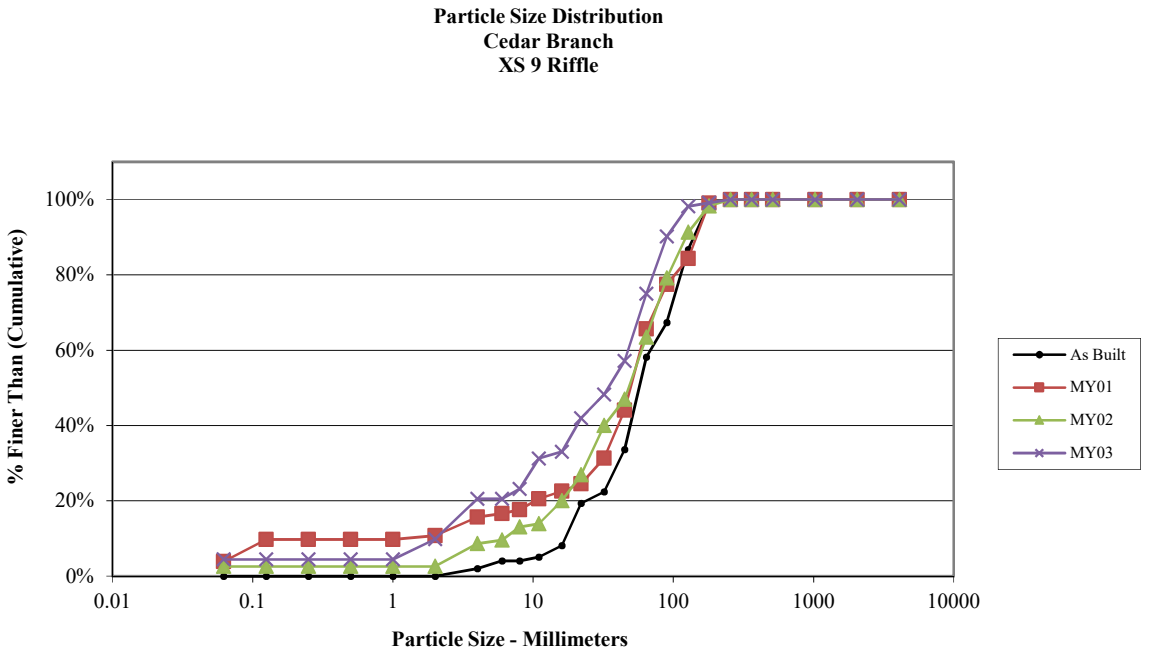
Size (mm)	
D16	0.062
D35	2.3
D50	10
D65	21
D84	47
D95	75

Size Distribution	
mean	1.7
dispersion	83.0
skewness	-0.45

Type	
silt/clay	17%
sand	17%
gravel	60%
cobble	6%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 9 Riffle -MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	5
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	6
Very Fine	2 - 4		12
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	3
Medium	8 - 11.3	A	9
Medium	11.3 - 16	V	2
Coarse	16 - 22.6	E	10
Coarse	22.6 - 32	L	7
Very Coarse	32 - 45	S	10
Very Coarse	45 - 64		20
Small	64 - 90	C	17
Small	90 - 128	O	9
Large	128 - 180	B	1
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	112

Note:



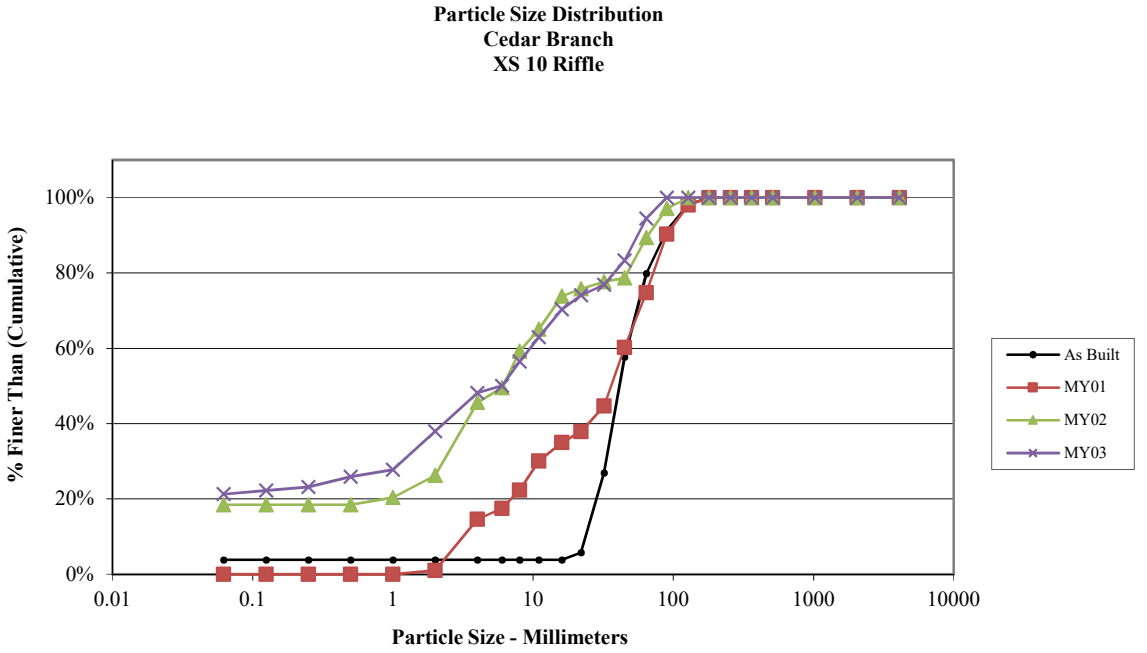
Size (mm)	
D16	3
D35	17
D50	34
D65	53
D84	78
D95	110

Size Distribution	
mean	15.3
dispersion	6.8
skewness	-0.29

Type	
silt/clay	4%
sand	5%
gravel	65%
cobble	25%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 10 Riffle - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	23
Very Fine	.062 - .125	S	1
Fine	.125 - .25	A	1
Medium	.25 - .50	N	3
Coarse	.50 - 1	D	2
Very Coarse	1 - 2	S	11
Very Fine	2 - 4		11
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	7
Medium	8 - 11.3	A	7
Medium	11.3 - 16	V	8
Coarse	16 - 22.6	E	4
Coarse	22.6 - 32	L	3
Very Coarse	32 - 45	S	7
Very Coarse	45 - 64		12
Small	64 - 90	C	6
Small	90 - 128	O	
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	108

Note:



