Monitoring Report MY01

Cedar Branch Restoration Site
Monitoring Year 01
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: November 2018
Date Submitted: January 2019

Monitoring and Design Firm

Prepared by:

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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, 2019

To: Matthew Reid, DMS Project Manager

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

Subject: Cedar Branch Stream Restoration Site
MY-01 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-01 Baseline Monitoring Report comments from NCDMS received on January 22, 2019, for the Cedar Branch Stream Restoration Site.

All three stream flow gauges malfunctioned on September 15, 2018. Have these gauges been repaired or replaced? Please update text with this information.

- *These gauges have been repaired. The text has been updated with this information.*

Consider adding photos in report documenting flow as well as a link/address for the videos.

- *Several photos of the streams flowing have been added to the report. The videos are not currently in an easily shareable form, but a compilation of the year's videos (similar to the one presented for Jacob's Ladder) can be put together for the credit release meeting.*

Please add the fixed elevations used for the Total Cross-sectional Area measurement for each cross-section on Table 9 and/or graphs.

- *This has been added to the report.*

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

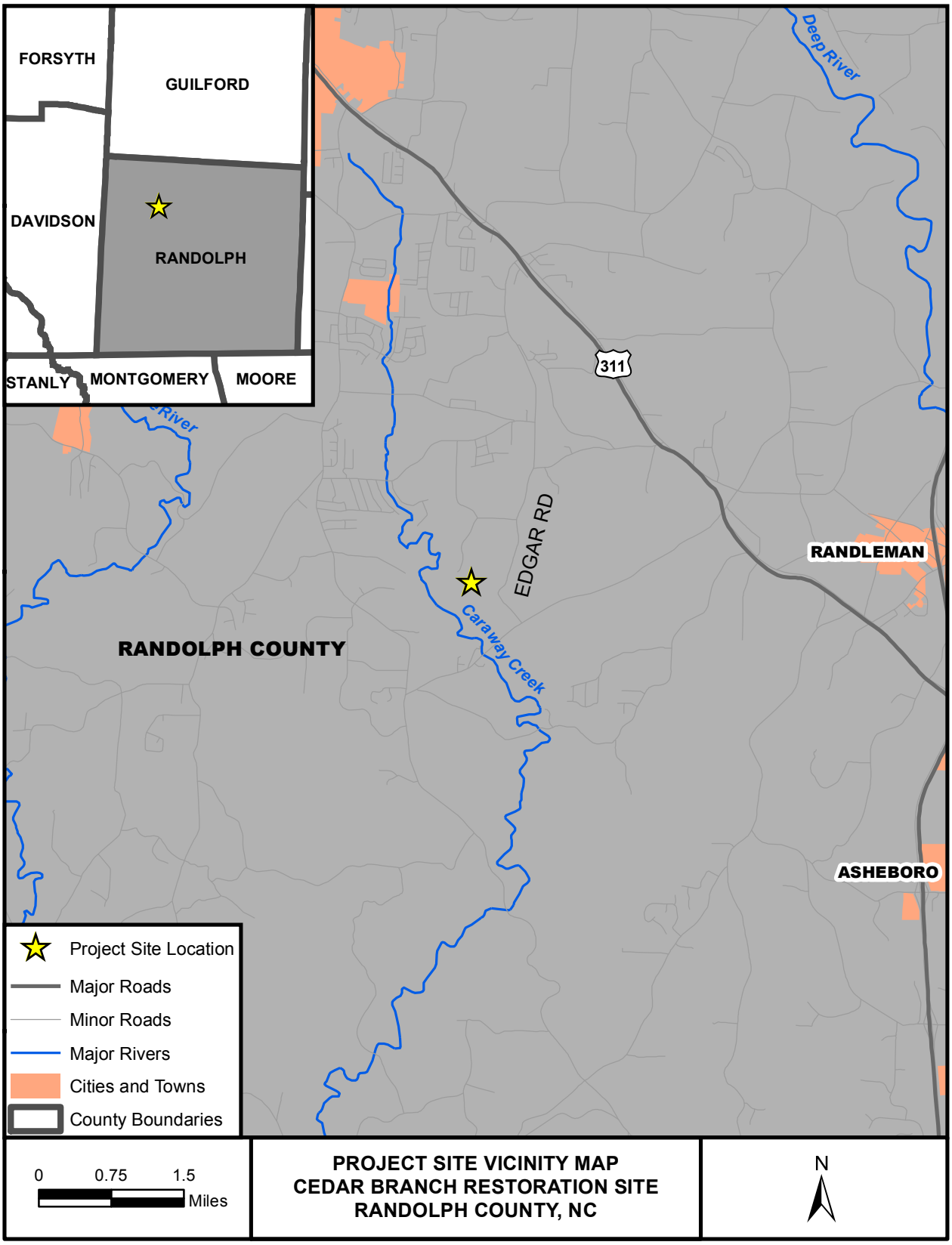
The first-year vegetation monitoring was conducted November 5, 2018. The site averaged 750 planted stems/acre across all 13 plots. All thirteen plots had greater than 320 planted stems/acre, Including volunteers, the site averaged 766 total stems/acre. In general the site is well vegetated, with widespread herbaceous coverage and healthy planted stems.

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 2018, August, September, and November experienced above average rainfall, while January, March, April, June, and October experienced average rainfall. The months of February, May, and July experienced below average rainfall for the site. Overall, the area experienced average rainfall during the 2018 growing season. During the site's first growing season, the groundwater monitoring well on T1 achieved 64 days (27.4%) of continuous saturation within twelve inches of the soil surface, while the two wells on T3 achieved 104 days (44.4%) and 21 days (9.0%). 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 4 bankfull events in 2018. The stream flow gauges on T1 and T3 both recorded at least 30 consecutive days of flow (60 and 83 days respectively), while the gauge on T1-1 recorded a maximum of 16 days of flow. All three gauges malfunctioned on September 15 and did not record any data after this date. Based on the average to below average rainfall experienced before this date, and the average to above average rainfall experienced after this date, it is believed that all three gauges would have recorded higher flow totals if they had not malfunctioned. These gauges have since been repaired. 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 102 consecutive days, T1-1 had flow for a maximum of 7 consecutive days, and T3 had flow for a maximum of 93 consecutive days. The difference in these numbers from those obtained from the gauge is largely due to the cameras becoming obscured by vegetation, the angle of the sun, or moisture on the lens for parts of the year. The camera on T1-1 also malfunctioned on August 28, and no videos were recorded after this date. KCI is developing a maintenance plan for the cameras for 2019 that will minimize the amount of time the cameras are obscured.

The longitudinal profile was not repeated for the first-year survey because the baseline survey found that the stream was constructed as designed, and there were no concerns about bed elevation adjustments. The first-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.

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*	

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

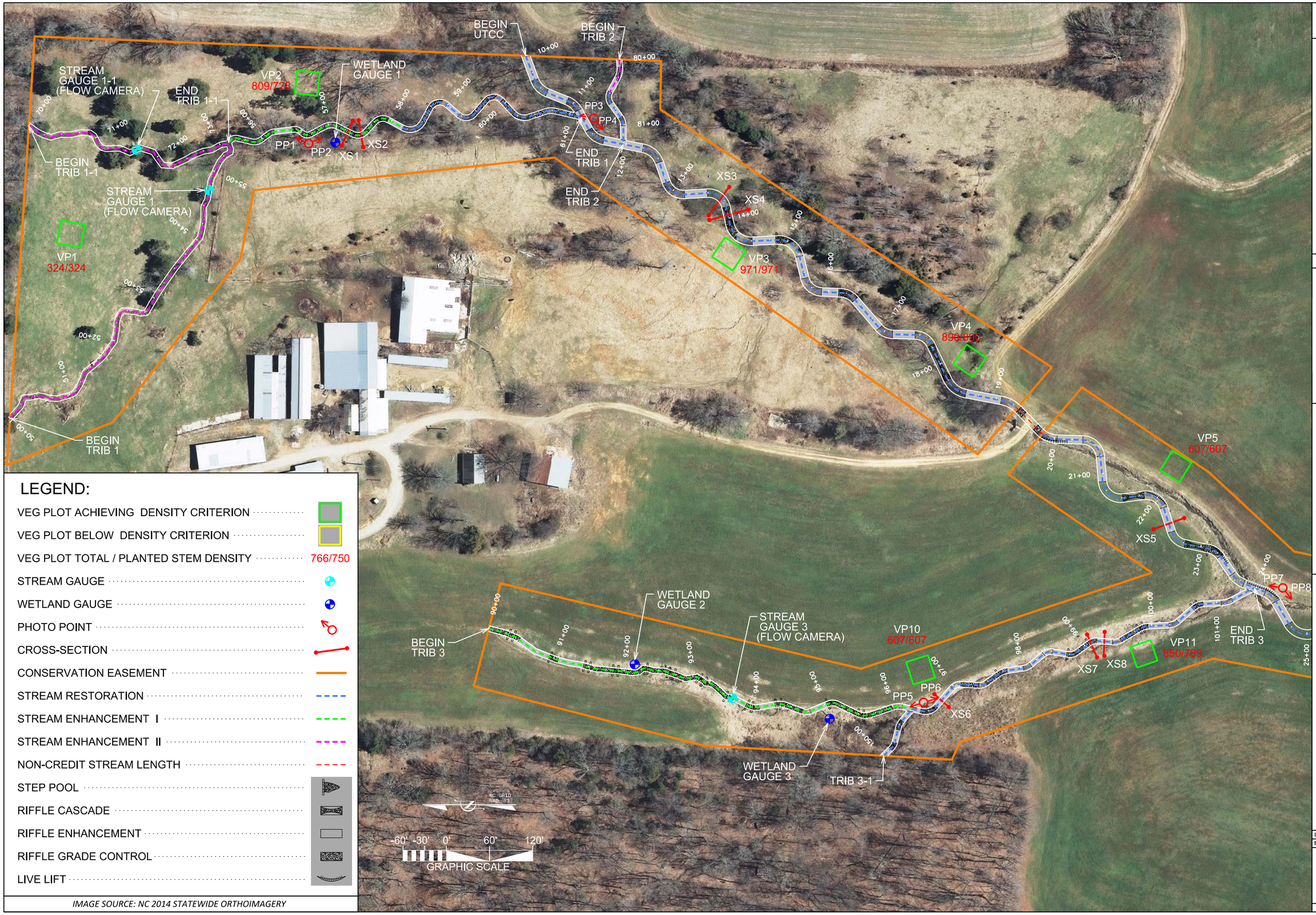
Table 4. Project Information Cedar Branch Restoration Site, DMS Project #97009						
Project Name	Cedar Branch Restoration Site					
County	Randolph County					
Project Area (acres)	21.3 acres					
Project Coordinates (lat. and long.)	35.823878° N, -79.90855° W					
Project Watershed Summary Information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

Existing Wetland Summary Information		
Parameters		
Size of Wetland (acres)	0.02 (WA)	0.03 (WB and WC)
Wetland Type	Bottomland Hardwood Forest	Bottomland Hardwood Forest
Mapped Soil Series	Wynott-Enon Complex	Mecklenburg clay loam
Drainage class	Well Drained	Well Drained
Soil Hydric Status	Hydric	Hydric
Source of Hydrology	Stream Floodplain	Hillside Seepage and Stream Floodplain
Hydrologic Impairment	Ditching and Grazing	Ditching and Grazing
Existing vegetation community	Forested Wetland (Headwater Forest)	Emergent Wetland (Non-Tidal Freshwater Marsh)

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

APPENDIX B

Visual Assessment Data



LEGEND:

- VEG PLOT ACHIEVING DENSITY CRITERION
- VEG PLOT BELOW DENSITY CRITERION
- VEG PLOT TOTAL / PLANTED STEM DENSITY — 766/750
- 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

IMAGE SOURCE: NC 2014 STATEWIDE ORTHOIMAGERY

REVISIONS

NCDEQ – DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
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RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH STREAM RESTORATION SITE MONITORING YEAR 1

RANDOLPH COUNTY, NORTH CAROLINA

DATE: JAN 2019
SCALE: GRAPHIC

CURRENT CONDITION PLAN VIEW

BEGIN TRIB 4
250+00
251+00
XS10
252+00
VP13
769/769
253+00
PP9
254+00
PP10
VP12
526/526
255+00
XS11
XS12
256+00
257+00
VP7
526/486
XS9
END TRIB 4
VP6
1012/1012
XS13
VP8
1174/1174
STREAM GAUGE UTCC
VP9
890/890
XS14
XS15
TRIB 5
END UTCC
PP11
PP12

LEGEND:

- VEG PLOT ACHIEVING DENSITY CRITERION
- VEG PLOT BELOW DENSITY CRITERION
- VEG PLOT TOTAL / PLANTED STEM DENSITY — 766/750
- 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

IMAGE SOURCE: NC 2014 STATEWIDE ORTHOIMAGERY

NC GRID NAD '83

-60' -30' 0' 60' 120'

GRAPHIC SCALE

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CEDAR BRANCH STREAM RESTORATION SITE MONITORING YEAR 1

RANDOLPH COUNTY, NORTH CAROLINA

DATE: JAN 2019

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	0	0.00	0.0%
			Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	Pattern and Color	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%
Easement Acreage	**9.5**					
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	0	0.00	0.0%
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-01 – 11/5/18

PP2 – MY-00 – 4/18/18

PP2 – MY-01 – 11/5/18

PP3– MY-00 – 4/18/18

PP3 – MY-01 – 11/5/18

PP4 – MY-00 – 4/18/18

PP4 – MY-01 – 11/5/18

PP5 – MY-00 – 4/18/18

PP5 – MY-01 – 11/5/18

PP6– MY-00 – 4/18/18

PP6– MY-01 – 11/5/18

PP7 – MY-00 – 4/18/18

PP7 – MY-01 – 11/5/18

PP8 – MY-00 – 4/18/18

PP8 – MY-01 – 11/5/18

PP9– MY-00 – 4/18/18

PP9– MY-01 – 11/5/18

PP10 – MY-00 – 4/18/18

PP10 – MY-01 – 11/5/18

PP11 – MY-00 – 4/18/18

PP11 – MY-01 – 11/5/18

PP12– MY-00 – 4/18/18

PP12– MY-01 – 11/5/18

Vegetation Monitoring Plot Photos

Vegetation Plot 1 – MY-00 – 4/10/18

Vegetation Plot 1 – MY-01 – 11/5/18

Vegetation Plot 2 – MY-00 – 4/10/18

Vegetation Plot 2 – MY-01 – 11/5/18

Vegetation Plot 3 – MY-00 – 4/10/18

Vegetation Plot 3 – MY-01 – 11/5/18

Vegetation Plot 4 – MY-00 – 4/10/18

Vegetation Plot 4 – MY-01 – 11/5/18

Vegetation Plot 5 – MY-00 – 4/11/18

Vegetation Plot 5 – MY-01 – 11/5/18

Vegetation Plot 6 – MY-00 – 4/11/18

Vegetation Plot 6 – MY-01 – 11/5/18

Vegetation Plot 7 – MY-00 – 4/11/18

Vegetation Plot 7 – MY-01 – 11/5/18

Vegetation Plot 8 – MY-00 – 4/11/18

Vegetation Plot 8 – MY-01 – 11/5/18

Vegetation Plot 9 – MY-00 – 4/11/18

Vegetation Plot 9 – MY-01 – 11/5/18

Vegetation Plot 10 – MY-00 – 4/10/18

Vegetation Plot 10 – MY-01 – 11/5/18

Vegetation Plot 11 – MY-00 – 4/10/18

Vegetation Plot 11 – MY-01 – 11/5/18

Vegetation Plot 12 – MY-00 – 4/11/18

Vegetation Plot 12 – MY-01 – 11/5/18

Vegetation Plot 13 – MY-00 – 4/11/18

Vegetation Plot 13 – MY-01 – 11/5/18

APPENDIX C

Vegetation Plot Data

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

	Current Plot Data (MY01 2018)																			
	Plot 01		Plot 02		Plot 03		Plot 04		Plot 05		Plot 06		Plot 07		Plot 08		Plot 09		Plot 10	
Species	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**				
Green Ash (*Fraxinus pennsylvanica*)				2	6	6	8	8	8	8	3	3	2	2	6	6	1	1	2	2
Black Willow (*Salix nigra*)																				
Eastern Sycamore (*Platanus occidentalis*)					6	6	4	4	3	3	10	10	5	5	4	4	6	6	8	8
Persimmon (*Diospyros virginiana)*	3	3																		
Pin oak (*Quercus palustris*)	1	1	3	3																
River Birch (Betula nigra)					2	2					3	3			6	6	3	3	2	2
Silver Willow (*Salix sericea*)																				
Smooth Sumac (*Rhus glabra*)														1						
Swamp Chestnut Oak (*Quercus michauxii*)	3	3	2	2	6	6	6	6	1	1	9	9	3	3	11	11	4	4	1	1
Tulip Poplar (*Liriodendron tulipifera*)			6	6	1	1	4	4	1	1			2	2			8	8	1	1
Willow Oak (*Quercus phellos*)	1	1	7	7	3	3			2	2					2	2			1	1
Oak (*Quercus sp.*)																				
Unknown																				
Stem count	8	8	18	20	24	24	22	22	15	15	25	25	12	13	29	29	22	22	15	15
size (ares)	1		1		1		1		1		1		1		1		1		1	
size (ACRES)	0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025	
Species count	4	4	4	5	6	6	4	4	5	5	4	4	4	5	5	5	5	5	6	6
Stems per ACRE	324	324	728	809	971	971	890	890	607	607	1012	1012	486	526	1174	1174	890	890	607	607

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

	Current Plot Data (MY01 2018)						Annual Means			
	Plot 11		Plot 12		Plot 13		MY01 (2018)		MY00 (2018)	
Species	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**	**Planted**	**Total**
Green Ash (*Fraxinus pennsylvanica*)							36	38		
Black Willow (*Salix nigra*)		1						1		
Eastern Sycamore (*Platanus occidentalis*)							46	46		
Persimmon (*Diospyros virginiana)*	1	1			4	4	8	8		
Pin oak (*Quercus palustris*)	1	1					5	5		
River Birch (Betula nigra)							16	16	6	6
Silver Willow (*Salix sericea*)		1						1		
Smooth Sumac (*Rhus glabra*)								1		
Swamp Chestnut Oak (*Quercus michauxii*)	9	9	4	4	9	9	68	68		
Tulip Poplar (*Liriodendron tulipifera*)	3	3			5	5	31	31	13	13
Willow Oak (*Quercus phellos*)	5	5	9	9	1	1	31	31		
Oak (*Quercus sp.*)									30	30
Unknown									280	280
Stem count	19	21	13	13	19	19	241	246	329	329
size (ares)	1		1		1		13		13	
size (ACRES)	0.025		0.025		0.025		0.32		0.32	
Species count	5	7	2	2	4	4	8	11	4	4
Stems per ACRE	769	850	526	526	769	769	750	766	1024	1024

