MY1 FINAL MONITORING REPORT
Banner Branch Mitigation Project
Stokes County
Roanoke River Basin
CU 03010103

DMS Project # 100080
DMS Contract # 7610 and 7701
DMS RFP # 16-007405
USACE Action ID Number SAW-2018-01760
DWR Project # 18-1154
Calendar Year of Data Collection: 2021

Prepared for:
North Carolina Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

Environmental Quality

WATER & LAND SOLUTIONS
7721 SIX FORKS ROAD, SUITE 130, RALEIGH, NC 27615
(919) 614 - 5111 | waterlandsolutions.com

December 29, 2021

NC Department of Environmental Quality
Division of Mitigation Services
Attn: Jeremiah Dow, Project Manager
217 W. Jones Street, Suite 3000
Raleigh, NC 27603

RE: WLS Responses to NCDEQ DMS Review Comments for Task 7 Submittal, Draft Monitoring Year 1 Report for the Banner Branch Mitigation Project, DMS Full-Delivery Project ID #100080, Contract #s 7610 & 7701, Roanoke River Basin, Cataloging Unit 03010103, Stokes County, NC

Dear Mr. Dow:

Water & Land Solutions, LLC (WLS) is pleased to present the Final Monitoring Year 1 Report for the Banner Branch Mitigation Project to the North Carolina Department of Environmental Quality (NCDEQ) Division of Mitigation Services (DMS). Per the DMS review comments, WLS has updated the Final Monitoring Year 1 Report and associated deliverables accordingly. We are providing the electronic deliverables via cloud link. The electronic deliverables are organized under the following folder structure as required under the digital submission requirements:

1. Report PDF
2. Support Files
    1_ Tables
    2_CCPV
    3_Veg
    4_Geomorph
    5_Hydro
    6_Photos

We are providing our written responses to DMS' review comments on the Draft Monitoring Year 1 Report below. Each of the DMS review comments is copied below in **bold** text, followed by the appropriate response from WLS in regular text:

1. You may discontinue future pebble counts if you wish on this project. Per the memo distributed on Oct. 19, 2021, "The absence of pebble count data in future monitoring reports where pebble count data was listed as part of monitoring in the mitigation plan must be documented in the monitoring report. The September 29, 2021 Technical Work Group meeting may be cited as the source of the new policy." Response: Pebble counts will not be collected in future monitoring reports. Language has been added to section 2.2.1 Streambed Material Condition and Stability.

2. Section 4.3 – Presumably the reference to WG-2 should be GW-2? While we understand that it is very early in the project, does WLS have any thoughts on the cause of the hydroperiod of only 1.7% at this gauge's location? Response: WG-2 has been corrected to GW-2. For W8A, the vertical profile of Banner Branch was gradually raised to tie into BB-R1/UT1-R3 confluence at station 43+11 thereby

increasing the frequency of overbank flows and restoring hydrology. WLS expects hydrology in this area to increase over the next couple of years.

3. UT4 R1 XS17 cross section data and photo indicates that there could be a mid-channel bar forming. Is this the case or is it a debris jam that may flush through (hard to tell with certainty in the photo)? Response: A small mid-channel bar has formed on a woody riffle. We expect overtime this bar will flush out with storm events. There is no evidence of bank instability in this area.

4. Appendix A – A Visual Stream Stability Assessment table should be filled out for each reach. Response: Visual Stream Stability Assessment tables have been created for each reach.

Please contact me if you have any questions or comments.

Sincerely,

Water & Land Solutions, LLC

Emily Dunnigan
Water & Land Solutions, LLC
7721 Six Forks Road, Suite 130
Raleigh, NC 27615
Office Phone: (919) 614-5111
Mobile Phone: (269) 908-6306
Email: emily@waterlandsolutions.com

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LIST OF APPENDICES

1 Project Summary

1.1 Project Location and Description

The Banner Branch Mitigation Project ("Project") is a North Carolina Department of Environmental Quality (NCDEQ), Division of Mitigation Services (DMS) full-delivery stream and wetland mitigation project contracted with Water & Land Solutions, LLC (WLS) in response to RFP 16-007405. The Project provides stream and wetland mitigation credits in the Roanoke River Basin (Cataloging Unit 03010103). The project site is located in Stokes County approximately five miles northeast of Lawsonville. The project site is in NCDEQ sub-basin 03-02-01, Roanoke River Basin Priority Plan (RBRP, amended 2015), and Targeted Local Watershed 03010103180010 (Warm Water Thermal Regime), all within the Roanoke River Basin.