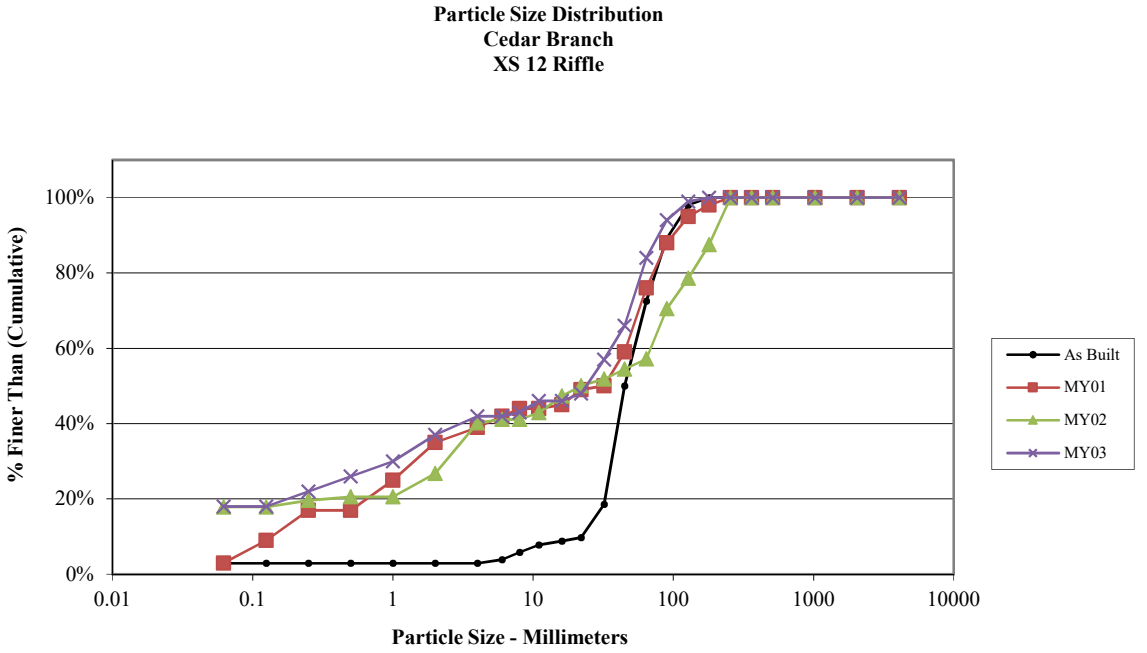
Size (mm)	
D16	0.062
D35	1.6
D50	6
D65	12
D84	46
D95	66

Size Distribution	
mean	1.7
dispersion	52.2
skewness	-0.32

Type	
silt/clay	21%
sand	17%
gravel	46%
cobble	6%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 12 Riffle - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	18
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	4
Medium	.25 - .50	N	4
Coarse	.50 - 1	D	4
Very Coarse	1 - 2	S	7
Very Fine	2 - 4		5
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	9
Very Coarse	32 - 45	S	9
Very Coarse	45 - 64		18
Small	64 - 90	C	10
Small	90 - 128	O	5
Large	128 - 180	B	1
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:



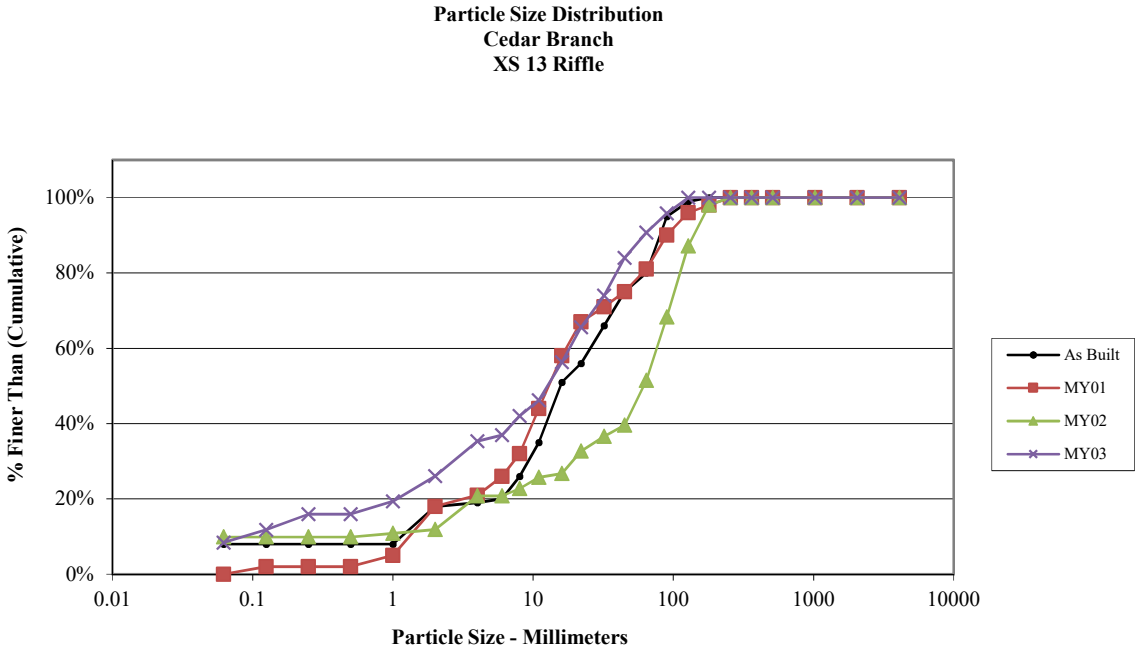
Size (mm)	
D16	0.062
D35	1.6
D50	24
D65	43
D84	64
D95	97

Size Distribution	
mean	2.0
dispersion	194.9
skewness	-0.62

Type	
silt/clay	18%
sand	19%
gravel	47%
cobble	16%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 13 Riffle - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	10
Very Fine	.062 - .125	S	4
Fine	.125 - .25	A	5
Medium	.25 - .50	N	
Coarse	.50 - 1	D	4
Very Coarse	1 - 2	S	8
Very Fine	2 - 4		11
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	6
Medium	8 - 11.3	A	5
Medium	11.3 - 16	V	12
Coarse	16 - 22.6	E	11
Coarse	22.6 - 32	L	10
Very Coarse	32 - 45	S	12
Very Coarse	45 - 64		8
Small	64 - 90	C	6
Small	90 - 128	O	5
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	119

Note:



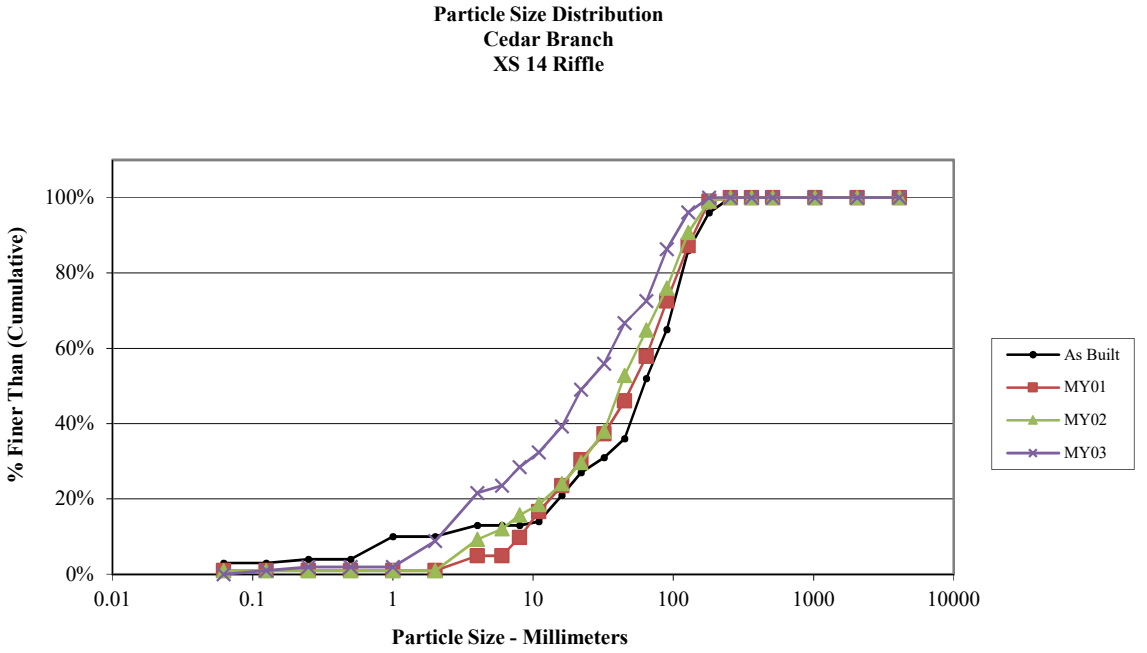
Size (mm)	
D16	0.5
D35	3.9
D50	13
D65	22
D84	45
D95	85

Size Distribution	
mean	4.7
dispersion	14.7
skewness	-0.31

Type	
silt/clay	8%
sand	18%
gravel	65%
cobble	9%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 14 Riffle - MY03			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	1
Fine	.125 - .25	A	1
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	7
Very Fine	2 - 4		13
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	5
Medium	8 - 11.3	A	4
Medium	11.3 - 16	V	6
Coarse	16 - 22.6	E	10
Coarse	22.6 - 32	L	7
Very Coarse	32 - 45	S	11
Very Coarse	45 - 64		6
Small	64 - 90	C	14
Small	90 - 128	O	10
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	101

Note:



Size (mm)	
D16	3
D35	13
D50	23
D65	43
D84	85
D95	120

Size Distribution	
mean	16.0
dispersion	5.7
skewness	-0.13

Type	
silt/clay	0%
sand	9%
gravel	63%
cobble	28%
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