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 3 (Pool) Station 13+58, UTCC							Cross-Section 4 (Riffle) Station 13+85, UTCC							Cross-Section 5 (Riffle) Station 22+44, UTCC						
Baseline Bankfull Elevation:	676.01							675.79							662.96						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	13.5	13.6						12.1	12.5						14.5	14.3					
Floodprone Width (ft)	-	-						>50	>50						>40	>40					
Bankfull Mean Depth (ft)	1.5	1.5						1.0	1.0						1.1	1.1					
Bankfull Max Depth (ft)	2.8	2.8						1.7	1.7						1.7	1.9					
Bankfull Cross-Sectional Area (ft^2)	20.2	20.2						12.6	12.6						15.8	15.8					
Total Cross-Sectional Area (ft^2)	20.2	20.0						12.6	13.8						15.8	15.7					
Bankfull Width/Depth Ratio	-	-						11.6	12.3						13.3	13.0					
Bankfull Entrenchment Ratio	-	-						4.6	4.5						3.1	3.2					
Bankfull Bank Height Ratio	-	-						1.0	1.0						1.0	1.0					
d50 (mm)	-	-						33	49						31	40					
	Cross-Section 9 (Riffle) Station 26+17, UTCC							Cross-Section 13 (Riffle) Station 35+12, UTCC							Cross-Section 14 (Riffle) Station 41+94, UTCC						
Baseline Bankfull Elevation:	657.32							645.24							637.94						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	13.2	13.0						12.7	13.8						15.3	13.9					
Floodprone Width (ft)	>40	>40						>50	>50						>40	>40					
Bankfull Mean Depth (ft)	1.0	1.0						0.8	0.7						0.8	0.9					
Bankfull Max Depth (ft)	1.8	1.8						1.4	1.4						1.7	1.7					
Bankfull Cross-Sectional Area (ft^2)	13.0	13.0						9.6	9.6						12.8	12.8					
Total Cross-Sectional Area (ft^2)	13.0	12.0						9.6	7.9						12.8	12.6					
Bankfull Width/Depth Ratio	13.3	12.9						16.7	19.8						18.3	15.1					
Bankfull Entrenchment Ratio	3.4	3.5						3.8	3.5						2.8	3.1					
Bankfull Bank Height Ratio	1.0	0.9						1.0	1.0						1.0	1.1					
d50 (mm)	57	50						16	13						61	51					

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

Dimension and Substrate	Cross-Section 15 (Pool) Station 42+58, UTCC							Cross-Section 1 (Riffle) Station 57+19, T1							Cross-Section 2 (Pool) Station 57+44, T1						
Baseline Bankfull Elevation:	637.43							686.84							686.01						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	22.5	20.7						8.9	8.3						11.8	13.5					
Floodprone Width (ft)	-	-						>40	>40						-	-					
Bankfull Mean Depth (ft)	1.6	1.7						0.5	0.6						1.1	1.0					
Bankfull Max Depth (ft)	3.4	3.3						1.0	1.0						2.1	2.0					
Bankfull Cross-Sectional Area (ft^2)	35.8	35.8						4.6	4.6						13.4	13.4					
Total Cross-Sectional Area (ft^2)	35.8	32.8						4.6	4.3						13.4	11.8					
Bankfull Width/Depth Ratio	-	-						17.0	14.8						-	-					
Bankfull Entrenchment Ratio	-	-						4.2	4.6						-	-					
Bankfull Bank Height Ratio	-	-						1.0	0.9						-	-					
d50 (mm)	-	-						24	18						-	-					
	Cross-Section 6 (Riffle) Station 96+69, T3							Cross-Section 7 (Pool) Station 99+07, T3							Cross-Section 8 (Riffle) Station 99+25, T3						
Baseline Bankfull Elevation:	673.00							666.60							665.93						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	6.0	6.5						10.3	8.9						6.0	5.6					
Floodprone Width (ft)	>30	>30						-	-						>30	>30					
Bankfull Mean Depth (ft)	0.5	0.5						0.7	0.8						0.4	0.4					
Bankfull Max Depth (ft)	0.8	1.0						1.8	1.6						0.7	0.9					
Bankfull Cross-Sectional Area (ft^2)	3.1	3.1						6.9	6.9						2.5	2.5					
Total Cross-Sectional Area (ft^2)	3.1	3.2						6.9	8.7						2.5	2.7					
Bankfull Width/Depth Ratio	11.7	13.7						-	-						14.1	12.6					
Bankfull Entrenchment Ratio	4.4	4.1						-	-						5.0	5.4					
Bankfull Bank Height Ratio	1.0	0.9						-	-						1.0	1.1					
d50 (mm)	41	41						-	-						40	18					

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

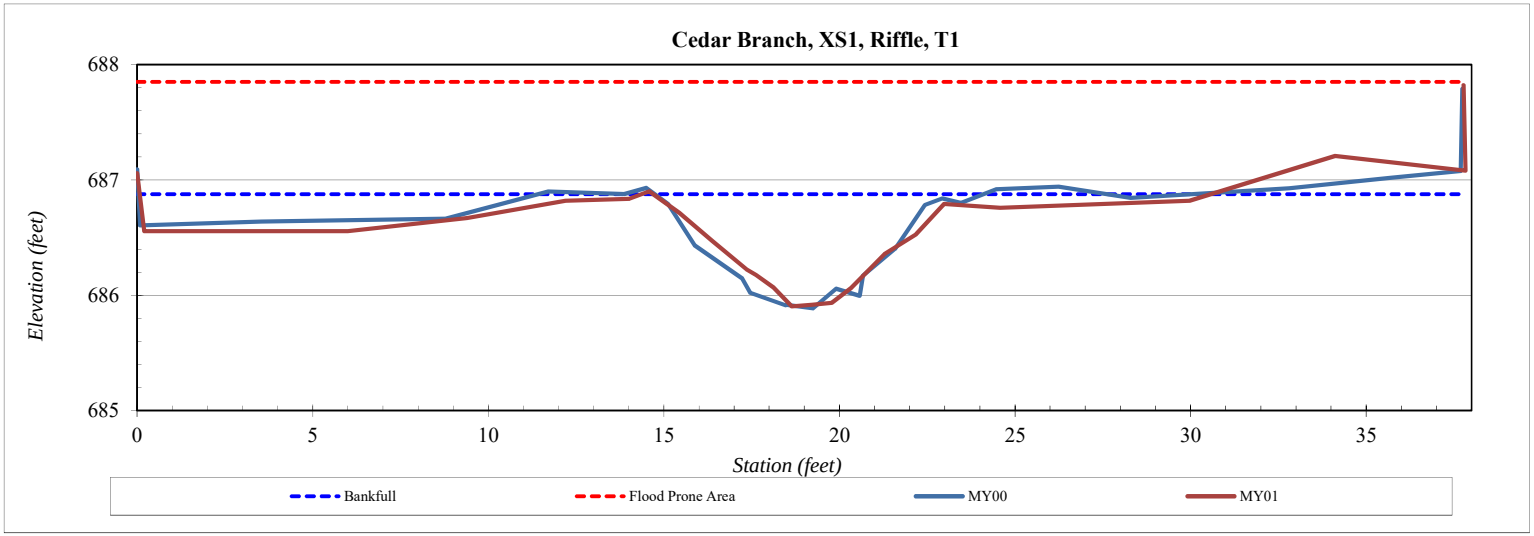
Dimension and Substrate	Cross-Section 10 (Riffle) Station 252+25, T4							Cross-Section 11 (Pool) Station 225+97, T4							Cross-Section 12 (Riffle) Station 226+04, T4						
Baseline Bankfull Elevation:	666.93							656.55							656.12						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	7.0	8.7						10.2	9.6						6.7	6.9					
Floodprone Width (ft)	>30	>30						-	-						>30	>30					
Bankfull Mean Depth (ft)	0.5	0.4						1.1	1.1						0.5	0.5					
Bankfull Max Depth (ft)	0.8	1.0						2.1	2.0						0.8	0.8					
Bankfull Cross-Sectional Area (ft^2)	3.3	3.3						10.8	10.8						3.5	3.5					
Total Cross-Sectional Area (ft^2)	3.3	3.0						10.8	11.9						3.5	3.8					
Bankfull Width/Depth Ratio	14.9	23.0						-	-						12.9	13.6					
Bankfull Entrenchment Ratio	5.1	4.1						-	-						4.7	4.6					
Bankfull Bank Height Ratio	1.0	0.9						-	-						1.0	1.0					

Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS1
Drainage Area (sq mi):	0.05
Date:	1/11/2019
Field Crew:	T. Seelinger, J. Sullivan

Station	Elevation
0.00	687.06
0.20	686.56
6.00	686.56
9.39	686.67
12.20	686.82
14.02	686.84
14.59	686.90
15.44	686.71
16.38	686.47
17.36	686.22
17.62	686.18
18.12	686.07
18.64	685.90
19.22	685.92
19.78	685.94
20.33	686.06
21.29	686.36
22.18	686.53
22.98	686.79
23.64	686.78
24.58	686.76
29.97	686.82
34.11	687.21
37.83	687.08
37.77	687.82

SUMMARY DATA	
Current Bankfull Elevation:	686.88
Bankfull Cross-Sectional Area:	4.6
Total Cross-Sectional Area:	4.3
Bankfull Width:	8.3
Flood Prone Area Elevation:	687.9
Flood Prone Width:	37.8
Max Depth at Bankfull:	1.0
Mean Depth at Bankfull:	0.6
W / D Ratio:	14.8
Entrenchment Ratio:	4.6
Bank Height Ratio:	0.9

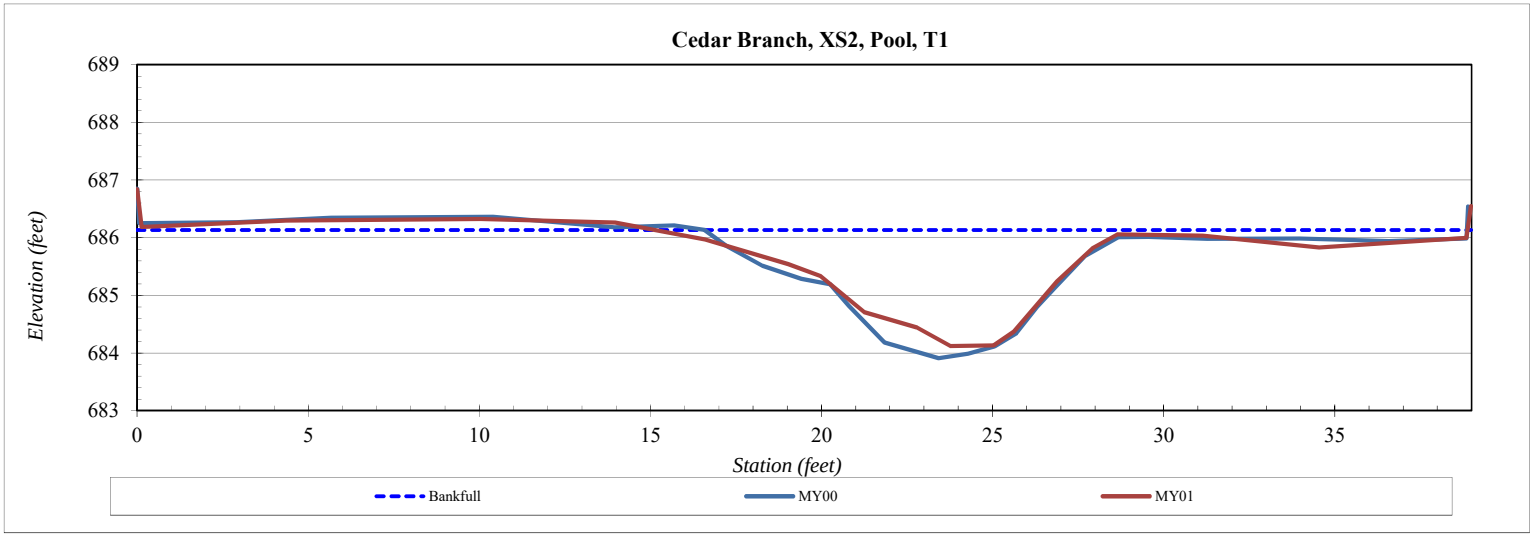


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS2
Drainage Area (sq mi):	0.05
Date:	1/11/2019
Field Crew:	T. Seelinger, J. Sullivan

Station	Elevation
0.00	686.84
0.13	686.19
4.35	686.30
10.05	686.32
13.97	686.27
16.60	685.97
19.03	685.54
19.98	685.33
21.25	684.71
22.79	684.44
23.77	684.12
25.03	684.13
25.63	684.37
26.89	685.24
27.93	685.82
28.65	686.06
31.15	686.04
34.54	685.83
38.84	686.00
38.99	686.55

SUMMARY DATA	
Current Bankfull Elevation:	686.13
Bankfull Cross-Sectional Area:	13.4
Total Cross-Sectional Area:	11.8
Bankfull Width:	13.5
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	2.0
Mean Depth at Bankfull:	1.0
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---

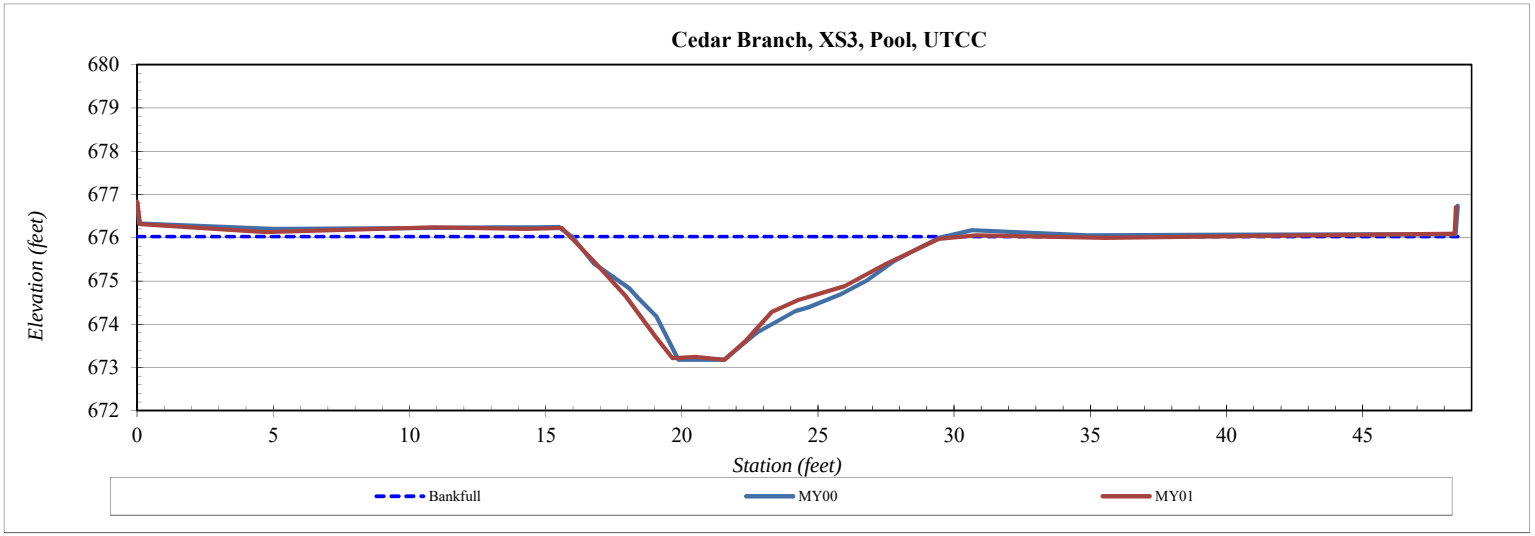


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS3
Drainage Area (sq mi):	0.21
Date:	1/11/2019
Field Crew:	T. Seelinger, J. Sullivan

Station	Elevation
0.00	676.83
0.10	676.31
4.71	676.13
10.92	676.24
14.27	676.21
15.59	676.23
16.77	675.46
17.94	674.65
19.01	673.72
19.66	673.22
20.50	673.24
21.58	673.18
22.35	673.62
23.30	674.28
24.26	674.55
25.98	674.88
27.48	675.39
29.45	675.98
30.81	676.06
35.56	676.00
43.00	676.06
48.37	676.09
48.42	676.71

SUMMARY DATA	
Current Bankfull Elevation:	676.02
Bankfull Cross-Sectional Area:	20.2
Total Cross-Sectional Area:	20.0
Bankfull Width:	13.6
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	2.8
Mean Depth at Bankfull:	1.5
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---

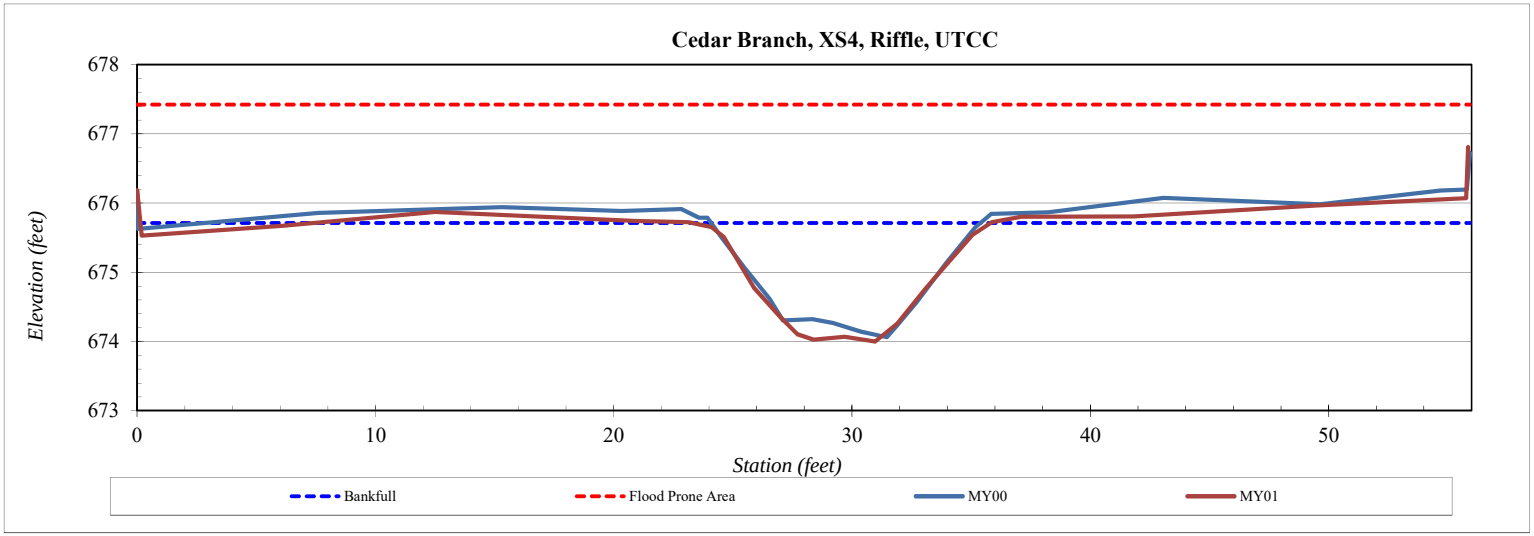


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS4
Drainage Area (sq mi):	0.21
Date:	1/11/2019
Field Crew:	T. Seelinger, J. Sullivan