The Project involved the restoration, enhancement, preservation and permanent protection of 14 stream reaches (UT1-R1, UT1-R2, UT1-R3, UT1A, UT1B, UT1C, UT2, UT2A, UT3, BB-R1, BB-R2, BB-R3, UT4-R1, and UT4-R2) and their riparian buffers, totaling approximately 15,707 linear feet of designed streams and 6.183 acres of riparian wetlands. The Project will provide significant ecological improvements and functional uplift through stream and aquatic habitat restoration and through decreasing nutrient and sediment loads within the watershed. The mitigation plan provides a detailed project summary and Table 1 provides a summary of project assets. The CCPV illustrates the project mitigation components.

Prior to construction, landowners historically cleared large portions of mature forest and manipulated, and/or straightened streams and ditched riparian wetland systems to provide areas for crop production and cattle grazing. Many of the Project reaches had been heavily impacted from these historic and current land use practices, including livestock production, agriculture, and silviculture. Continuous livestock intrusion and associated hoof shear had severely impacted the streambanks along many of the Project stream reaches. The stream channels were actively incising in these areas and the floodplain connection had been lost in many locations. The lack of adequate and high-quality buffer vegetation, past land-use disturbances, active channel degradation, minimal impervious cover, and current agricultural and livestock practices presented a significant opportunity for water quality and ecosystem improvements through the implementation of this Project.

Monitoring Year 1 (MY1) activities occurred during the first week of November 2021. This report presents the data for MY1. The Project meets the MY1 success criteria for stream hydrology, stream horizontal and vertical stability, streambed condition and stability, stream flow, and vegetation. Eight of the nine wetlands are meeting success criteria for hydrology. Based on these results, the Project is on trajectory to meet interim and final success criteria. For more information on the chronology of the project history and activity, refer to Appendix E. Relevant project contact information is presented in Appendix E and project background information is presented in Table 3.

1.2 Project Quantities and Credits

The Project mitigation components include a combination of Stream Restoration, Enhancement and Preservation activities, as well as Riparian Wetland Restoration (Re-establishment & Rehabilitation) and Enhancement, as summarized in Table 1.

Table 1. Banner Branch Mitigation Site (ID-100080) Project Mitigation Quantities and Credits