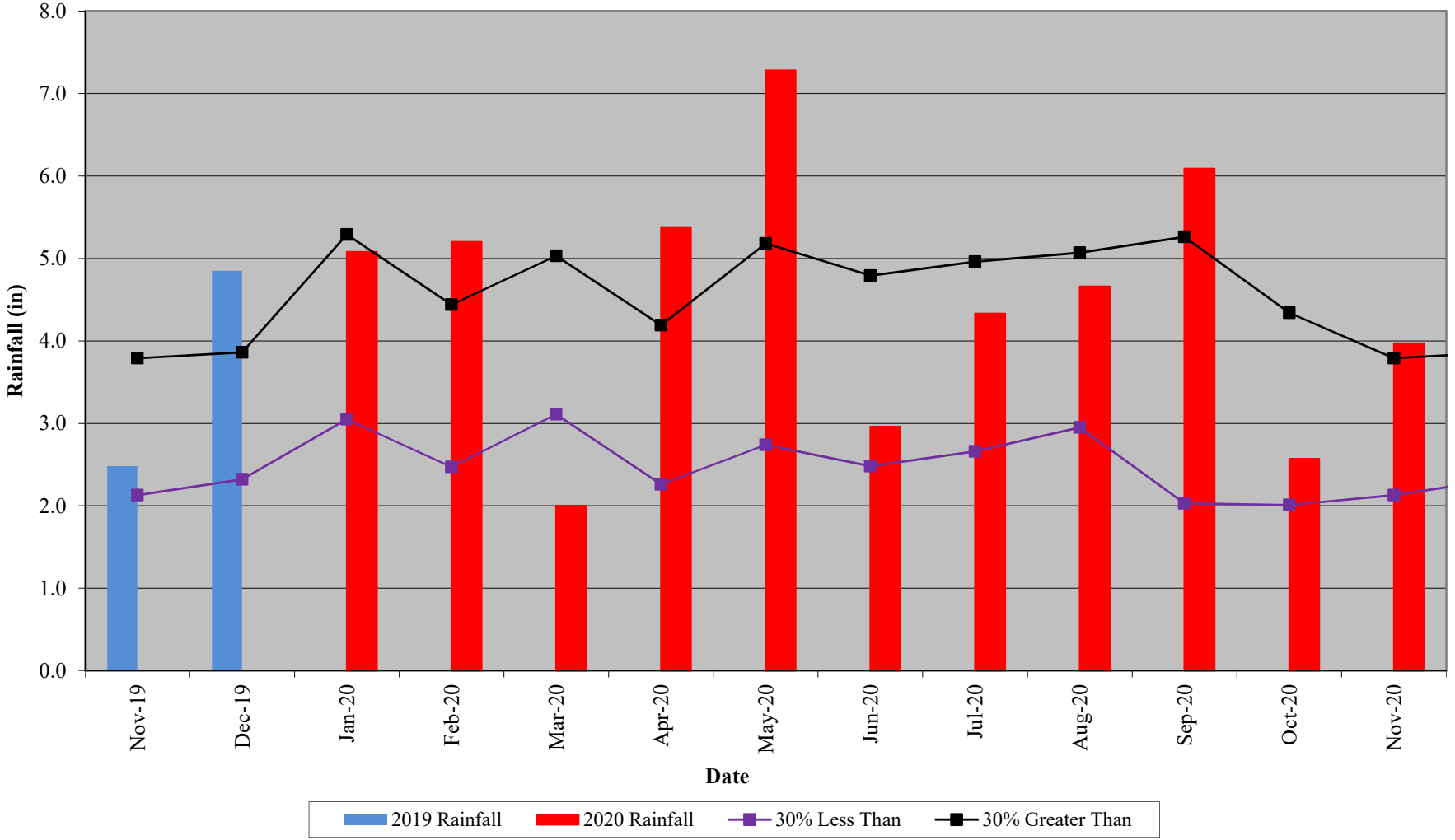


Table 10. Verification of Bankfull Events Cedar Branch Restoration Site, DMS Project #97009		
Date of Occurrence	**Method**	**Photo Number**
April 26, 2018	Onsite stream gauge	
August 3, 2018	Onsite stream gauge	
August 7, 2018	Onsite stream gauge	
August 22, 2018	Onsite stream gauge	
November 4, 2018	Photos taken on site	
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	
November 23, 2019	Onsite stream gauge	
December 1, 2019	Onsite stream gauge	
December 13, 2019	Onsite stream gauge	
January 3, 2020	Onsite stream gauge	
January 14, 2020	Photos taken on site	
January 24, 2020	Onsite stream gauge	
February 6, 2020	Onsite stream gauge	
February 13, 2020	Onsite stream gauge	
March 25, 2020	Onsite stream gauge	
April 13, 2020	Onsite stream gauge	
April 30, 2020	Onsite stream gauge	
May, 21, 2020	Onsite stream gauge	
May 24, 2020	Onsite stream gauge	
May 27, 2020	Onsite stream gauge	
June 19, 2020	Onsite stream gauge	
September 13, 2020	Onsite stream gauge	
October 6, 2020	Onsite stream gauge	
November 7, 2020	Onsite stream gauge	1

Photo 1. Wrack lines above bankfull, 11/16/2020

Cedar Branch Restoration Site
Hydrograph
Stream Gauge UTCC

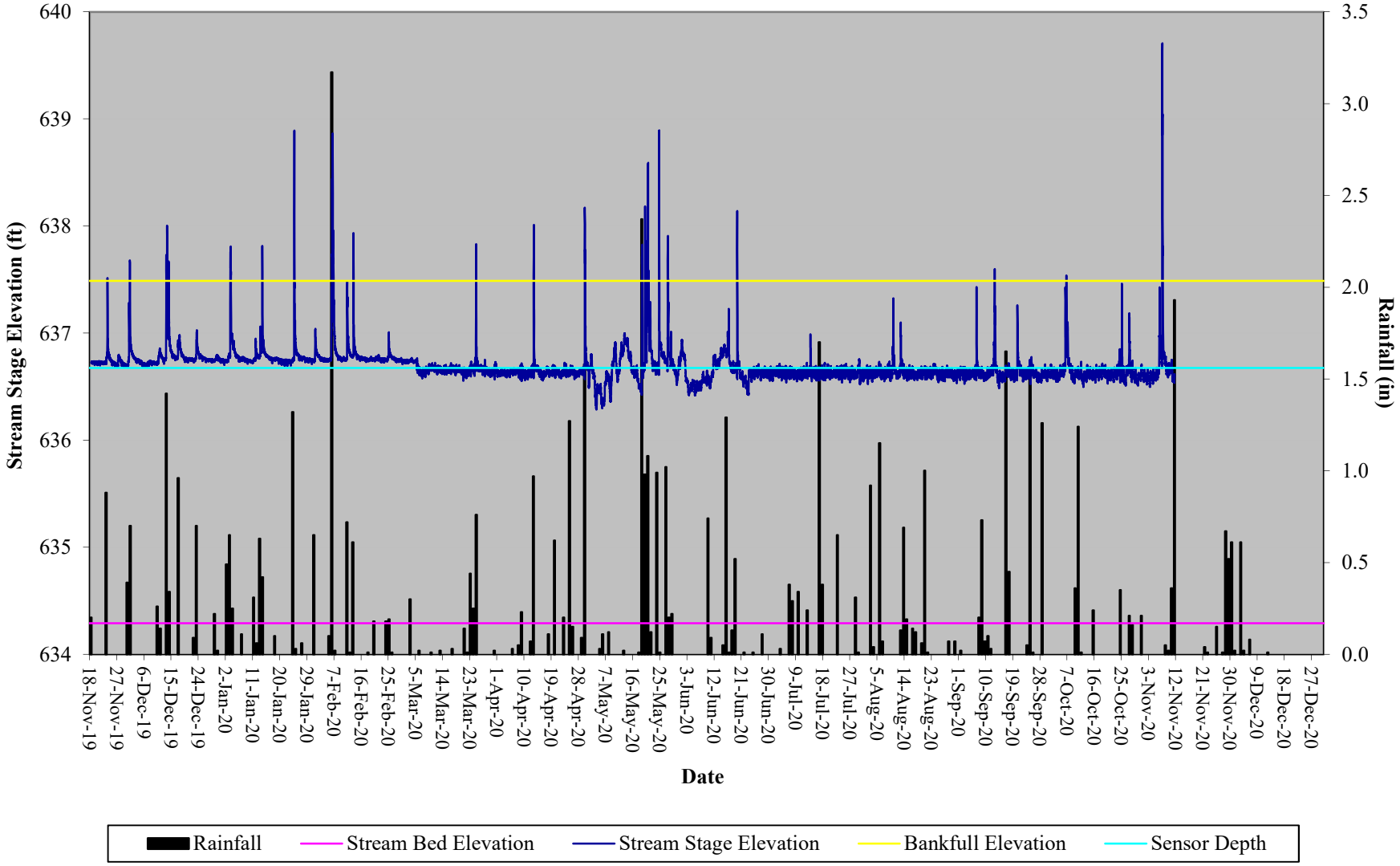


Table 11. Verification of Stream Flow Cedar Branch Restoration Site, DMS Project #97009				
	Gauge		Camera	
Reach	**Dates Achieving**	**Maximum Consecutive Days**	**Dates Achieving**	**Maximum Consecutive Days**
T1	January 11 – February 25	46	January 1 – September 17	260
T1-1	January 11 – March 17, April 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	Yes/142				
T1 (Camera)	Yes/102	Yes/260	Yes/189				
T1-1 (Gauge)	No/16	Yes/66	Yes/65				
T1-1 (Camera)	No/7*	Yes/105	Yes/63				
T3 (Gauge)	Yes/83	Yes/187	Yes/65				
T3 (Camera)	Yes/93	Yes/252	Yes/174				