Station	Elevation
0.00	676.19
0.18	675.53
6.15	675.67
12.50	675.87
20.87	675.74
23.14	675.73
24.09	675.66
24.62	675.51
25.87	674.78
27.00	674.35
27.70	674.10
28.39	674.03
29.69	674.07
30.98	674.00
31.91	674.26
33.08	674.76
35.07	675.54
35.87	675.72
37.10	675.80
41.82	675.81
49.44	675.97
55.76	676.07
55.85	676.81

SUMMARY DATA	
Current Bankfull Elevation:	675.71
Bankfull Cross-Sectional Area:	12.6
Total Cross-Sectional Area:	13.8
Bankfull Width:	12.5
Flood Prone Area Elevation:	677.4
Flood Prone Width:	55.9
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	1.0
W / D Ratio:	12.3
Entrenchment Ratio:	4.5
Bank Height Ratio:	1.0

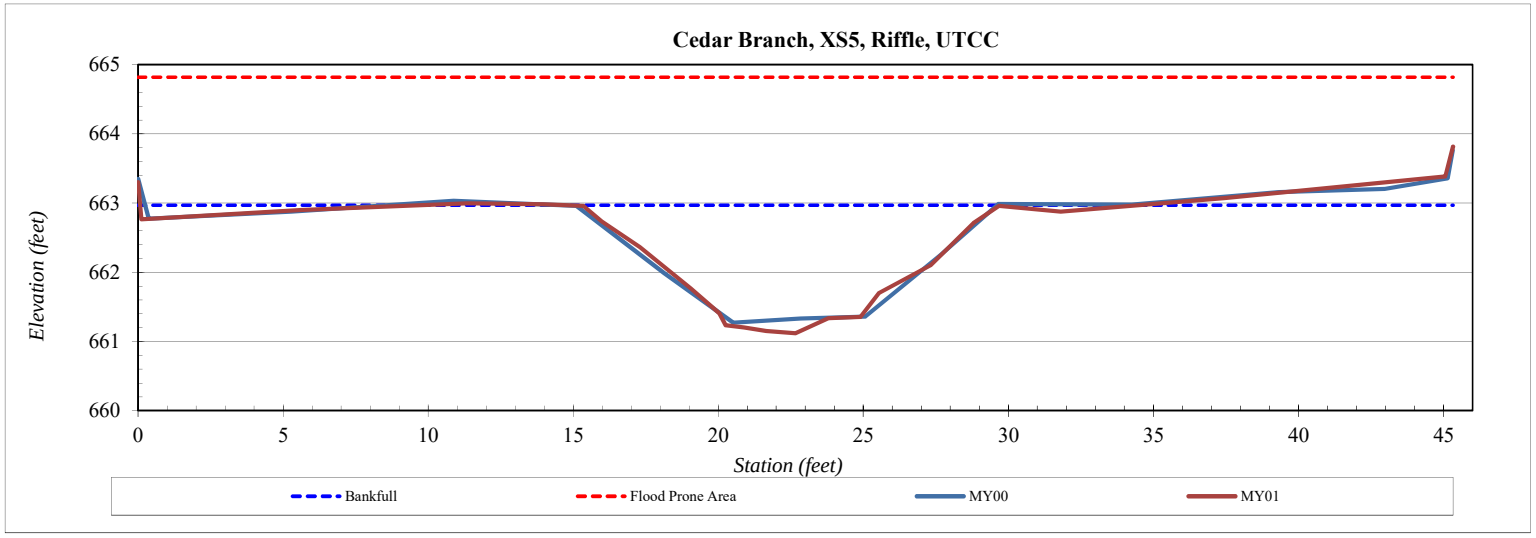


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS5
Drainage Area (sq mi):	0.21
Date:	1/11/2019
Field Crew:	T. Seelinger, J. Sullivan

Station	Elevation
0.00	663.30
0.11	662.77
5.60	662.90
11.35	663.00
13.98	662.98
15.35	662.96
15.98	662.73
17.30	662.36
19.06	661.76
20.04	661.40
20.25	661.24
20.89	661.20
21.65	661.15
22.64	661.12
23.80	661.34
24.90	661.36
25.55	661.70
27.31	662.10
28.80	662.72
29.67	662.96
31.80	662.88
37.41	663.07
45.06	663.39
45.33	663.82

SUMMARY DATA	
Current Bankfull Elevation:	662.97
Bankfull Cross-Sectional Area:	15.8
Total Cross-Sectional Area:	15.7
Bankfull Width:	14.3
Flood Prone Area Elevation:	664.8
Flood Prone Width:	45.3
Max Depth at Bankfull:	1.9
Mean Depth at Bankfull:	1.1
W / D Ratio:	13.0
Entrenchment Ratio:	3.2
Bank Height Ratio:	1.0

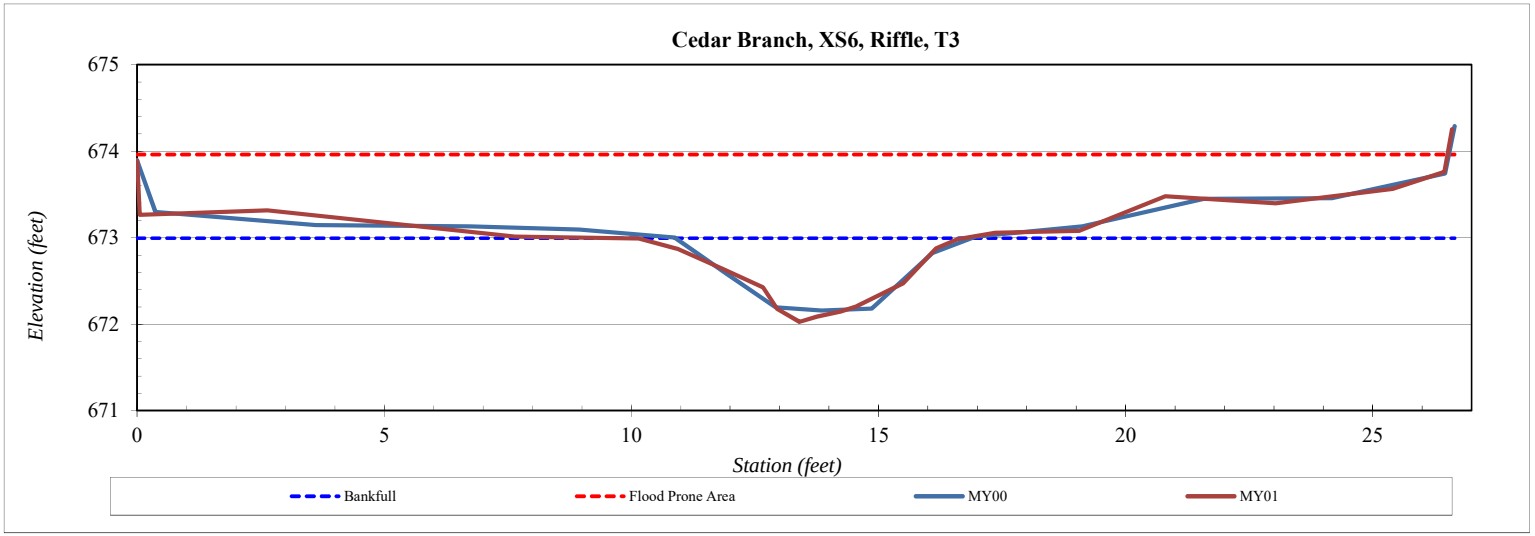


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS6
Drainage Area (sq mi):	0.04
Date:	1/11/2019
Field Crew:	T. Seelinger, J. Sullivan

Station	Elevation
0.00	673.89
0.05	673.26
2.64	673.32
7.65	673.01
10.15	672.99
10.92	672.87
11.84	672.64
12.66	672.42
12.95	672.18
13.40	672.03
13.76	672.09
14.24	672.15
14.56	672.21
15.50	672.47
16.17	672.88
16.61	672.99
17.36	673.06
19.07	673.08
20.81	673.48
23.03	673.40
25.40	673.56
26.45	673.76
26.61	674.26

SUMMARY DATA	
Current Bankfull Elevation:	672.99
Bankfull Cross-Sectional Area:	3.1
Total Cross-Sectional Area:	3.2
Bankfull Width:	6.5
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:	13.7
Entrenchment Ratio:	4.1
Bank Height Ratio:	0.9

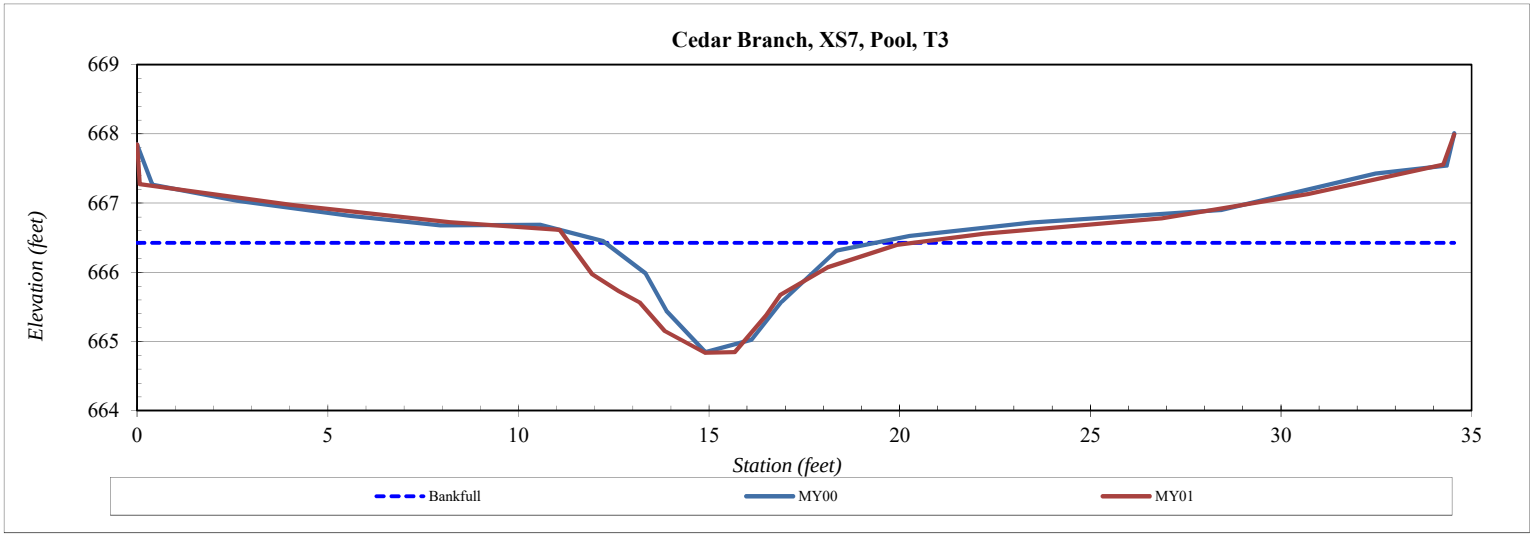


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS7
Drainage Area (sq mi):	0.04
Date:	1/11/2019
Field Crew:	T. Seelinger, J. Sullivan

Station	Elevation
0.00	667.85
0.07	667.28
4.06	666.98
8.20	666.73
11.08	666.62
11.93	665.98
12.63	665.73
13.19	665.56
13.84	665.15
14.90	664.84
15.68	664.85
16.50	665.38
16.87	665.68
18.11	666.07
19.92	666.40
22.22	666.56
26.88	666.78
30.71	667.13
34.26	667.56
34.54	667.99

SUMMARY DATA	
Current Bankfull Elevation:	666.42
Bankfull Cross-Sectional Area:	6.9
Total Cross-Sectional Area:	8.7
Bankfull Width:	8.9
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	1.6
Mean Depth at Bankfull:	0.8
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---

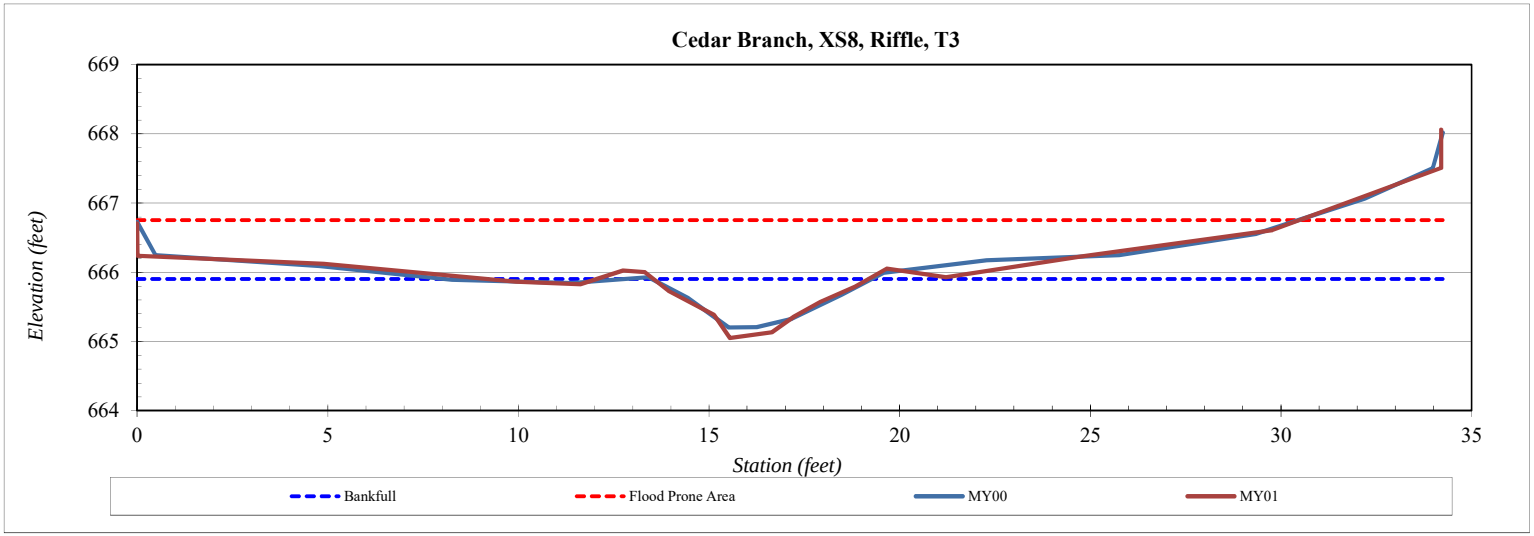


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS8
Drainage Area (sq mi):	0.04
Date:	1/11/2019
Field Crew:	T. Seelinger, J. Sullivan

Station	Elevation
0.00	666.71
0.01	666.24
4.89	666.13
9.93	665.86
11.62	665.83
12.75	666.03
13.31	666.00
13.94	665.73
15.13	665.38
15.55	665.05
16.65	665.13
17.23	665.36
17.92	665.57
18.83	665.79
19.66	666.05
21.22	665.93
24.77	666.23
29.78	666.61
34.20	667.51
34.20	668.06

SUMMARY DATA	
Current Bankfull Elevation:	665.90
Bankfull Cross-Sectional Area:	2.5
Total Cross-Sectional Area:	2.7
Bankfull Width:	5.6
Flood Prone Area Elevation:	666.8
Flood Prone Width:	30.5
Max Depth at Bankfull:	0.9
Mean Depth at Bankfull:	0.4
W / D Ratio:	12.6
Entrenchment Ratio:	5.4
Bank Height Ratio:	1.1

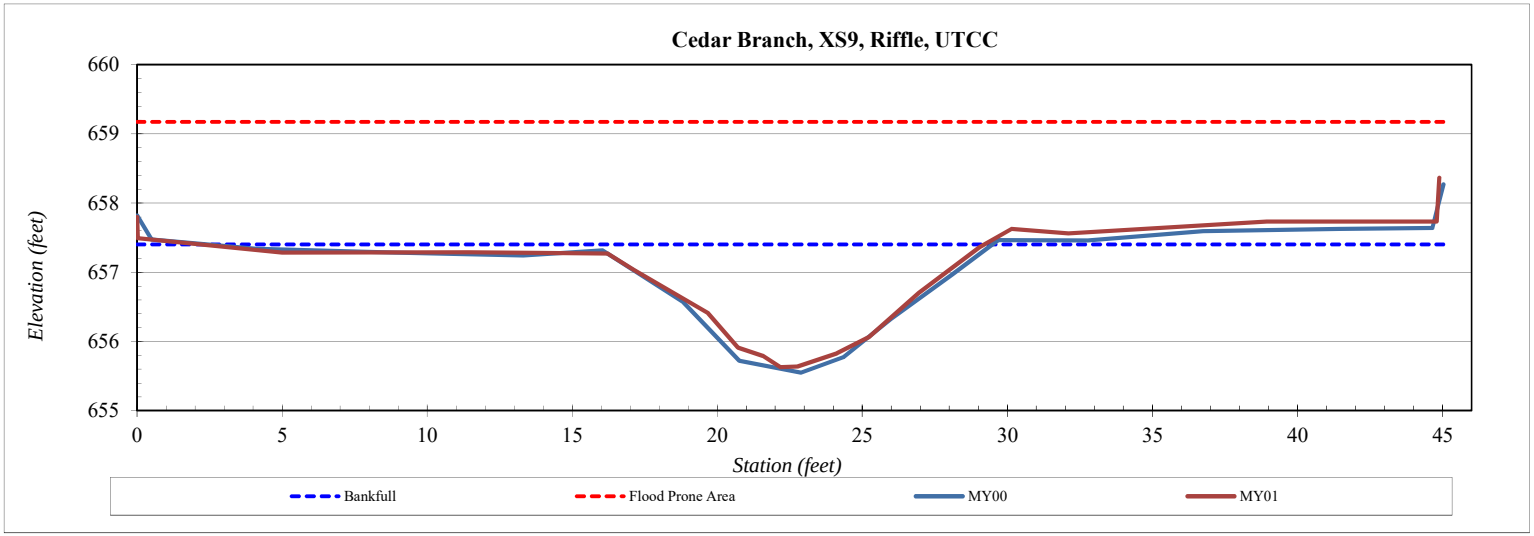


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS9
Drainage Area (sq mi):	0.28
Date:	1/11/2019
Field Crew:	T. Seelinger, J. Sullivan