Project Segment	Original Mitigation Plan Ft/Ac	As-Built Ft/Ac	Original Mitigation Category	Original Restoration Level	Original Mitigation Ratio (X:1)	Credits	Comments
Stream							
UT1-R1 (upper)	373	402	Warm	EI	1.50000	248.667	Floodplain Bench, In-Stream Structures, Supplemental Planting, Exclusion of Livestock, Permanent Conservation Easement
UT1-R1 (lower)	136	136	Warm	P	10.00000	13.600	Supplemental Planting, Exclusion of Livestock, Permanent Conservation Easement
UT1-R2	1,783	1,822	Warm	EII	2.50000	713.200	Riparian Planting, Livestock Exclusion
UT1-R3	822	851	Warm	P	10.00000	82.200	Conservation Easement
UT1A	410	410	Warm	EII	2.50000	164.000	Riparian Planting, Livestock Exclusion
UT1B (upper)	391	428	Warm	EII	2.50000	156.400	Riparian Planting, Livestock Exclusion
UT1B (lower)	97	103	Warm	EI	1.50000	64.667	Bank grading, Stabilization, Supplemental planting, Conservation Easement
UT1C (upper)	69	69	Warm	P	10.00000	6.900	Conservation Easement
UT1C (lower)	151	146	Warm	R (PI/PII)	1.00000	151.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement
UT2	1,287	1,270	Warm	R (PI/PII)	1.00000	1,287.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement
UT2A	289	287	Warm	EI	1.50000	192.667	Bank grading, Stabilization, Supplemental planting,. Conservation Easement
UT3	589	551	Warm	R (PI)	1.00000	589.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement
BB-R1	808	865	Warm	R (PI)	1.00000	808.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement
BB-R2	1,835	1,746	Warm	R (PI)	1.00000	1,835.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement
BB-R3	636	678	Warm	R (PI/PII)	1.00000	636.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement
UT4-R1 (upper)	2,346	2,346	Warm	R (PI/PII)	1.00000	2,346.000	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement
UT4-R1 (lower)	1,730/233	1,589/265	Warm	R (PI)	1.00/1.25	1,916.400	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement. 233 LF adjacent to pond credited at 1.25:1.
UT4-R2	1,722	1,760	Warm	EI	1.50000	1,148.000	Bank Grading, Stabilization, Supplemental Planting, Conservation Easement
					Total:	**12,358.701**	
Wetland							
W1	0.825	0.783	R	REE	2.00000	0.413	Planted, excluded livestock, remediated compaction and encompasses section of Priority 1 reaches
W1A	1.240	1.227	R	E	1.00000	1.240	Planted, excluded livestock, remediated compaction, soil manipulation, and encompasses section of Priority 1 reach
W2	0.524	0.511	R	E	2.00000	0.262	Planted, excluded livestock, remediated compaction
W3	0.888	0.886	R	RH	1.50000	0.592	Planted, excluded livestock, remediated compaction and encompasses section of Priority 1 reach
W4	0.321	0.319	R	E	2.00000	0.161	Planted, excluded livestock, remediated compaction
W4A	0.808	0.807	R	REE	1.00000	0.808	Planted, excluded livestock, remediated compaction, soil manipulation, and encompasses section of EI reach
W5	0.203	0.203	R	E	2.00000	0.102	Planted, excluded livestock, remediated compaction and encompasses section of EII reach
W5A	0.097	0.097	R	E	2.00000	0.049	Planted, excluded livestock, remediated compaction, and encompasses section of EII reach
W5B	0.010	0.007	R	E	2.00000	0.005	Planted, excluded livestock, remediated compaction
W6A	0.251	0.251	R	RH	1.50000	0.167	Planted, excluded livestock, remediated compaction and encompasses section of Priority 1 reach
W6B	0.045	0.045	R	E	2.00000	0.023	Planted, excluded livestock, remediated compaction
W7	0.041	0.041	R	E	2.00000	0.021	Planted, excluded livestock, remediated compaction
W8A	0.107	0.107	R	REE	1.00000	0.107	Planted, remediated compaction, soil manipulation, and encompasses section of Priority 1 reach of BB-R1
W9	0.823	0.817	R	REE	1.00000	0.823	Planted, excluded livestock, remediated compaction, soil manipulation, and encompasses section of P1 reach of BB-R2
					Total:	**4.773**	

Project Credits

Restoration Level	Stream			Riparian Wetland	Non-Rip Wetland	Coastal Marsh
	Warm	Cool	Cold			
Restoration	9,568.400					
Re-establishment				2.151		
Rehabilitation				0.759		
Enhancement				1.861		
Enhancement I	1,654.000					
Enhancement II	1,033.600					
Creation						
Preservation	102.700					
Totals	**12,358.701**			**4.773**		