*camera malfunction

T1 – 6/21/2020

T1 – 10/16/2020

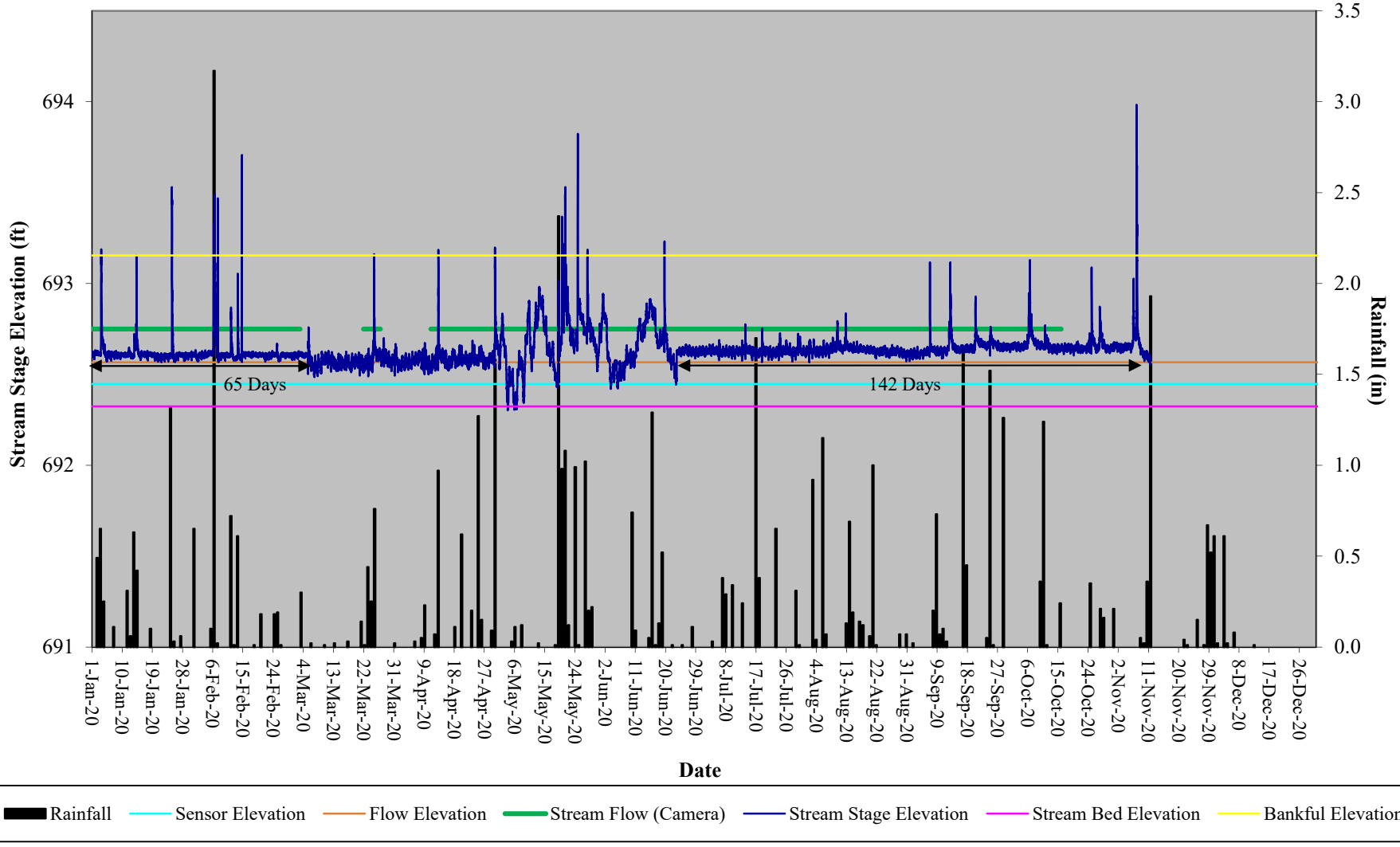
T1-1 – 1/1/2020

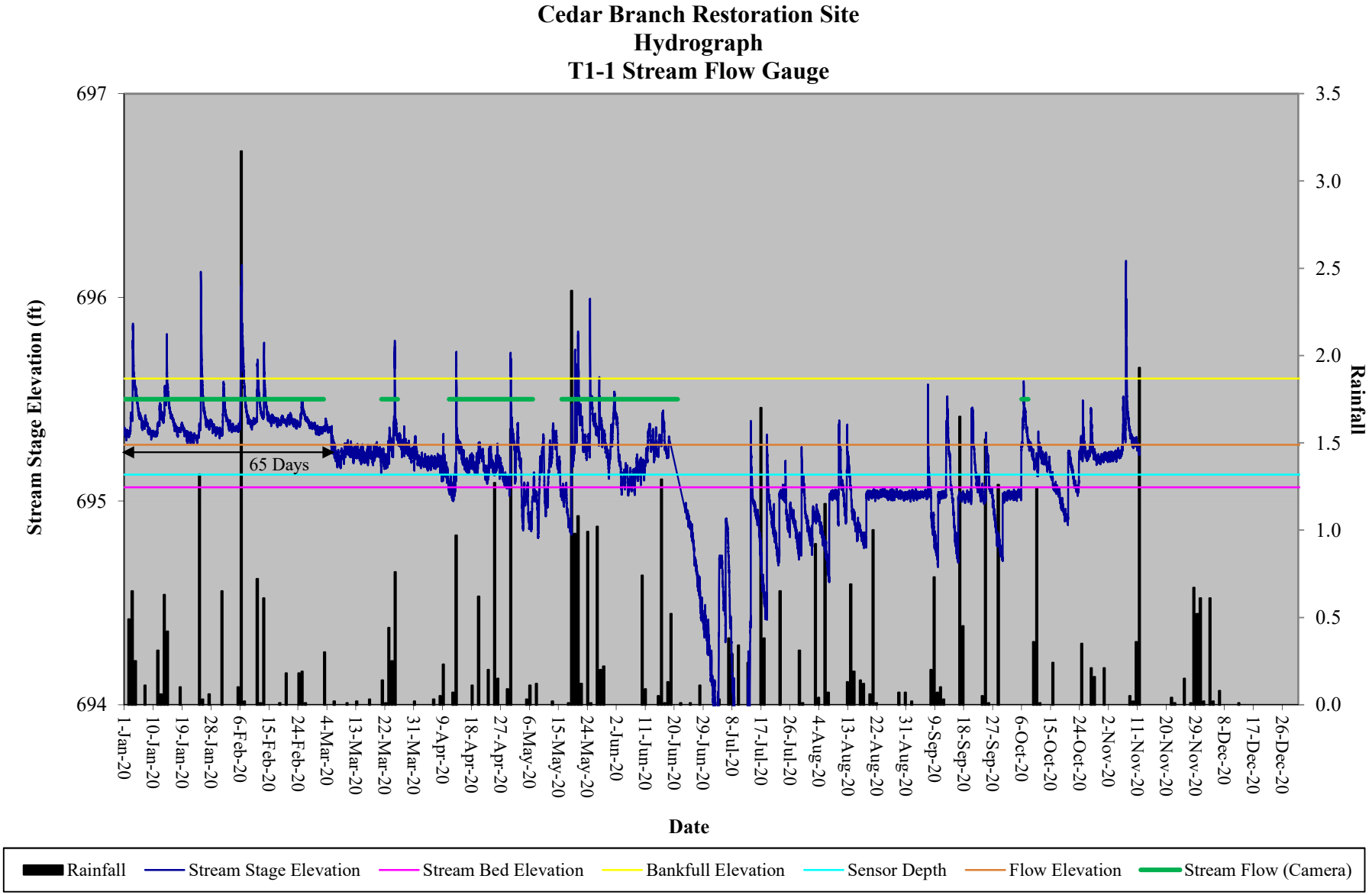
T1-1 – 3/3/2020

T3 – 9/9/2020

T3 – 10/15/2020

Cedar Branch Restoration Site
Hydrograph
T1 Stream Flow Gauge




Cedar Branch Restoration Site
Hydrograph
T1-1 Stream Flow Gauge
Stream Stage Elevation (ft)
Rainfall
Date
65 Days
697
696
695
694
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1-Jan-20
10-Jan-20
19-Jan-20
28-Jan-20
6-Feb-20
15-Feb-20
24-Feb-20
4-Mar-20
13-Mar-20
22-Mar-20
31-Mar-20
9-Apr-20
18-Apr-20
27-Apr-20
6-May-20
15-May-20
24-May-20
2-Jun-20
11-Jun-20
20-Jun-20
29-Jun-20
8-Jul-20
17-Jul-20
26-Jul-20
4-Aug-20
13-Aug-20
22-Aug-20
31-Aug-20
9-Sep-20
18-Sep-20
27-Sep-20
6-Oct-20
15-Oct-20
24-Oct-20
2-Nov-20
11-Nov-20
20-Nov-20
29-Nov-20
8-Dec-20
17-Dec-20
26-Dec-20
Rainfall
Stream Stage Elevation
Stream Bed Elevation
Bankfull Elevation
Sensor Depth
Flow Elevation
Stream Flow (Camera)