Station	Elevation
0.00	657.80
0.02	657.50
5.00	657.28
11.44	657.29
13.98	657.28
16.22	657.27
17.12	657.04
19.68	656.41
20.72	655.91
21.58	655.79
22.18	655.63
22.76	655.64
24.12	655.83
25.22	656.06
26.95	656.70
29.04	657.37
30.15	657.63
32.09	657.56
38.93	657.73
44.79	657.73
44.89	658.36

SUMMARY DATA	
Current Bankfull Elevation:	657.40
Bankfull Cross-Sectional Area:	13.0
Total Cross-Sectional Area:	12.0
Bankfull Width:	13.0
Flood Prone Area Elevation:	659.2
Flood Prone Width:	44.9
Max Depth at Bankfull:	1.8
Mean Depth at Bankfull:	1.0
W / D Ratio:	12.9
Entrenchment Ratio:	3.5
Bank Height Ratio:	0.9

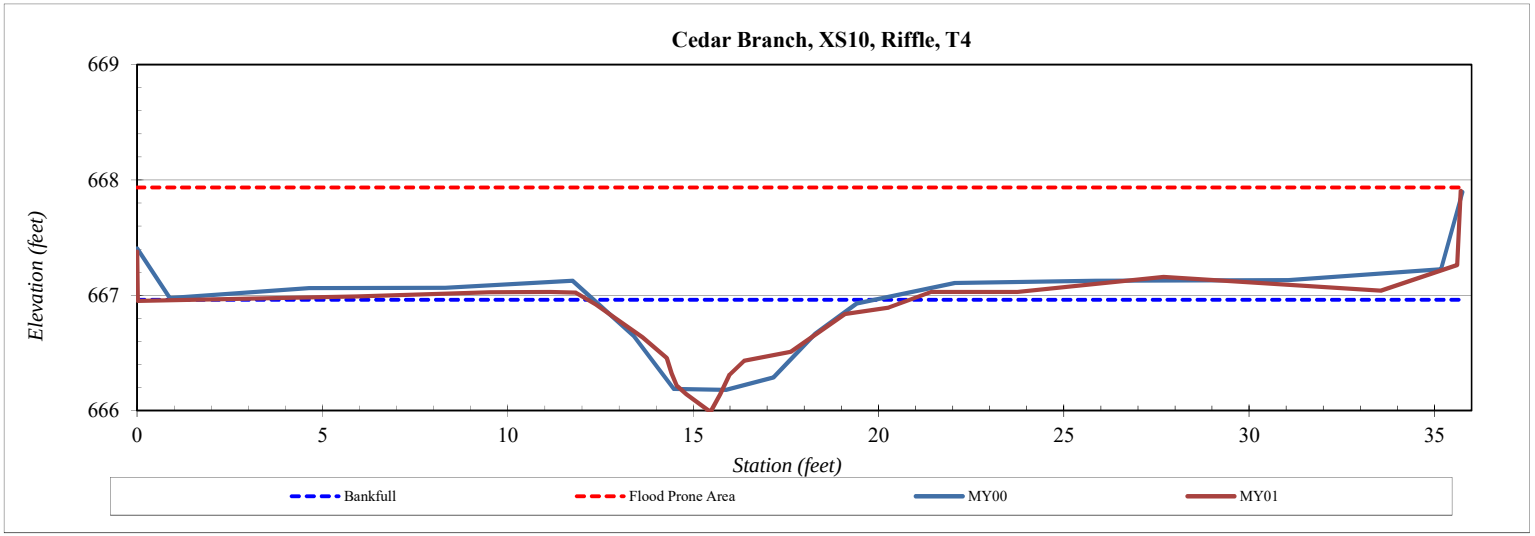


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS10
Drainage Area (sq mi):	0.05
Date:	1/14/2019
Field Crew:	T. Seelinger, J. Sullivan

Station	Elevation
0.00	667.38
0.02	666.95
5.93	666.99
9.51	667.03
11.15	667.03
11.82	667.02
12.37	666.92
13.64	666.64
14.29	666.45
14.41	666.32
14.57	666.21
14.81	666.14
15.47	665.99
15.73	666.14
15.99	666.31
16.37	666.43
17.64	666.51
19.10	666.84
20.27	666.90
21.44	667.03
23.74	667.03
27.69	667.16
33.55	667.04
35.61	667.26
35.71	667.91

SUMMARY DATA	
Current Bankfull Elevation:	666.96
Bankfull Cross-Sectional Area:	3.3
Total Cross-Sectional Area:	3.0
Bankfull Width:	8.7
Flood Prone Area Elevation:	667.9
Flood Prone Width:	35.7
Max Depth at Bankfull:	1.0
Mean Depth at Bankfull:	0.4
W / D Ratio:	23.0
Entrenchment Ratio:	4.1
Bank Height Ratio:	0.9

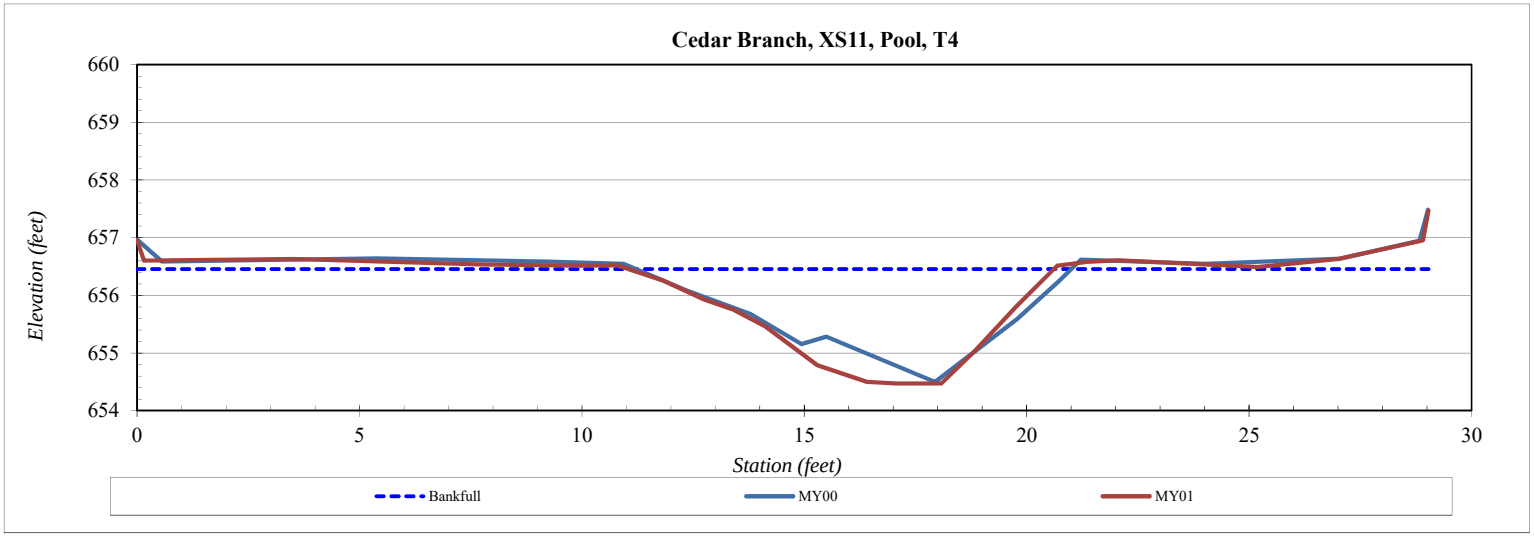


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS11
Drainage Area (sq mi):	0.05
Date:	1/14/2019
Field Crew:	T. Seelinger, J. Sullivan

Station	Elevation
0.00	656.96
0.15	656.60
3.53	656.63
7.70	656.54
9.89	656.51
10.80	656.52
11.82	656.26
12.75	655.93
13.38	655.76
14.14	655.46
15.30	654.79
16.41	654.50
17.07	654.47
18.08	654.47
18.79	655.00
19.77	655.81
20.68	656.51
21.36	656.58
22.07	656.61
25.19	656.49
27.00	656.63
28.91	656.95
29.03	657.46

SUMMARY DATA	
Current Bankfull Elevation:	656.45
Bankfull Cross-Sectional Area:	10.8
Total Cross-Sectional Area:	11.9
Bankfull Width:	9.6
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	2.0
Mean Depth at Bankfull:	1.1
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---

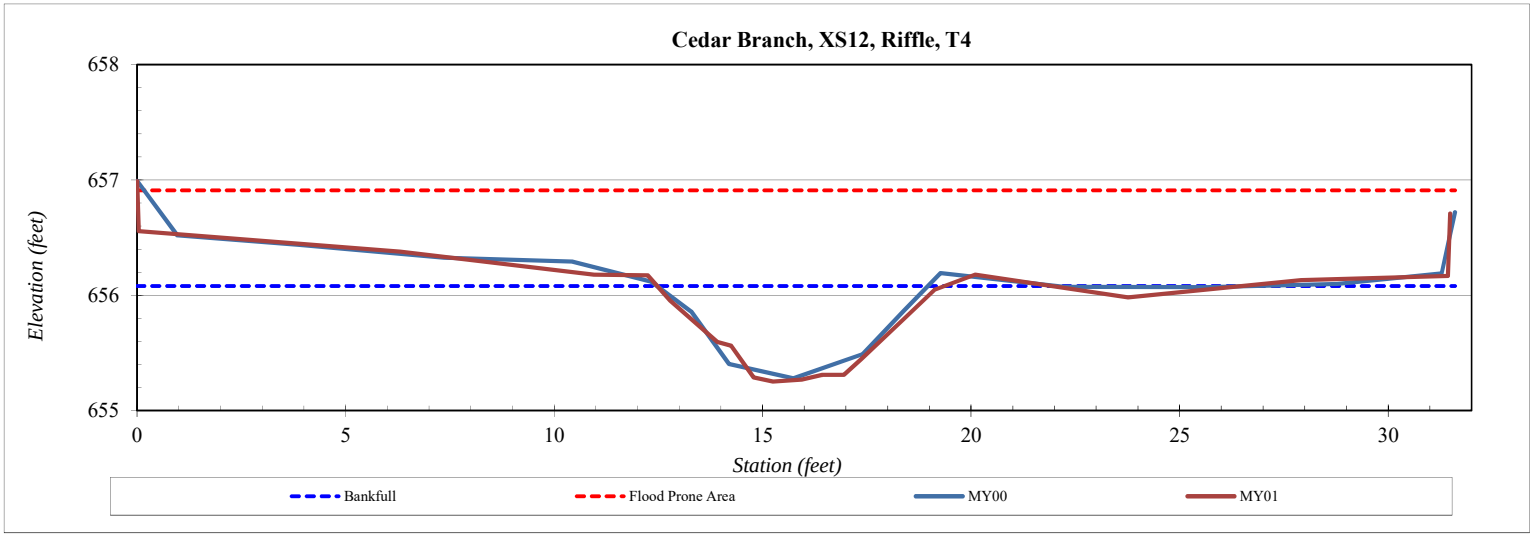


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS12
Drainage Area (sq mi):	0.05
Date:	1/14/2019
Field Crew:	T. Seelinger, J. Sullivan

Station	Elevation
0.00	656.99
0.04	656.56
6.31	656.38
10.96	656.18
12.25	656.17
12.78	655.95
13.91	655.60
14.24	655.56
14.78	655.29
15.25	655.25
15.93	655.27
16.43	655.31
16.95	655.31
17.36	655.44
18.36	655.79
19.12	656.05
20.10	656.18
23.76	655.98
27.92	656.13
31.43	656.17
31.49	656.71

SUMMARY DATA	
Current Bankfull Elevation:	656.08
Bankfull Cross-Sectional Area:	3.5
Total Cross-Sectional Area:	3.8
Bankfull Width:	6.9
Flood Prone Area Elevation:	656.9
Flood Prone Width:	31.5
Max Depth at Bankfull:	0.8
Mean Depth at Bankfull:	0.5
W / D Ratio:	13.6
Entrenchment Ratio:	4.6
Bank Height Ratio:	1.0

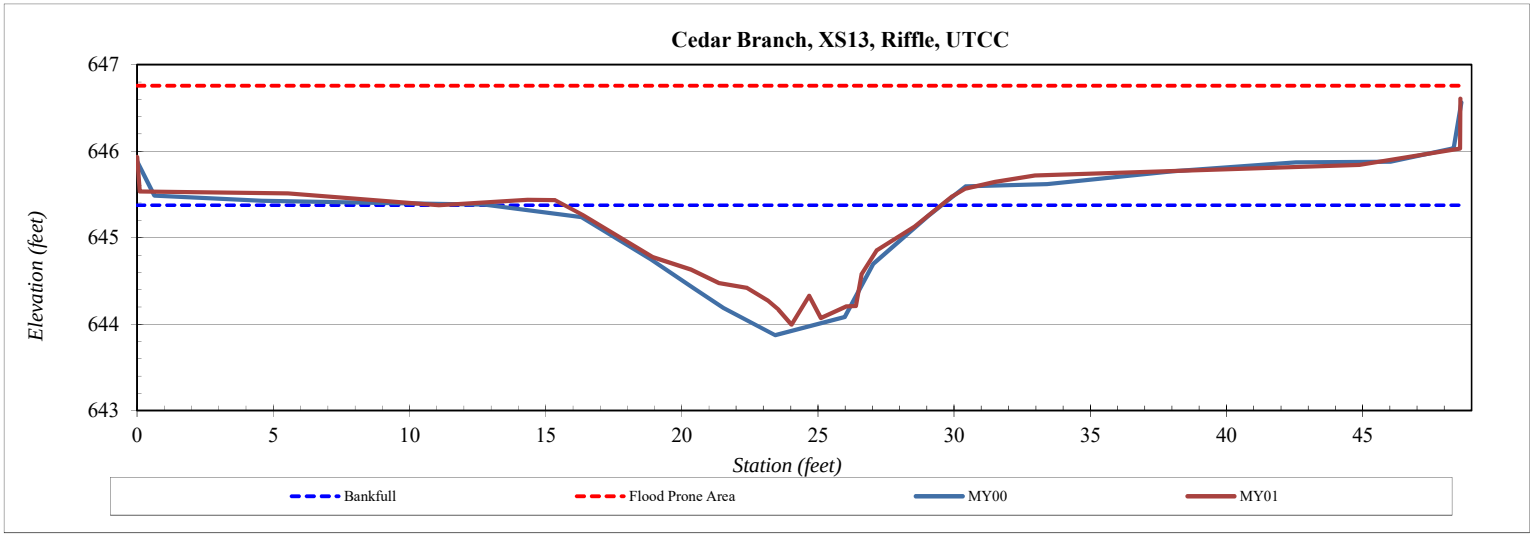


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS13
Drainage Area (sq mi):	0.41
Date:	1/14/2019
Field Crew:	T. Seelinger, J. Sullivan

Station	Elevation
0.00	645.94
0.10	645.53
5.54	645.51
11.08	645.38
14.33	645.44
15.35	645.44
16.38	645.26
18.93	644.78
20.34	644.63
21.35	644.48
22.39	644.42
23.16	644.27
23.54	644.17
24.02	644.00
24.68	644.33
25.11	644.07
26.06	644.21
26.39	644.21
26.61	644.58
27.16	644.85
28.54	645.13
29.93	645.48
30.42	645.57
31.50	645.65
32.96	645.72
39.89	645.79
44.88	645.84
48.57	646.03
48.59	646.61

SUMMARY DATA	
Current Bankfull Elevation:	645.38
Bankfull Cross-Sectional Area:	9.6
Total Cross-Sectional Area:	7.9
Bankfull Width:	13.8
Flood Prone Area Elevation:	646.8
Flood Prone Width:	48.6
Max Depth at Bankfull:	1.4
Mean Depth at Bankfull:	0.7
W / D Ratio:	19.8
Entrenchment Ratio:	3.5
Bank Height Ratio:	1.0

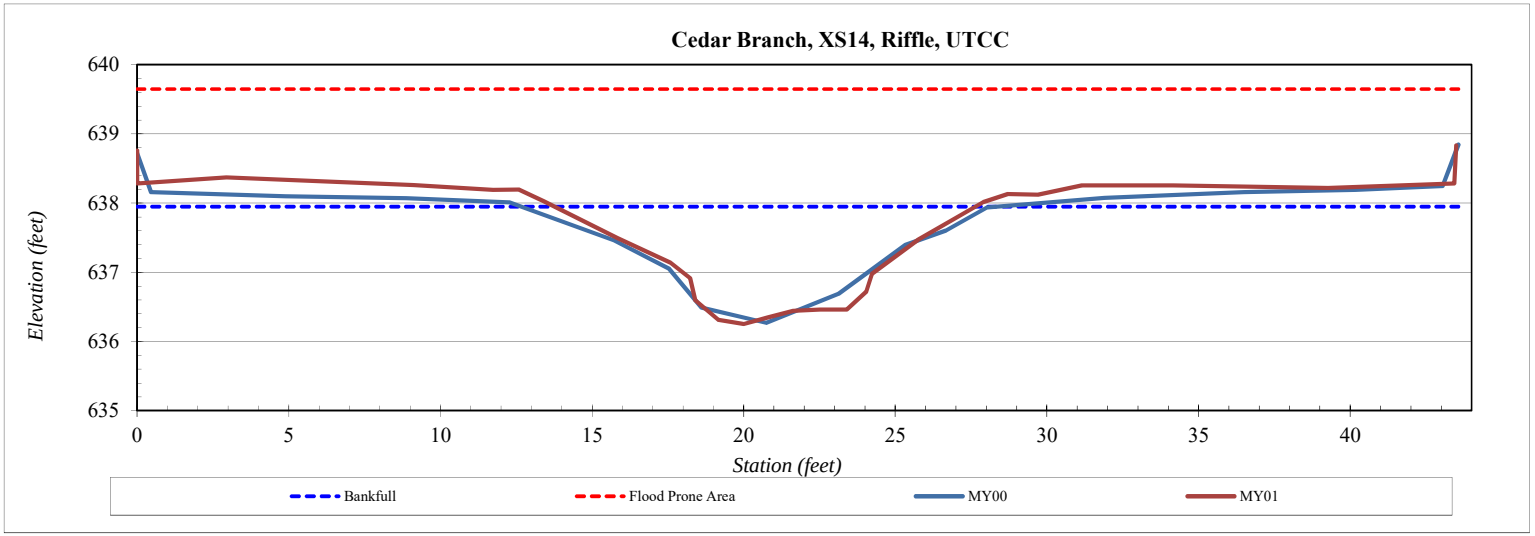


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS14
Drainage Area (sq mi):	0.41
Date:	1/14/2019
Field Crew:	T. Seelinger, J. Sullivan