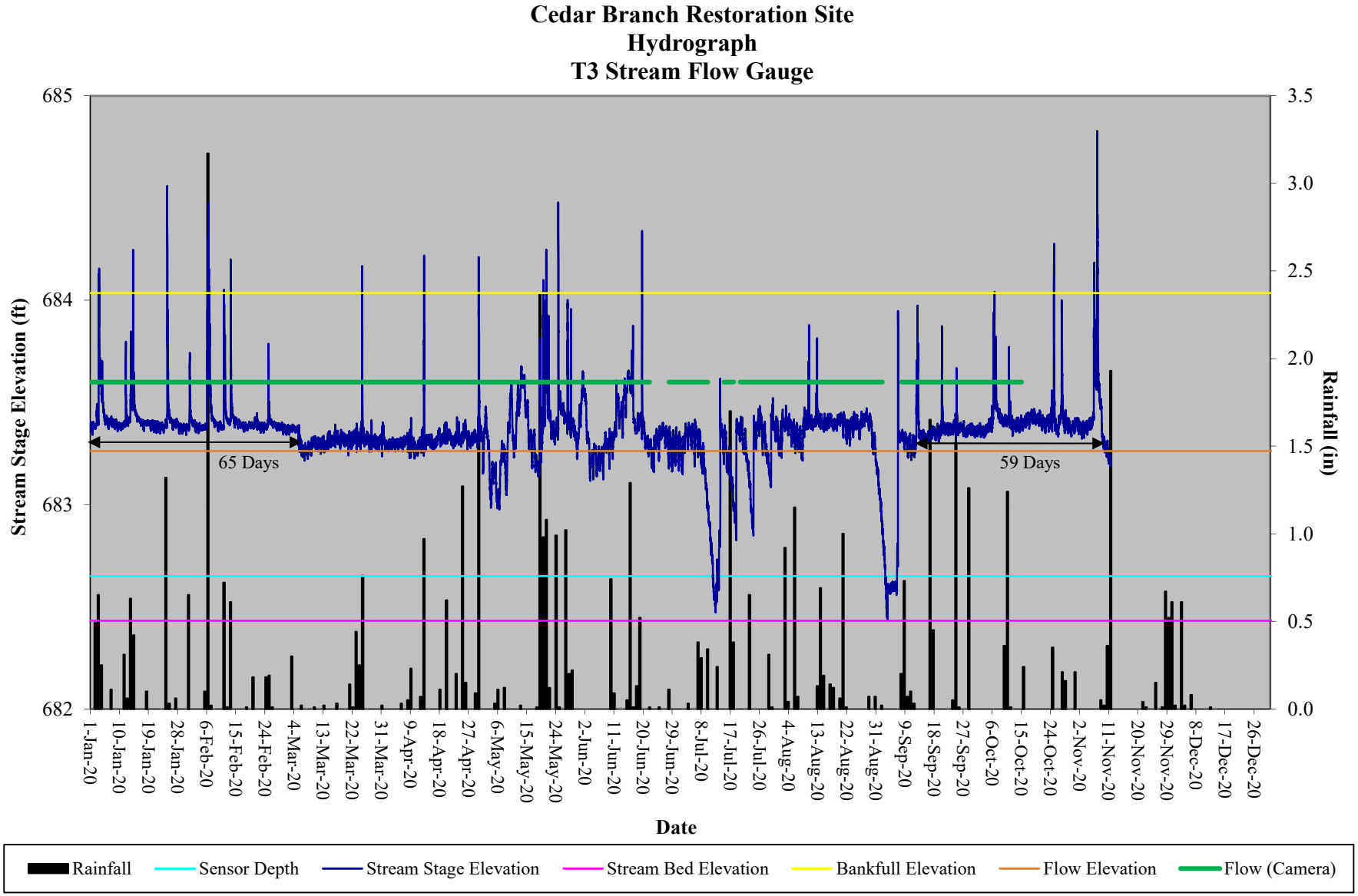
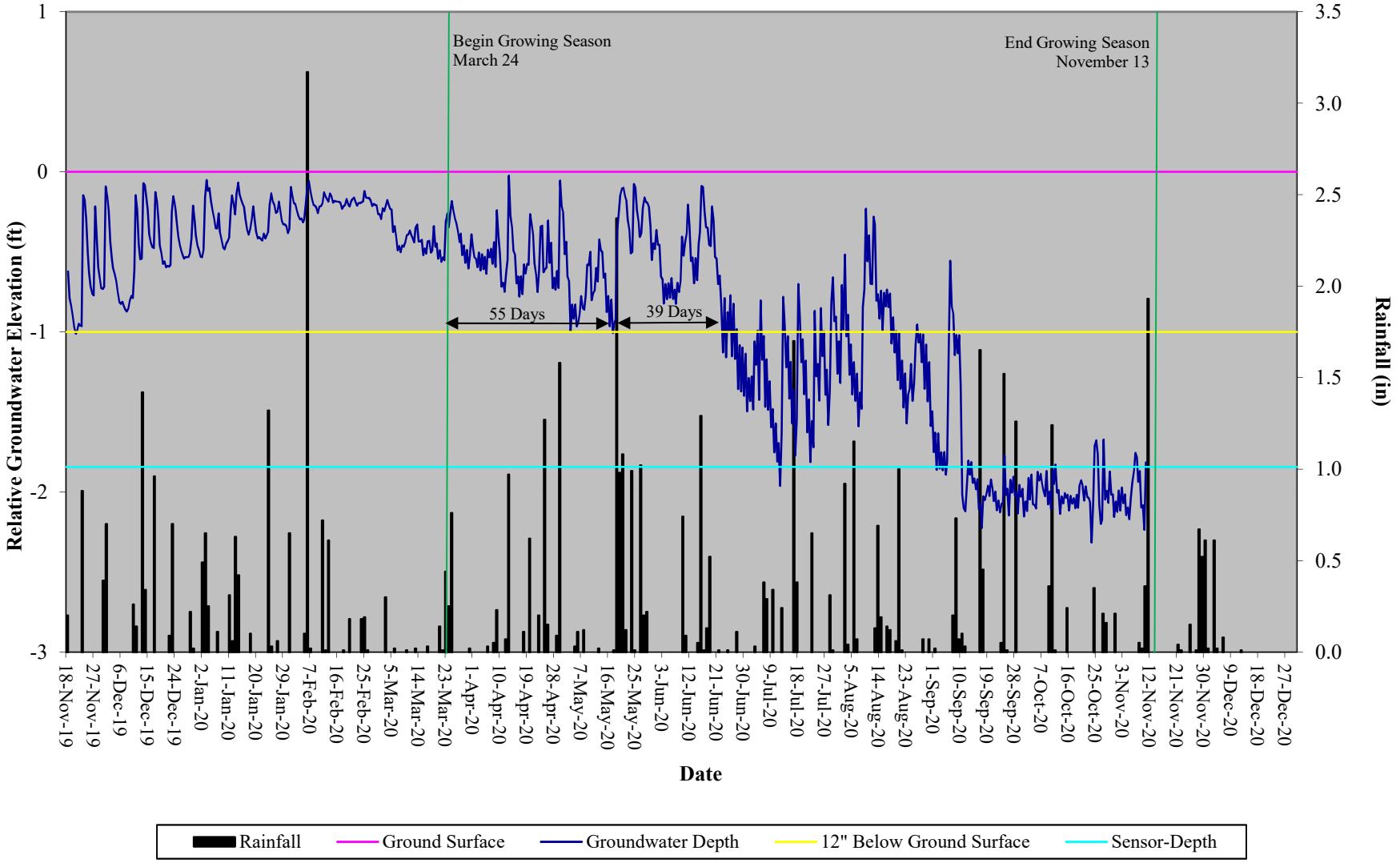
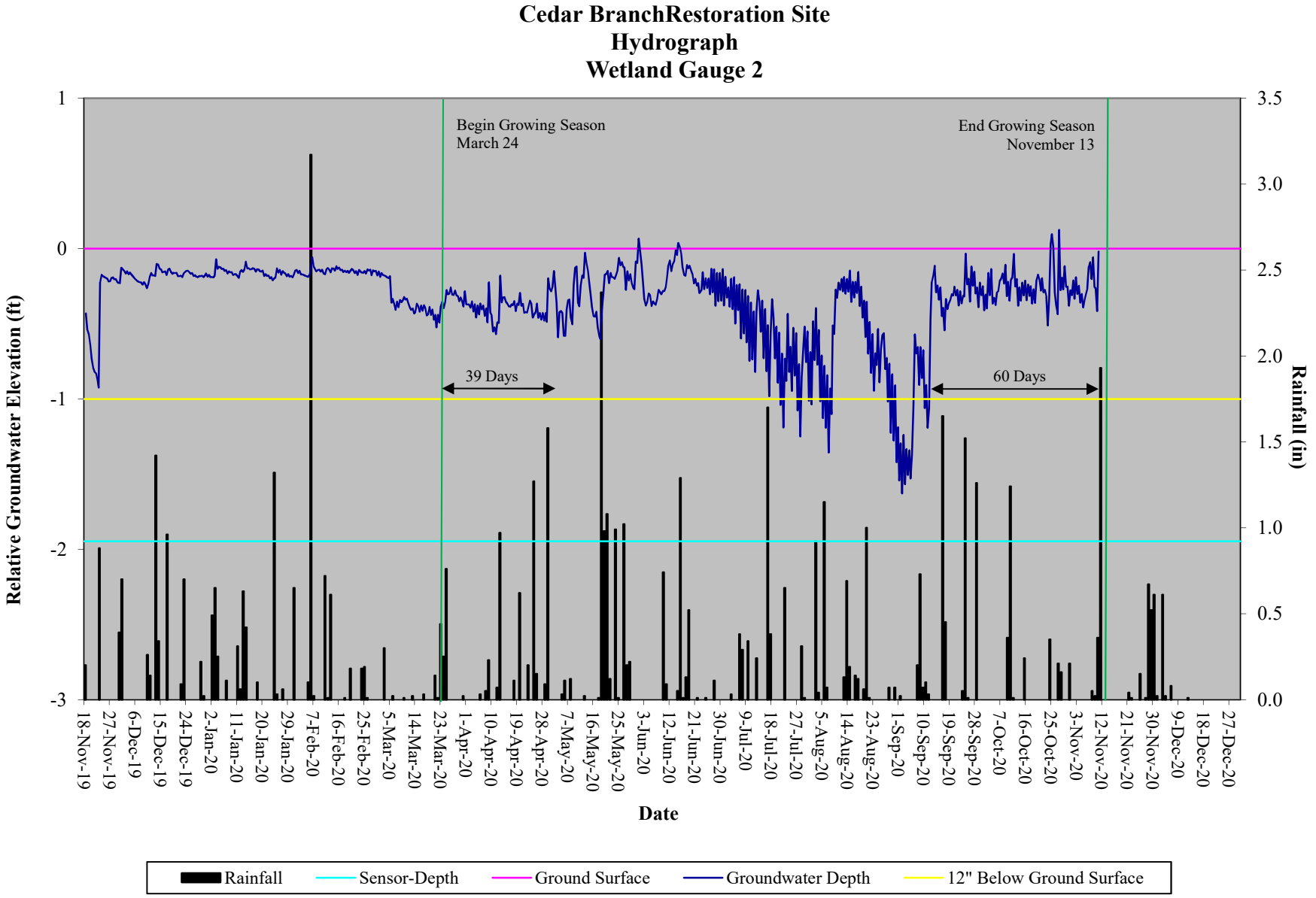