Station	Elevation
0.00	638.76
0.00	638.29
2.95	638.37
9.12	638.26
11.74	638.19
12.58	638.20
13.41	638.03
15.83	637.49
17.58	637.14
18.23	636.91
18.40	636.60
19.16	636.31
19.99	636.25
20.78	636.35
21.63	636.44
22.52	636.46
23.40	636.46
24.04	636.72
24.23	636.98
25.76	637.47
27.91	638.02
28.71	638.13
29.70	638.12
31.14	638.26
34.16	638.26
39.27	638.22
43.43	638.29
43.49	638.83

SUMMARY DATA	
Current Bankfull Elevation:	637.95
Bankfull Cross-Sectional Area:	12.8
Total Cross-Sectional Area:	12.6
Bankfull Width:	13.9
Flood Prone Area Elevation:	639.6
Flood Prone Width:	43.5
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	0.9
W / D Ratio:	15.1
Entrenchment Ratio:	3.1
Bank Height Ratio:	1.1

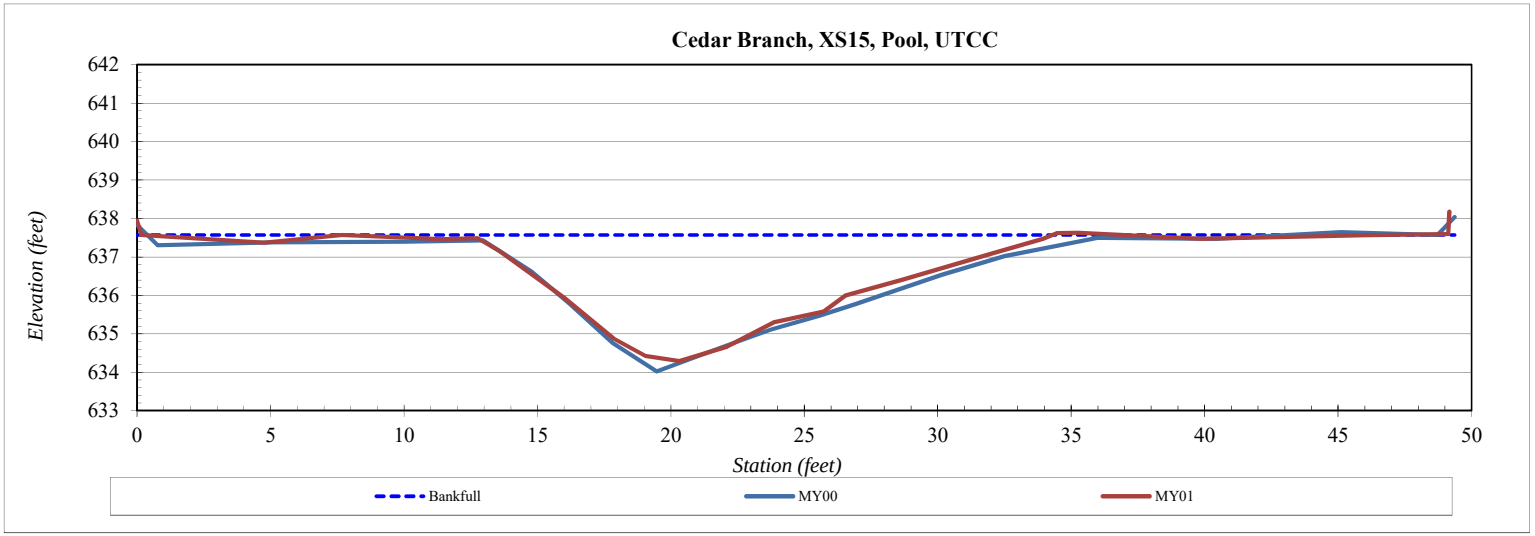


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS15
Drainage Area (sq mi):	0.41
Date:	1/14/2019
Field Crew:	T. Seelinger, J. Sullivan

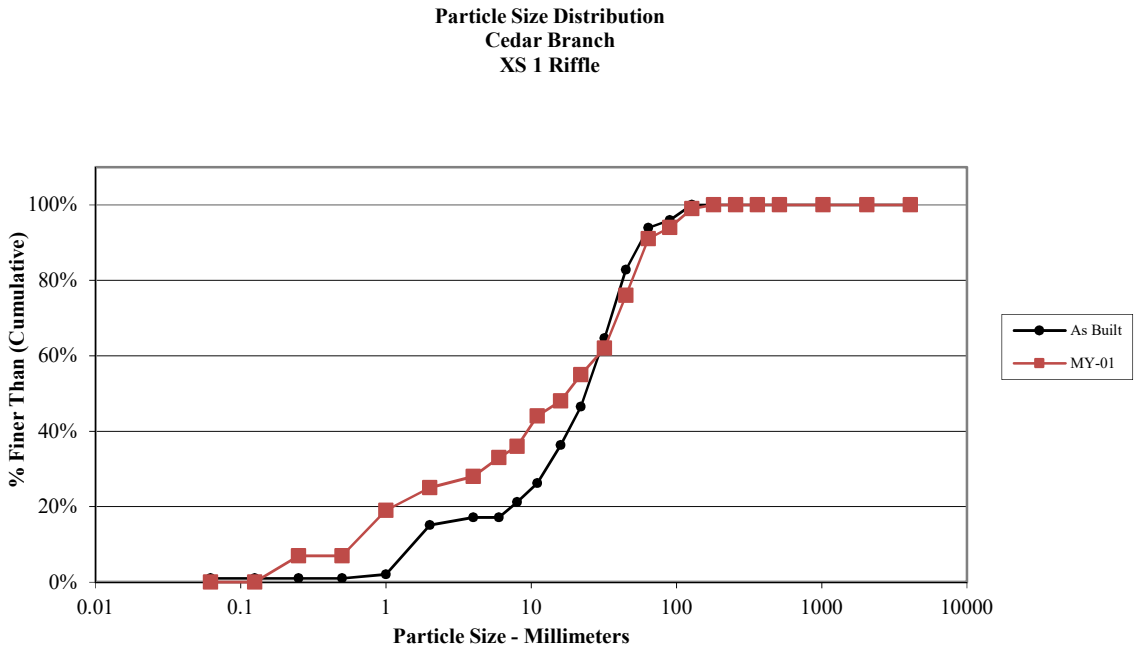
Station	Elevation
0.00	637.94
0.16	637.57
4.76	637.37
7.68	637.57
11.42	637.47
12.75	637.49
13.57	637.16
16.01	635.93
17.86	634.87
19.05	634.43
20.32	634.29
22.11	634.67
23.90	635.31
25.73	635.58
26.55	636.00
28.67	636.41
32.03	637.09
33.94	637.47
34.48	637.62
35.26	637.63
39.87	637.47
45.88	637.56
49.12	637.60
49.17	638.18

SUMMARY DATA	
Current Bankfull Elevation:	637.57
Bankfull Cross-Sectional Area:	35.8
Total Cross-Sectional Area:	32.8
Bankfull Width:	20.7
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	3.3
Mean Depth at Bankfull:	1.7
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---



Cross-Section 1 Riffle - MY-01			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	7
Medium	.25 - .50	N	
Coarse	.50 - 1	D	12
Very Coarse	1 - 2	S	6
Very Fine	2 - 4		3
Fine	4 - 5.7	G	5
Fine	5.7 - 8	R	3
Medium	8 - 11.3	A	8
Medium	11.3 - 16	V	4
Coarse	16 - 22.6	E	7
Coarse	22.6 - 32	L	7
Very Coarse	32 - 45	S	14
Very Coarse	45 - 64		15
Small	64 - 90	C	3
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:



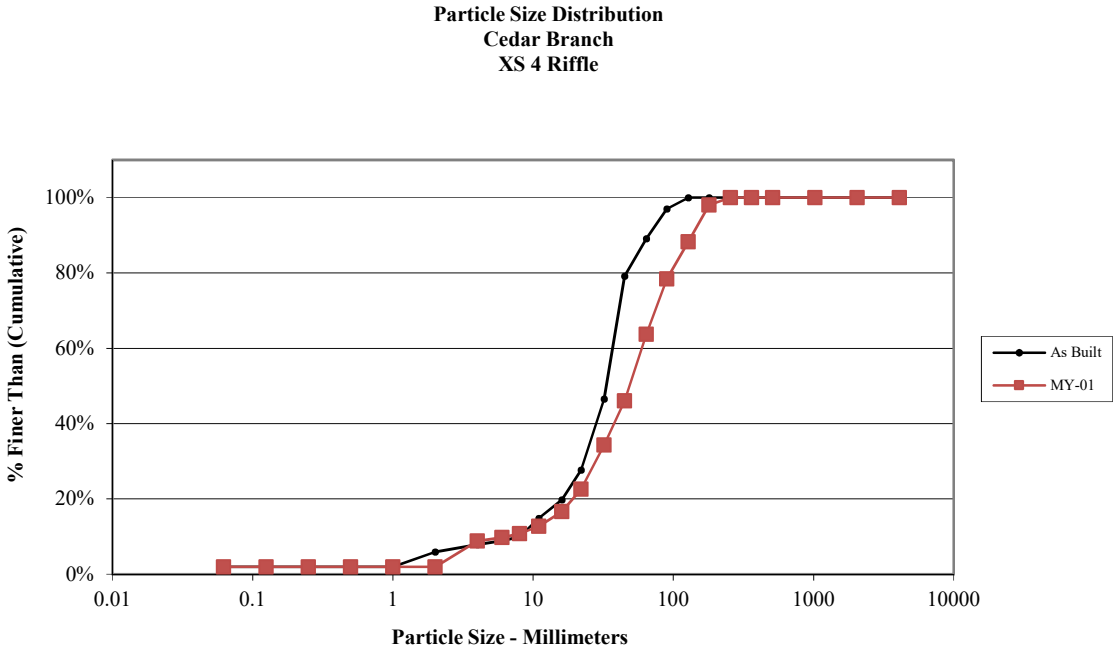
Size (mm)	
D16	0.84
D35	7.3
D50	18
D65	34
D84	54
D95	97

Size Distribution	
mean	6.7
dispersion	12.2
skewness	-0.32

Type	
silt/clay	0%
sand	25%
gravel	66%
cobble	8%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 4 Riffle - MY-01			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	2
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		7
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	2
Medium	11.3 - 16	V	4
Coarse	16 - 22.6	E	6
Coarse	22.6 - 32	L	12
Very Coarse	32 - 45	S	12
Very Coarse	45 - 64		18
Small	64 - 90	C	15
Small	90 - 128	O	10
Large	128 - 180	B	10
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	102

Note:



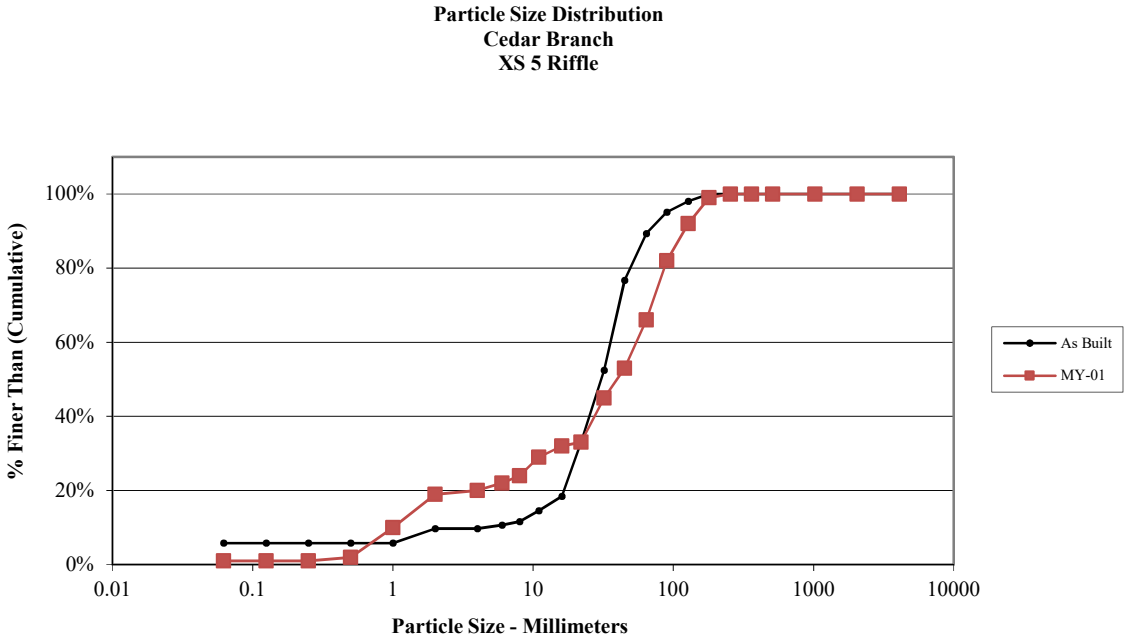
Size (mm)	
D16	15
D35	33
D50	49
D65	66
D84	110
D95	160

Size Distribution	
mean	40.6
dispersion	2.8
skewness	-0.09

Type	
silt/clay	2%
sand	0%
gravel	62%
cobble	25%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 5 Riffle - MY-01			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	1
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	1
Coarse	.50 - 1	D	8
Very Coarse	1 - 2	S	9
Very Fine	2 - 4		1
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	5
Medium	11.3 - 16	V	3
Coarse	16 - 22.6	E	1
Coarse	22.6 - 32	L	12
Very Coarse	32 - 45	S	8
Very Coarse	45 - 64		13
Small	64 - 90	C	16
Small	90 - 128	O	10
Large	128 - 180	B	7
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	100

Note:



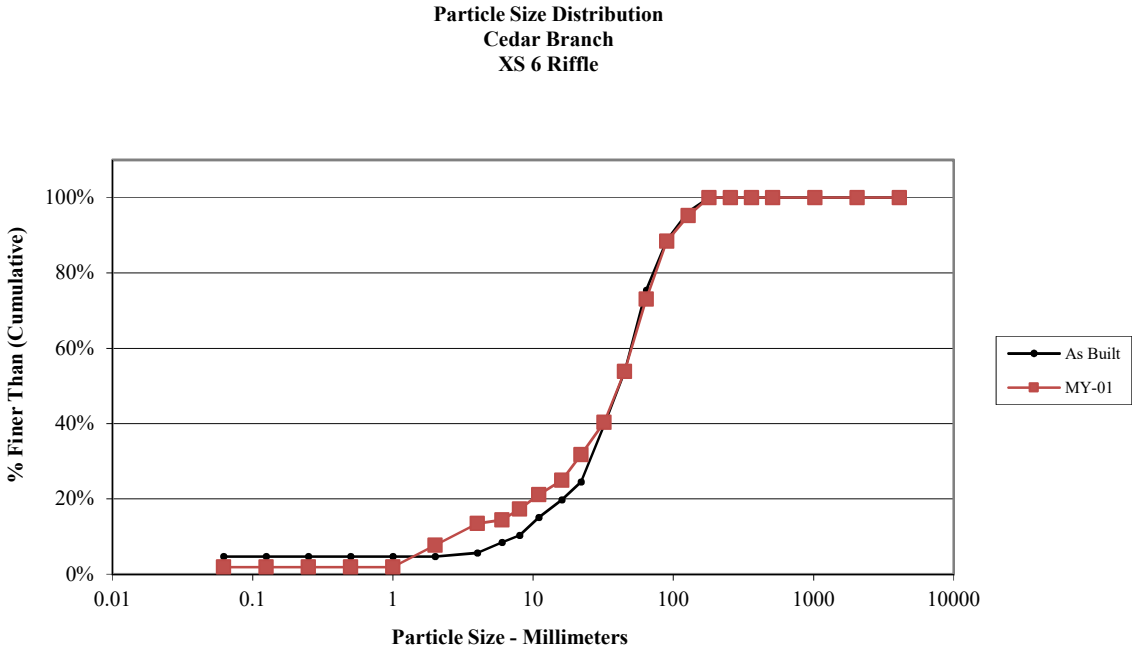
Size (mm)	
D16	1.6
D35	23
D50	40
D65	62
D84	97
D95	150

Size Distribution	
mean	0.1
dispersion	2.2
skewness	0.18

Type	
silt/clay	1%
sand	18%
gravel	46%
cobble	33%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 6 Riffle -MY-01			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	2
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		6
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	3
Medium	8 - 11.3	A	4
Medium	11.3 - 16	V	4
Coarse	16 - 22.6	E	7
Coarse	22.6 - 32	L	9
Very Coarse	32 - 45	S	14
Very Coarse	45 - 64		20
Small	64 - 90	C	16
Small	90 - 128	O	7
Large	128 - 180	B	5
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	104

Note:



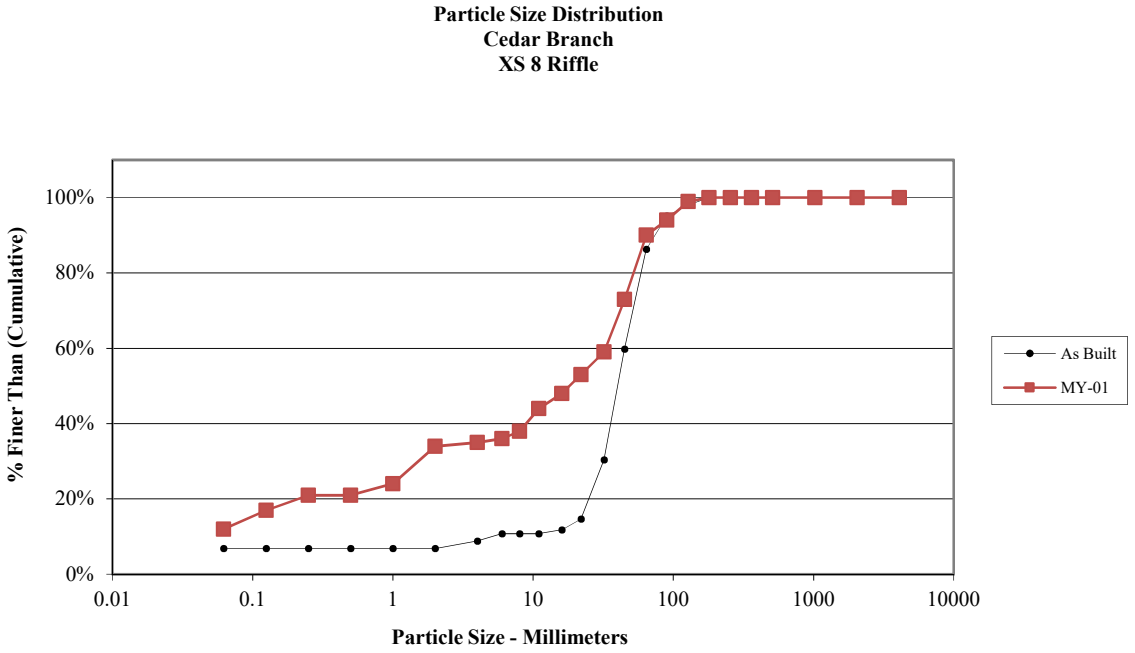
Size (mm)	
D16	7
D35	25
D50	41
D65	55
D84	82
D95	130

Size Distribution	
mean	24.0
dispersion	3.9
skewness	-0.23

Type	
silt/clay	2%
sand	6%
gravel	65%
cobble	27%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 8 Riffle - MY-01			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	12
Very Fine	.062 - .125	S	5
Fine	.125 - .25	A	4
Medium	.25 - .50	N	
Coarse	.50 - 1	D	3
Very Coarse	1 - 2	S	10
Very Fine	2 - 4		1
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	6
Medium	11.3 - 16	V	4
Coarse	16 - 22.6	E	5
Coarse	22.6 - 32	L	6
Very Coarse	32 - 45	S	14
Very Coarse	45 - 64		17
Small	64 - 90	C	4
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:



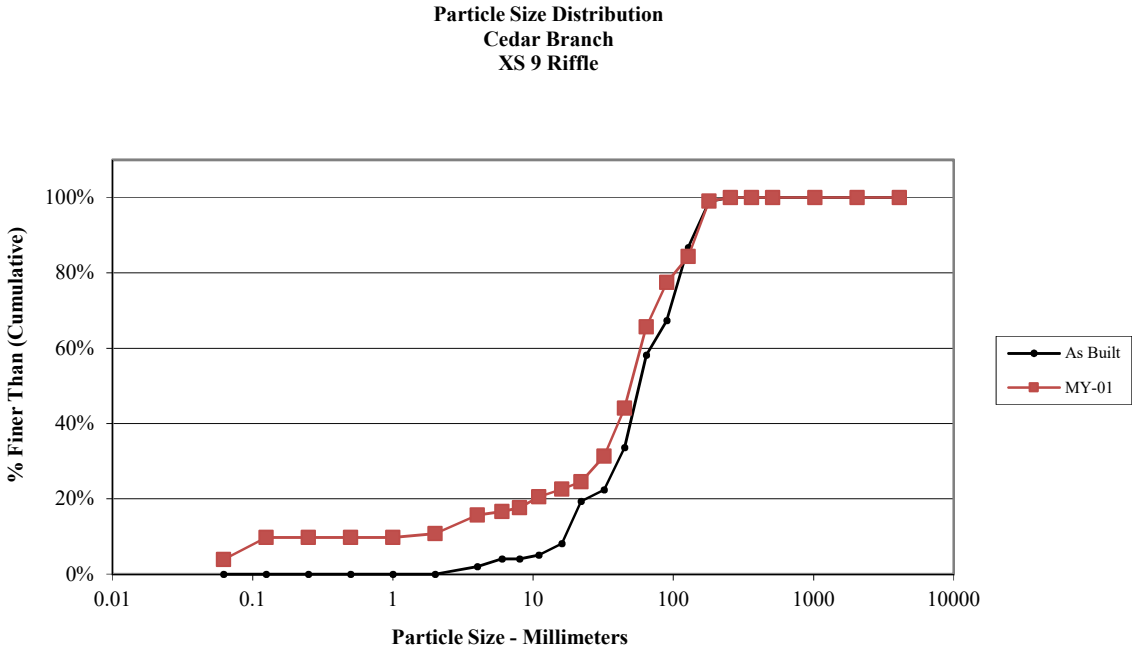
Size (mm)	
D16	0.11
D35	4
D50	18
D65	37
D84	57
D95	97

Size Distribution	
mean	2.5
dispersion	83.4
skewness	-0.52

Type	
silt/clay	12%
sand	22%
gravel	56%
cobble	10%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 9 Riffle -MY-01			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	4
Very Fine	.062 - .125	S	6
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	1
Very Fine	2 - 4		5
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	2
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	7
Very Coarse	32 - 45	S	13
Very Coarse	45 - 64		22
Small	64 - 90	C	12
Small	90 - 128	O	7
Large	128 - 180	B	15
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	102

Note:



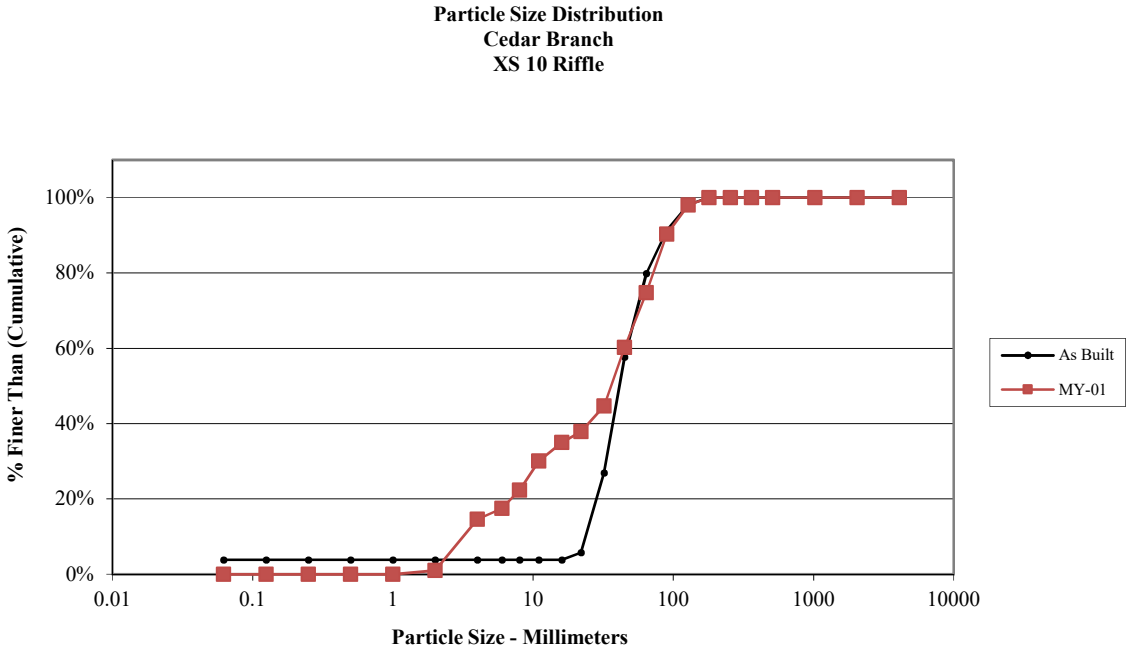
Size (mm)	
D16	4.6
D35	35
D50	50
D65	63
D84	130
D95	160

Size Distribution	
mean	24.5
dispersion	6.7
skewness	-0.26

Type	
silt/clay	0%
sand	7%
gravel	55%
cobble	34%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 10 Riffle - MY-01			
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	
Very Coarse	1 - 2	S	1
Very Fine	2 - 4		14
Fine	4 - 5.7	G	3
Fine	5.7 - 8	R	5
Medium	8 - 11.3	A	8
Medium	11.3 - 16	V	5
Coarse	16 - 22.6	E	3
Coarse	22.6 - 32	L	7
Very Coarse	32 - 45	S	16
Very Coarse	45 - 64		15
Small	64 - 90	C	16
Small	90 - 128	O	8
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:



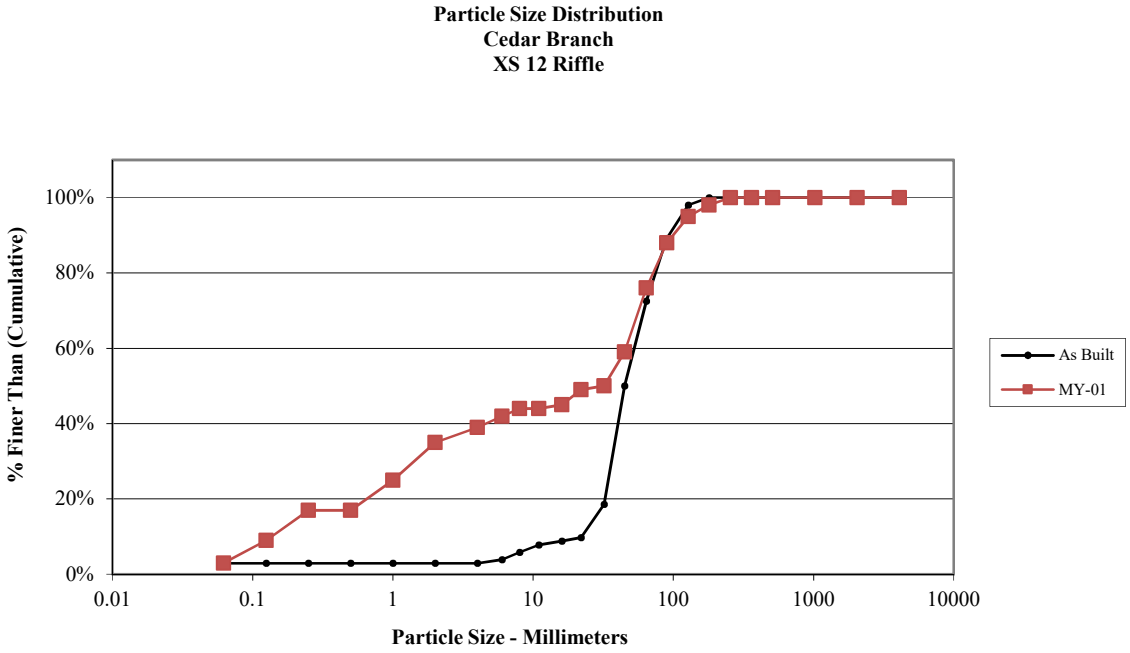
Size (mm)	
D16	4.9
D35	16
D50	36
D65	51
D84	78
D95	110

Size Distribution	
mean	19.5
dispersion	4.8
skewness	-0.24

Type	
silt/clay	0%
sand	1%
gravel	60%
cobble	25%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 12 Riffle - MY-01			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	3
Very Fine	.062 - .125	S	6
Fine	.125 - .25	A	8
Medium	.25 - .50	N	
Coarse	.50 - 1	D	8
Very Coarse	1 - 2	S	10
Very Fine	2 - 4		4
Fine	4 - 5.7	G	3
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	4
Coarse	22.6 - 32	L	1
Very Coarse	32 - 45	S	9
Very Coarse	45 - 64		17
Small	64 - 90	C	12
Small	90 - 128	O	7
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	100

Note:



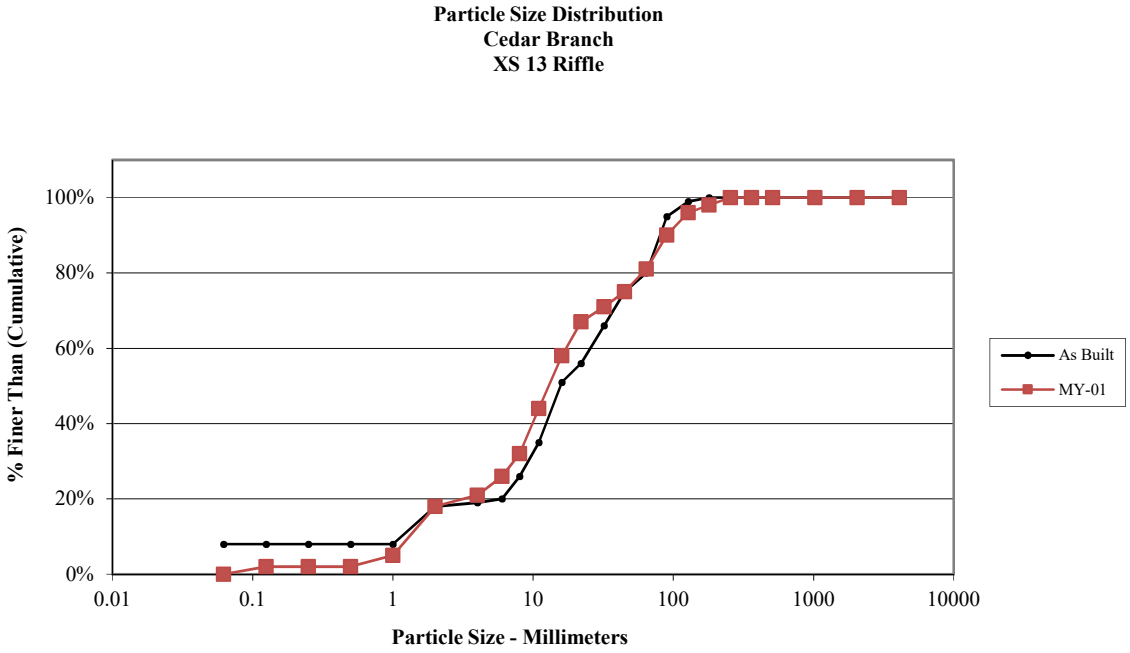
Size (mm)	
D16	0.23
D35	2
D50	32
D65	51
D84	80
D95	130

Size Distribution	
mean	4.3
dispersion	70.8
skewness	-0.55

Type	
silt/clay	3%
sand	32%
gravel	41%
cobble	22%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 13 Riffle - MY-01			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	2
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	3
Very Coarse	1 - 2	S	13
Very Fine	2 - 4		3
Fine	4 - 5.7	G	5
Fine	5.7 - 8	R	6
Medium	8 - 11.3	A	12
Medium	11.3 - 16	V	14
Coarse	16 - 22.6	E	9
Coarse	22.6 - 32	L	4
Very Coarse	32 - 45	S	4
Very Coarse	45 - 64		6
Small	64 - 90	C	9
Small	90 - 128	O	6
Large	128 - 180	B	2
Large	180 - 256	L	2
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



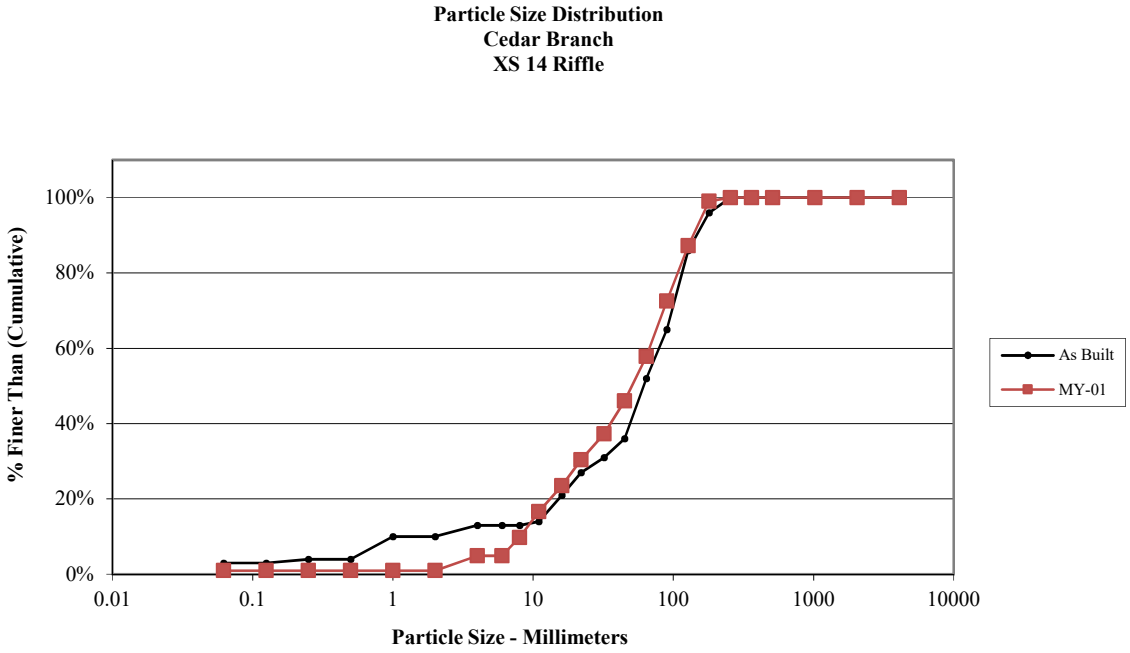
Size (mm)	
D16	1.8
D35	8.7
D50	13
D65	20
D84	72
D95	120

Size Distribution	
mean	11.4
dispersion	6.4
skewness	-0.05

Type	
silt/clay	0%
sand	18%
gravel	63%
cobble	17%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 14 Riffle - MY-01			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	1
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		4
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	5
Medium	8 - 11.3	A	7
Medium	11.3 - 16	V	7
Coarse	16 - 22.6	E	7
Coarse	22.6 - 32	L	7
Very Coarse	32 - 45	S	9
Very Coarse	45 - 64		12
Small	64 - 90	C	15
Small	90 - 128	O	15
Large	128 - 180	B	12
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	102

Note:



Size (mm)	
D16	11
D35	28
D50	51
D65	76
D84	120
D95	160

Size Distribution	
mean	36.3
dispersion	3.5
skewness	-0.14

Type	
silt/clay	1%
sand	0%
gravel	57%
cobble	42%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

APPENDIX E

Hydrologic Data

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

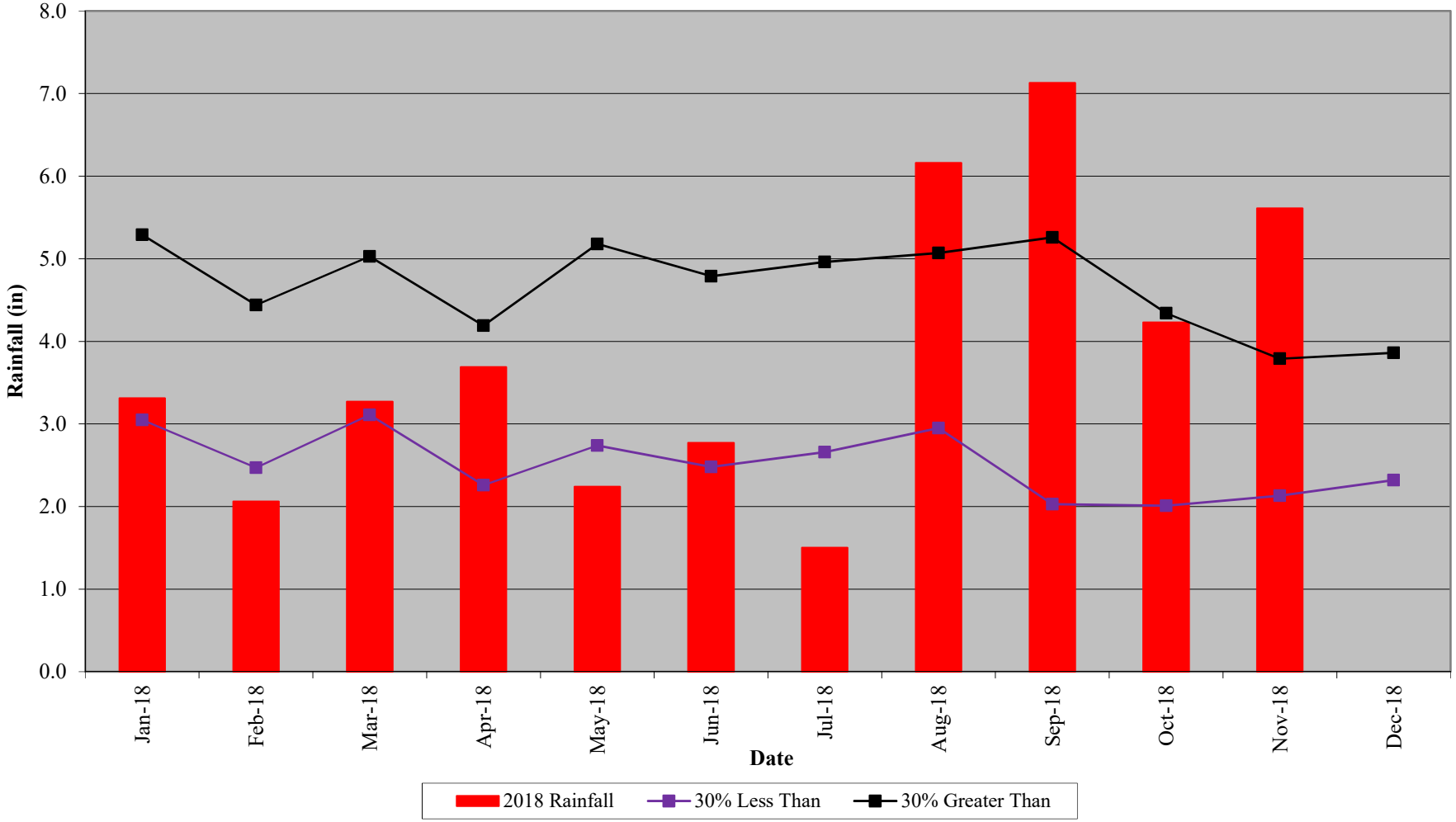


Table 10. Verification of Bankfull Events Cedar Branch Restoration Site, DMS Project #97009		
Date of Occurrence	**Method**	**Photo Number**
April 26, 2018	Onsite stream gauge	
August 3, 2018	Onsite stream gauge	
August 7, 2018	Onsite stream gauge	
August 22, 2018	Onsite stream gauge	
November 4, 2018	Photos taken on site	1

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

Cedar Branch Restoration Site
Hydrograph
Stream Gauge UTCC

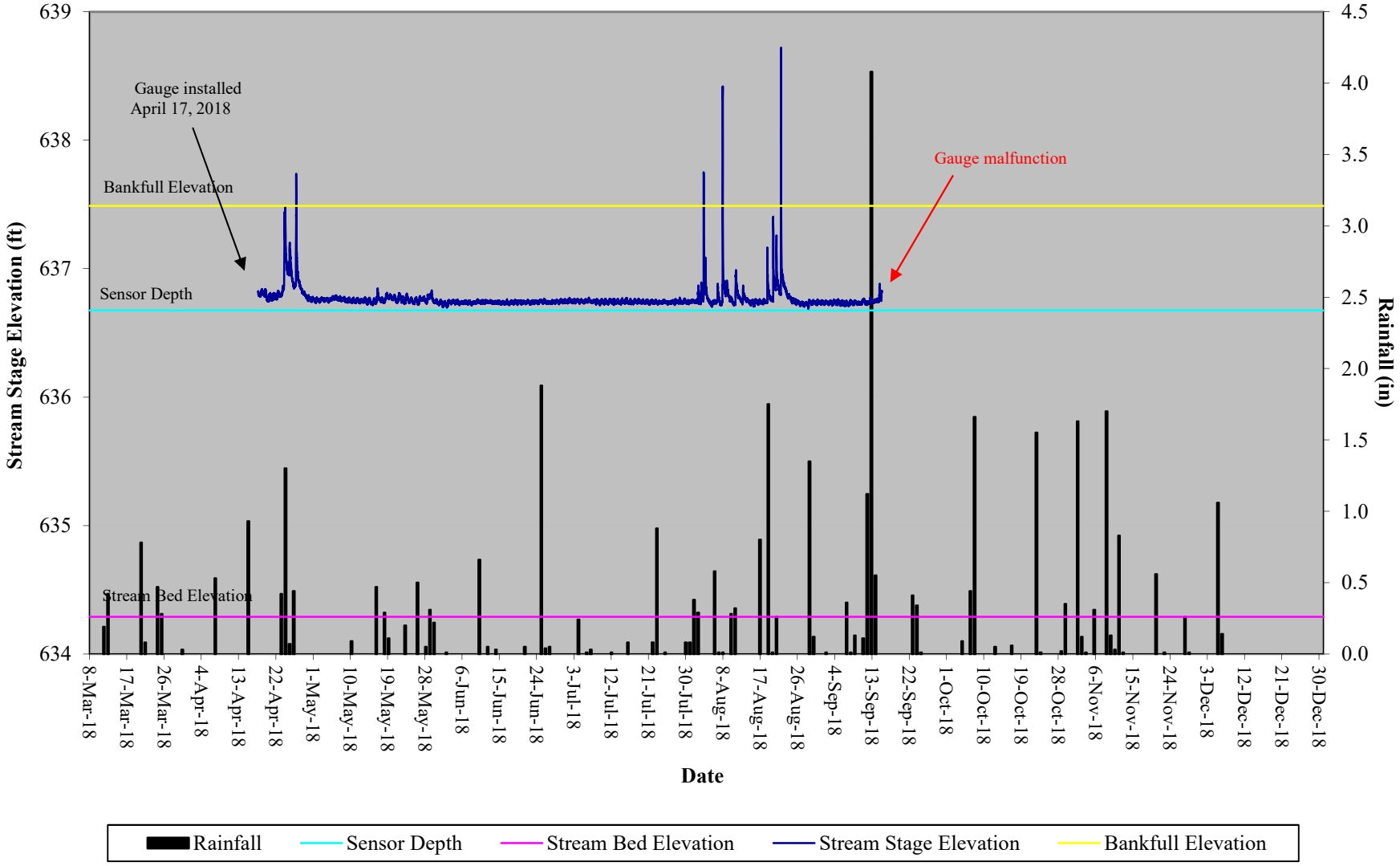


Table 11. Verification of Stream Flow Cedar Branch Restoration Site, DMS Project #97009				
	Gauge		Camera	
Reach	Dates Achieving	Maximum Consecutive Days	Dates Achieving	Maximum Consecutive Days
T1	April 17 – June 17, Aug. 10 – Sept. 15	60	May 1 – July 7, Sept. 21 – Dec. 31	102
T1-1	N/A	16	N/A	7
T3	April 17 – July 8, July 31 – Sept. 15	83	March 8 – June 8, Nov. 2 – Dec. 31	93

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						
T1 (Camera)	Yes/102						
T1-1 (Gauge)	No/16						
T1-1 (Camera)	No/7*						
T3 (Gauge)	Yes/83						
T3 (Camera)	Yes/93						

* camera malfunction

T1 – 7/2/2018

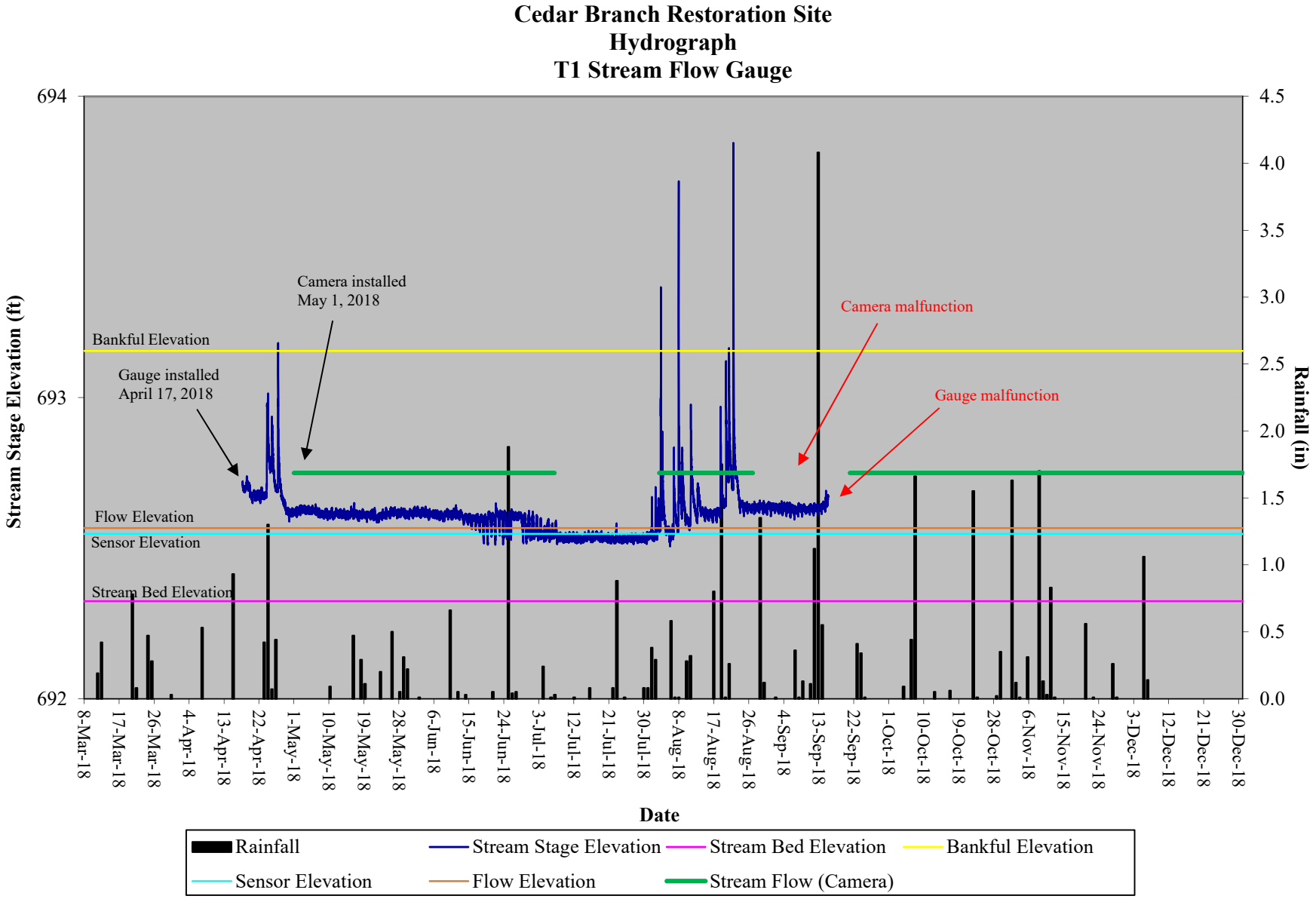
T1 – 8/27/2018

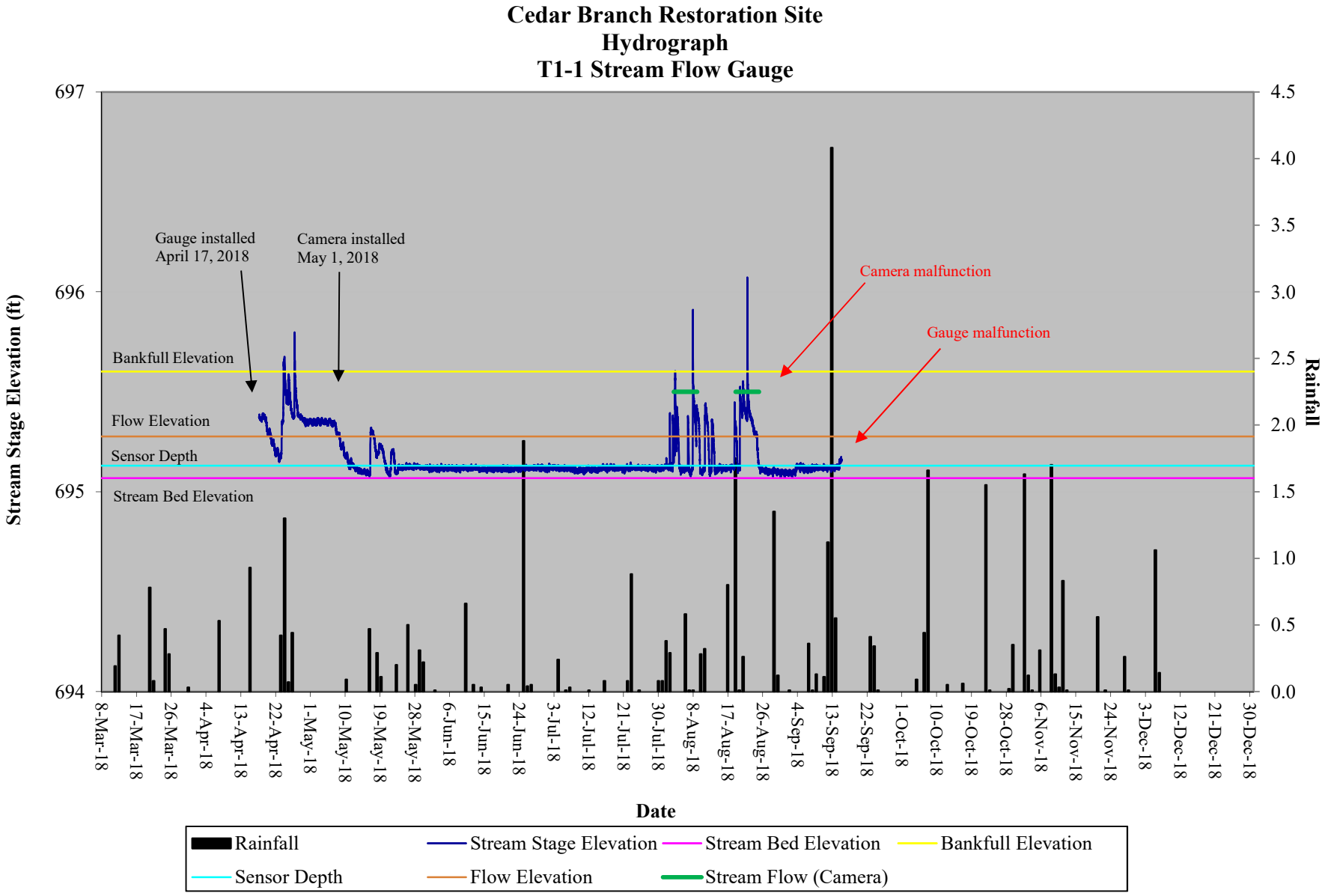
T1-1 – 5/21/2018

T1-1 – 8/23/2018

T3 – 3/26/2018

T3 – 5/31/2018


Cedar Branch Restoration Site
Hydrograph
T1 Stream Flow Gauge
Stream Stage Elevation (ft)
Rainfall (in)
694
693
692
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Camera installed
May 1, 2018
Camera malfunction
Bankful Elevation
Gauge installed
April 17, 2018
Gauge malfunction
Flow Elevation
Sensor Elevation
Stream Bed Elevation
8-Mar-18
17-Mar-18
26-Mar-18
4-Apr-18
13-Apr-18
22-Apr-18
1-May-18
10-May-18
19-May-18
28-May-18
6-Jun-18
15-Jun-18
24-Jun-18
3-Jul-18
12-Jul-18
21-Jul-18
30-Jul-18
8-Aug-18
17-Aug-18
26-Aug-18
4-Sep-18
13-Sep-18
22-Sep-18
1-Oct-18
10-Oct-18
19-Oct-18
28-Oct-18
6-Nov-18
15-Nov-18
24-Nov-18
3-Dec-18
12-Dec-18
21-Dec-18
30-Dec-18
Date
Rainfall
Stream Stage Elevation
Stream Bed Elevation
Bankful Elevation
Sensor Elevation
Flow Elevation
Stream Flow (Camera)


Cedar Branch Restoration Site
Hydrograph
T1-1 Stream Flow Gauge
Stream Stage Elevation (ft)
Rainfall
Date
Gauge installed
April 17, 2018
Camera installed
May 1, 2018
Camera malfunction
Gauge malfunction
Bankfull Elevation
Flow Elevation
Sensor Depth
Stream Bed Elevation
697
696
695
694
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
8-Mar-18
17-Mar-18
26-Mar-18
4-Apr-18
13-Apr-18
22-Apr-18
1-May-18
10-May-18
19-May-18
28-May-18
6-Jun-18
15-Jun-18
24-Jun-18
3-Jul-18
12-Jul-18
21-Jul-18
30-Jul-18
8-Aug-18
17-Aug-18
26-Aug-18
4-Sep-18
13-Sep-18
22-Sep-18
1-Oct-18
10-Oct-18
19-Oct-18
28-Oct-18
6-Nov-18
15-Nov-18
24-Nov-18
3-Dec-18
12-Dec-18
21-Dec-18
30-Dec-18
Rainfall
Stream Stage Elevation
Stream Bed Elevation
Bankfull Elevation
Sensor Depth
Flow Elevation
Stream Flow (Camera)