Cedar Branch Restoration Site
Hydrograph
T3 Stream Flow Gauge
Stream Stage Elevation (ft)
Rainfall (in)
685
684
683
682
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
65 Days
59 Days
1-Jan-20
10-Jan-20
19-Jan-20
28-Jan-20
6-Feb-20
15-Feb-20
24-Feb-20
4-Mar-20
13-Mar-20
22-Mar-20
31-Mar-20
9-Apr-20
18-Apr-20
27-Apr-20
6-May-20
15-May-20
24-May-20
2-Jun-20
11-Jun-20
20-Jun-20
29-Jun-20
8-Jul-20
17-Jul-20
26-Jul-20
4-Aug-20
13-Aug-20
22-Aug-20
31-Aug-20
9-Sep-20
18-Sep-20
27-Sep-20
6-Oct-20
15-Oct-20
24-Oct-20
2-Nov-20
11-Nov-20
20-Nov-20
29-Nov-20
8-Dec-20
17-Dec-20
26-Dec-20
Date
Rainfall
Sensor Depth
Stream Stage Elevation
Stream Bed Elevation
Bankfull Elevation
Flow Elevation
Flow (Camera)

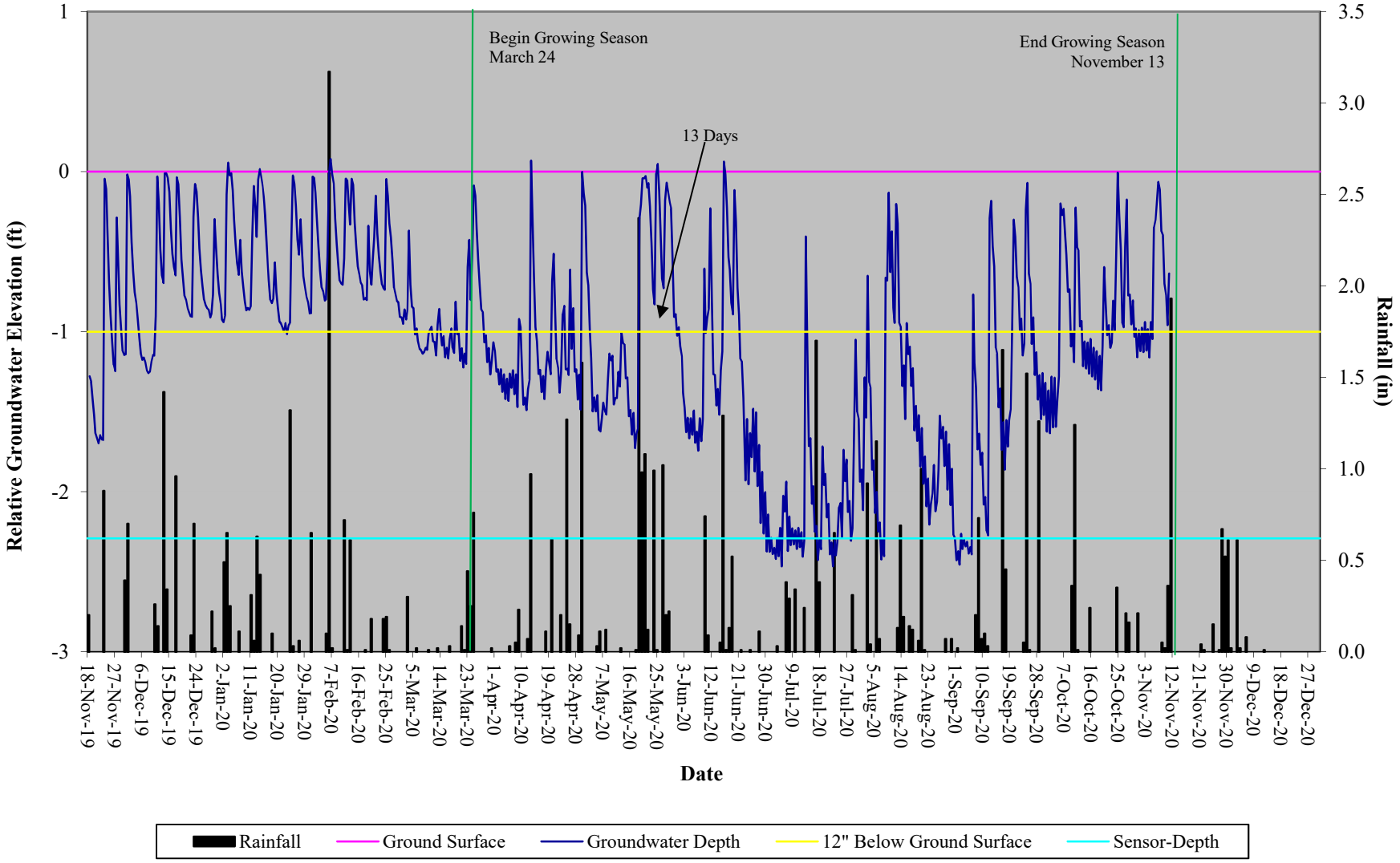
Table 13. Wetland Hydrology Verification Cedar Branch Restoration Site, DMS Project #97009								
		Max Consecutive Days During Growing Season (Percentage)						
Gauge #	**Location**	**MY-01 2018**	**MY-02 2019**	**MY-03 2020**	**MY-04 2021**	**MY-05 2022**	**MY-06 2023**	**MY-07 2024**
Gauge 1	T1	64 (27.4%)	63 (26.7%)	55 (23.3%)				
Gauge 2	T3	104 (44.4%)	148 (63.2%)	119 (50.9%)				
Gauge 3	T3	21 (9.0%)	26 (10.9%)	13 (5.3%)				

Cedar Branch Restoration Site
Hydrograph
Wetland Gauge 1




Cedar BranchRestoration Site
Hydrograph
Wetland Gauge 2
Begin Growing Season
March 24
End Growing Season
November 13
39 Days
60 Days
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
1
0
-1
-2
-3
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
18-Nov-19
27-Nov-19
6-Dec-19
15-Dec-19
24-Dec-19
2-Jan-20
11-Jan-20
20-Jan-20
29-Jan-20
7-Feb-20
16-Feb-20
25-Feb-20
5-Mar-20
14-Mar-20
23-Mar-20
1-Apr-20
10-Apr-20
19-Apr-20
28-Apr-20
7-May-20
16-May-20
25-May-20
3-Jun-20
12-Jun-20
21-Jun-20
30-Jun-20
9-Jul-20
18-Jul-20
27-Jul-20
5-Aug-20
14-Aug-20
23-Aug-20
1-Sep-20
10-Sep-20
19-Sep-20
28-Sep-20
7-Oct-20
16-Oct-20
25-Oct-20
3-Nov-20
12-Nov-20
21-Nov-20
30-Nov-20
9-Dec-20
18-Dec-20
27-Dec-20
Rainfall
Sensor-Depth
Ground Surface
Groundwater Depth
12" Below Ground Surface

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?