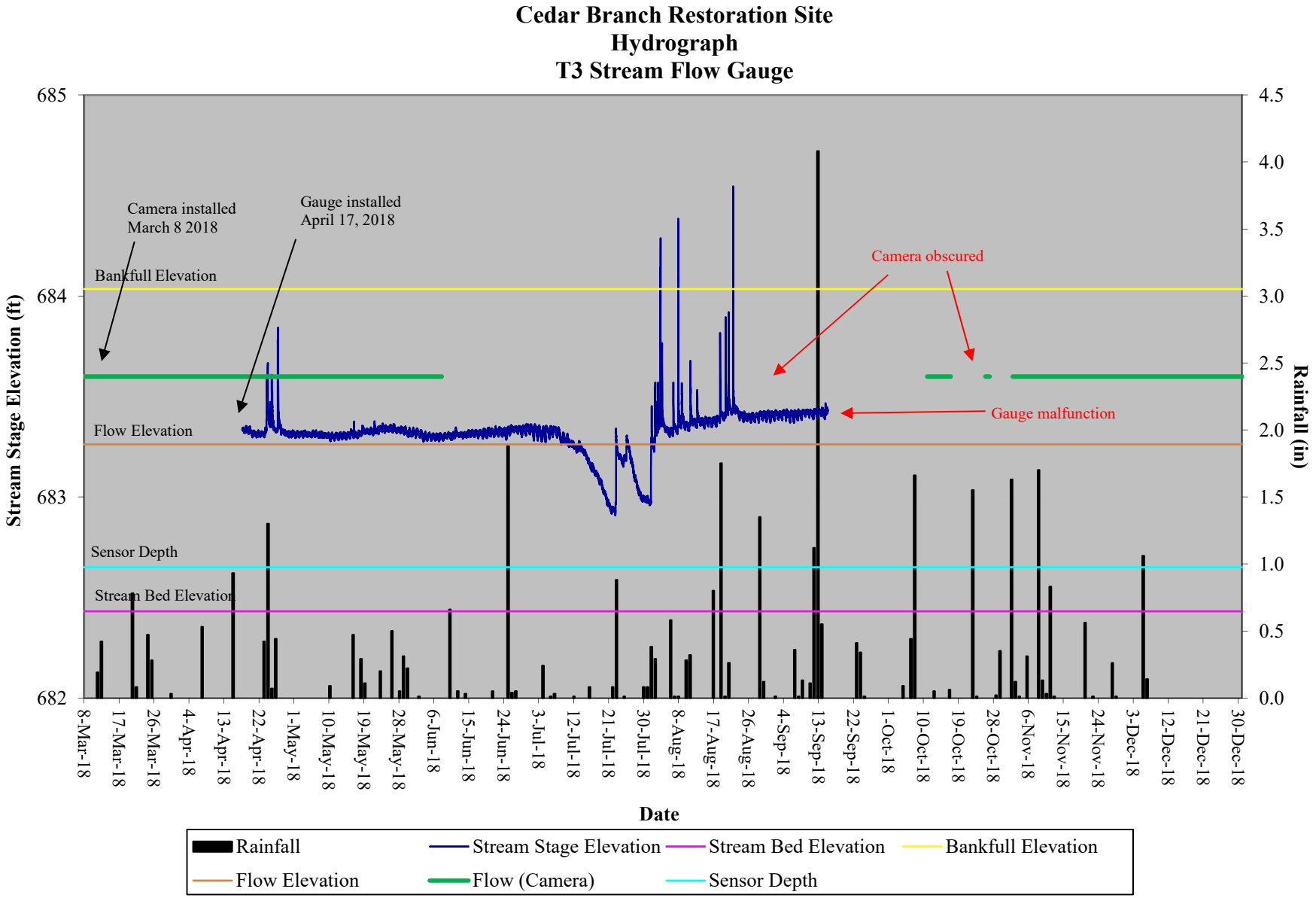
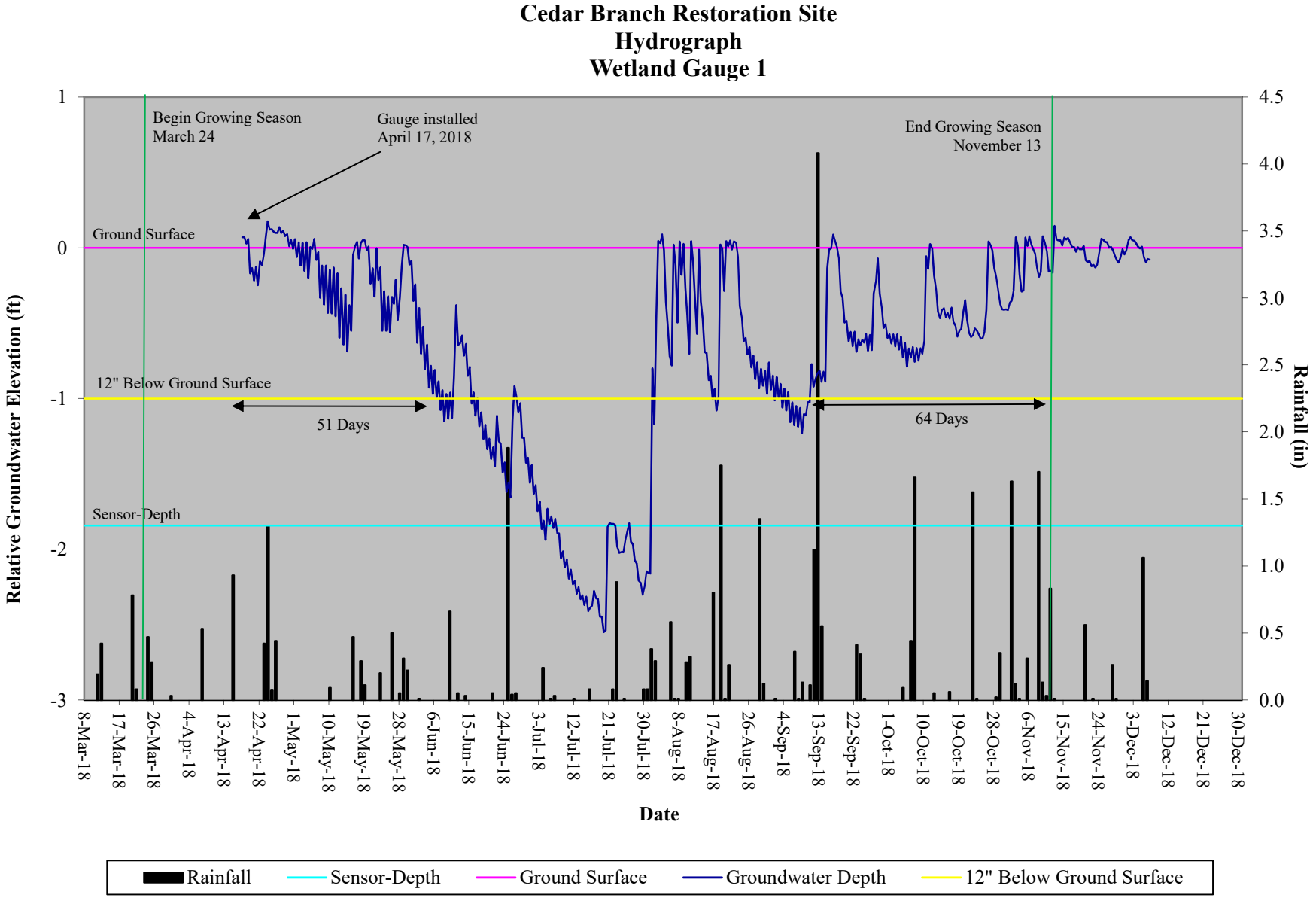
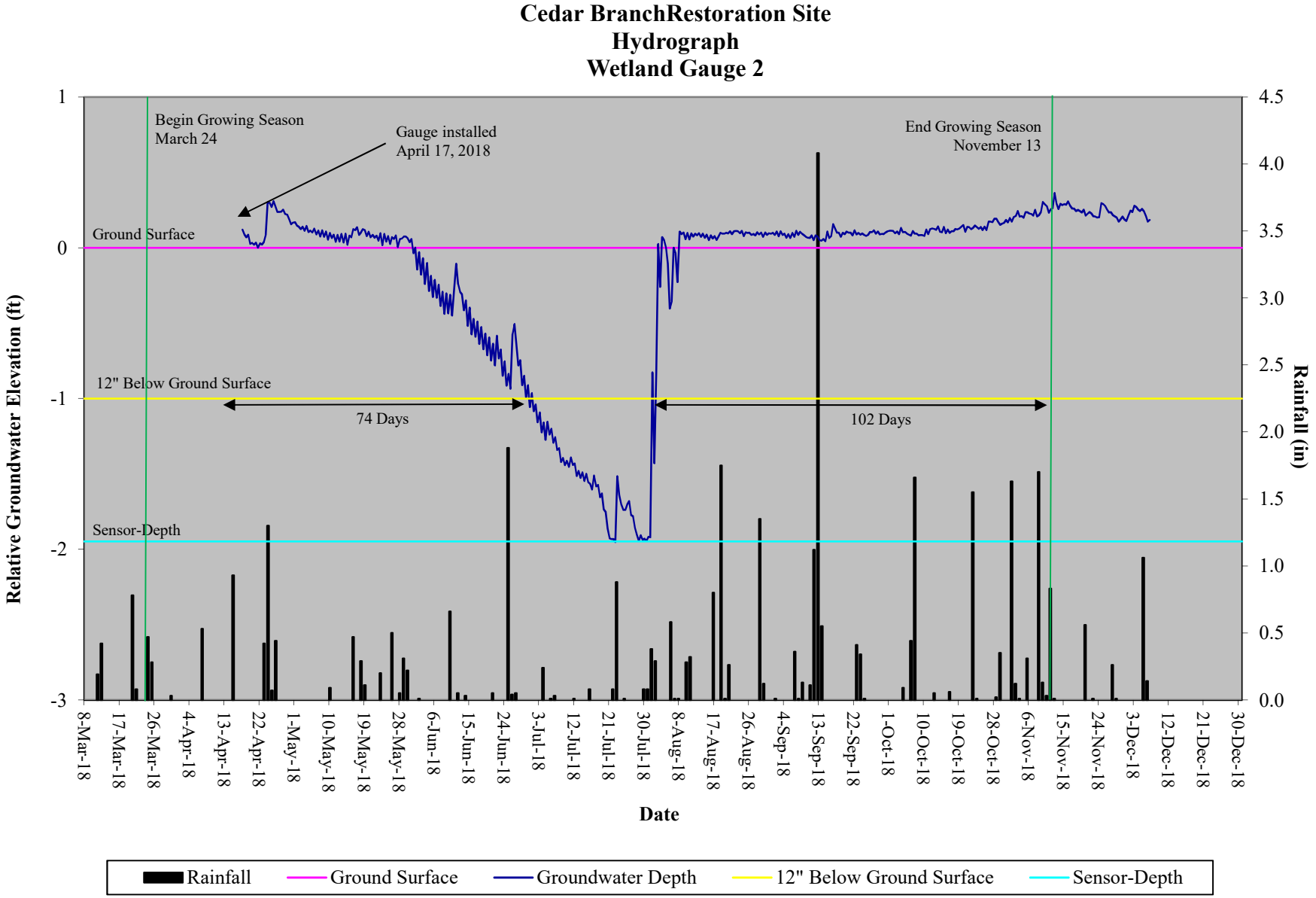
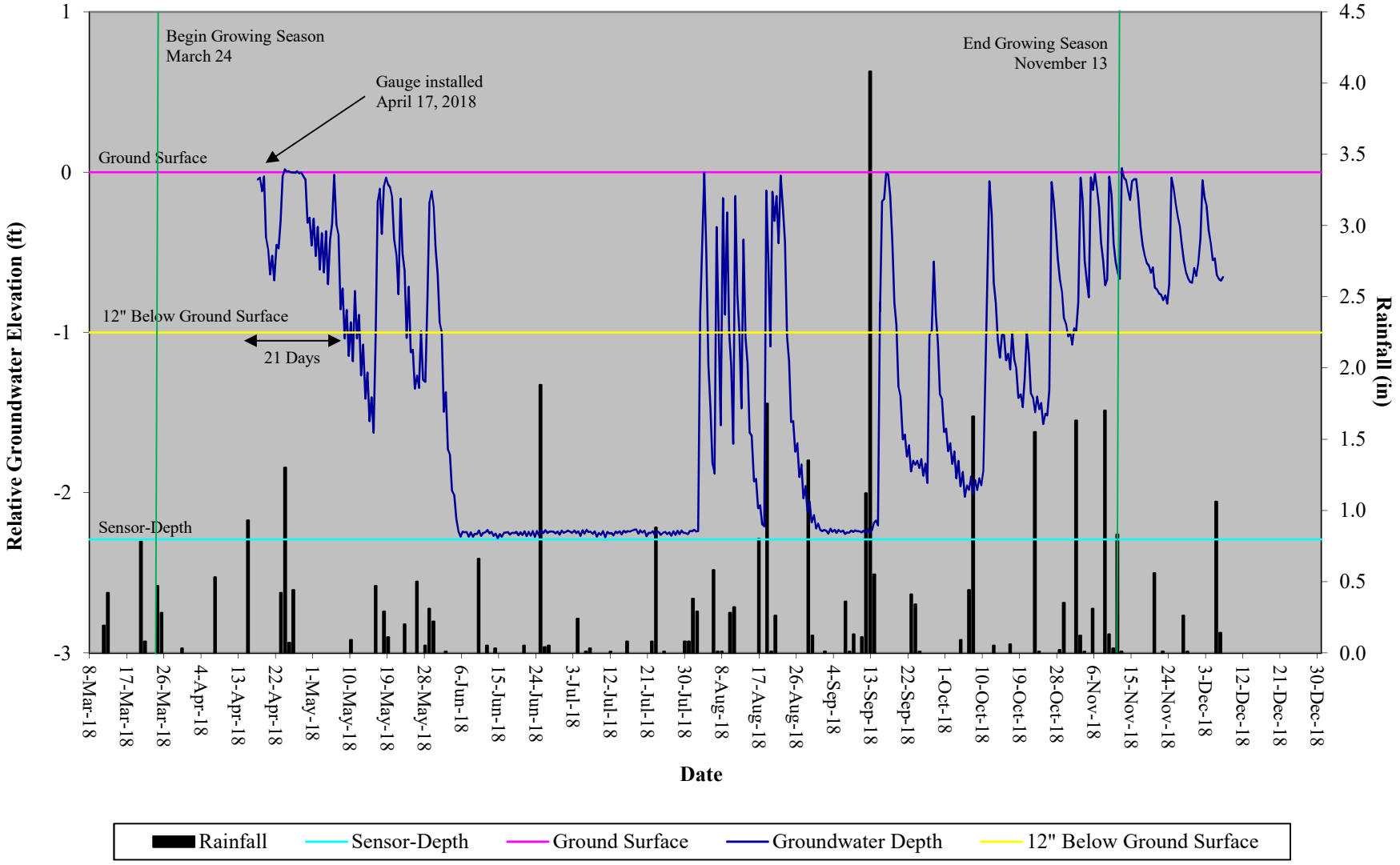

Cedar Branch Restoration Site
Hydrograph
T3 Stream Flow Gauge
Stream Stage Elevation (ft)
Rainfall (in)
Date
Camera installed
March 8 2018
Gauge installed
April 17, 2018
Camera obscured
Gauge malfunction
Bankfull Elevation
Flow Elevation
Sensor Depth
Stream Bed Elevation
685
684
683
682
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
8-Mar-18
17-Mar-18
26-Mar-18
4-Apr-18
13-Apr-18
22-Apr-18
1-May-18
10-May-18
19-May-18
28-May-18
6-Jun-18
15-Jun-18
24-Jun-18
3-Jul-18
12-Jul-18
21-Jul-18
30-Jul-18
8-Aug-18
17-Aug-18
26-Aug-18
4-Sep-18
13-Sep-18
22-Sep-18
1-Oct-18
10-Oct-18
19-Oct-18
28-Oct-18
6-Nov-18
15-Nov-18
24-Nov-18
3-Dec-18
12-Dec-18
21-Dec-18
30-Dec-18
Rainfall
Stream Stage Elevation
Stream Bed Elevation
Bankfull Elevation
Flow Elevation
Flow (Camera)
Sensor Depth

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%)						
Gauge 2	T3	104 (44.4%)						
Gauge 3	T3	21 (9.0%)						


Cedar Branch Restoration Site
Hydrograph
Wetland Gauge 1
Begin Growing Season
March 24
Gauge installed
April 17, 2018
End Growing Season
November 13
Ground Surface
12" Below Ground Surface
Sensor-Depth
51 Days
64 Days
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
1
0
-1
-2
-3
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
8-Mar-18
17-Mar-18
26-Mar-18
4-Apr-18
13-Apr-18
22-Apr-18
1-May-18
10-May-18
19-May-18
28-May-18
6-Jun-18
15-Jun-18
24-Jun-18
3-Jul-18
12-Jul-18
21-Jul-18
30-Jul-18
8-Aug-18
17-Aug-18
26-Aug-18
4-Sep-18
13-Sep-18
22-Sep-18
1-Oct-18
10-Oct-18
19-Oct-18
28-Oct-18
6-Nov-18
15-Nov-18
24-Nov-18
3-Dec-18
12-Dec-18
21-Dec-18
30-Dec-18
Rainfall
Sensor-Depth
Ground Surface
Groundwater Depth
12" Below Ground Surface


Cedar BranchRestoration Site
Hydrograph
Wetland Gauge 2
Begin Growing Season
March 24
Gauge installed
April 17, 2018
End Growing Season
November 13
Ground Surface
12" Below Ground Surface
Sensor-Depth
74 Days
102 Days
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
1
0
-1
-2
-3
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
8-Mar-18
17-Mar-18
26-Mar-18
4-Apr-18
13-Apr-18
22-Apr-18
1-May-18
10-May-18
19-May-18
28-May-18
6-Jun-18
15-Jun-18
24-Jun-18
3-Jul-18
12-Jul-18
21-Jul-18
30-Jul-18
8-Aug-18
17-Aug-18
26-Aug-18
4-Sep-18
13-Sep-18
22-Sep-18
1-Oct-18
10-Oct-18
19-Oct-18
28-Oct-18
6-Nov-18
15-Nov-18
24-Nov-18
3-Dec-18
12-Dec-18
21-Dec-18
30-Dec-18
Rainfall
Ground Surface
Groundwater Depth
12" Below Ground Surface
Sensor-Depth

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?