Total Stream Credit	**12,358.701**
Total Wetland Credit	**4.773**

Wetland Mitigation Category

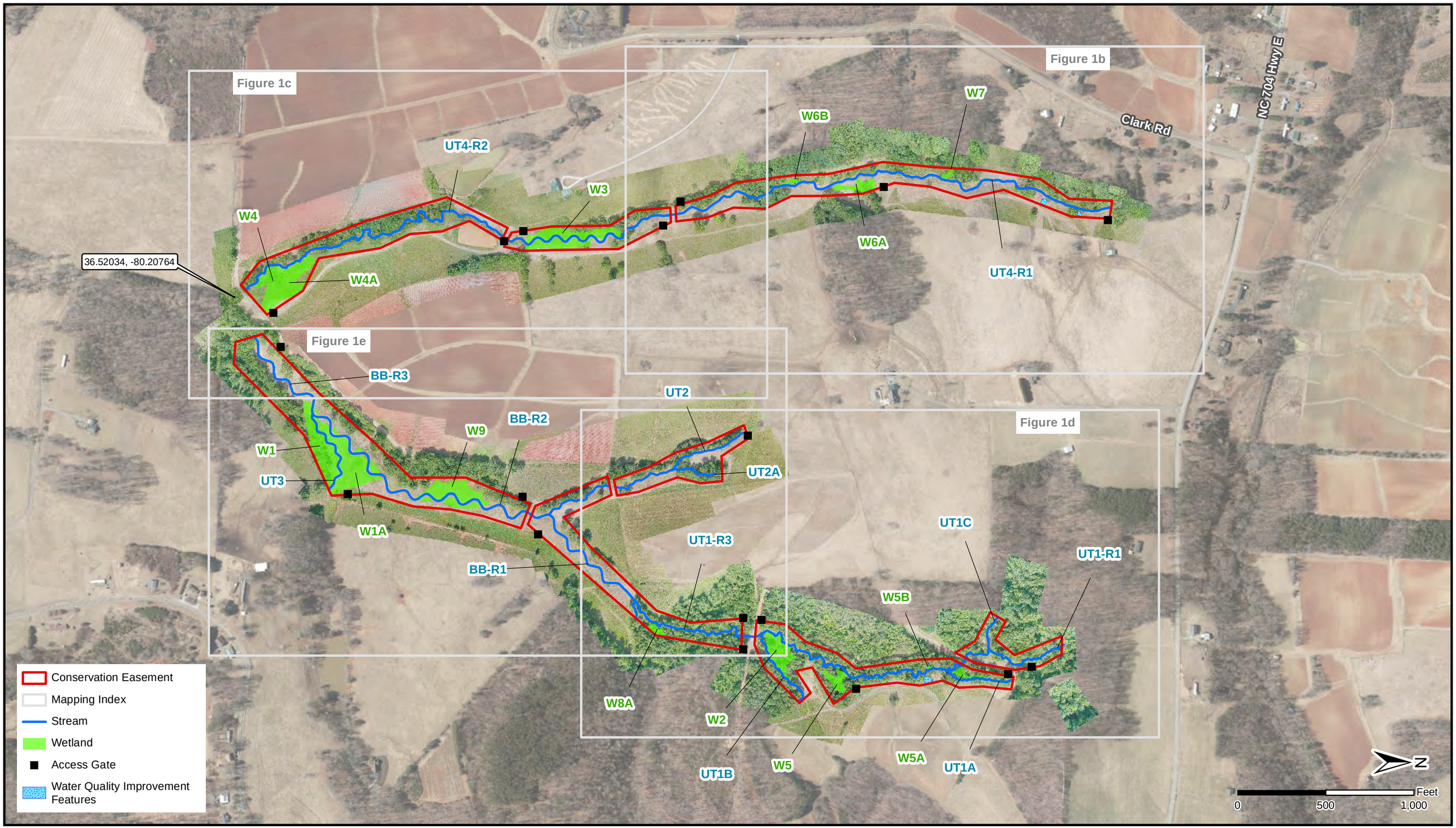
CM	Coastal Marsh
R	Riparian
NR	Non-Riparian

Restoration Level

HQP	High Quality Preservation
P	Preservation
E	Wetland Enhancement - Veg and Hydro
EII	Stream Enhancement II
EI	Stream Enhancement I
C	Wetland Creation
RH	Wetland Rehabilitation - Veg and Hydro
REE	Wetland Re-establishment Veg and Hydro
R	Restoration

1.3 Current Condition Plan View

The following pages present the Current Condition Plan View (CCPV).



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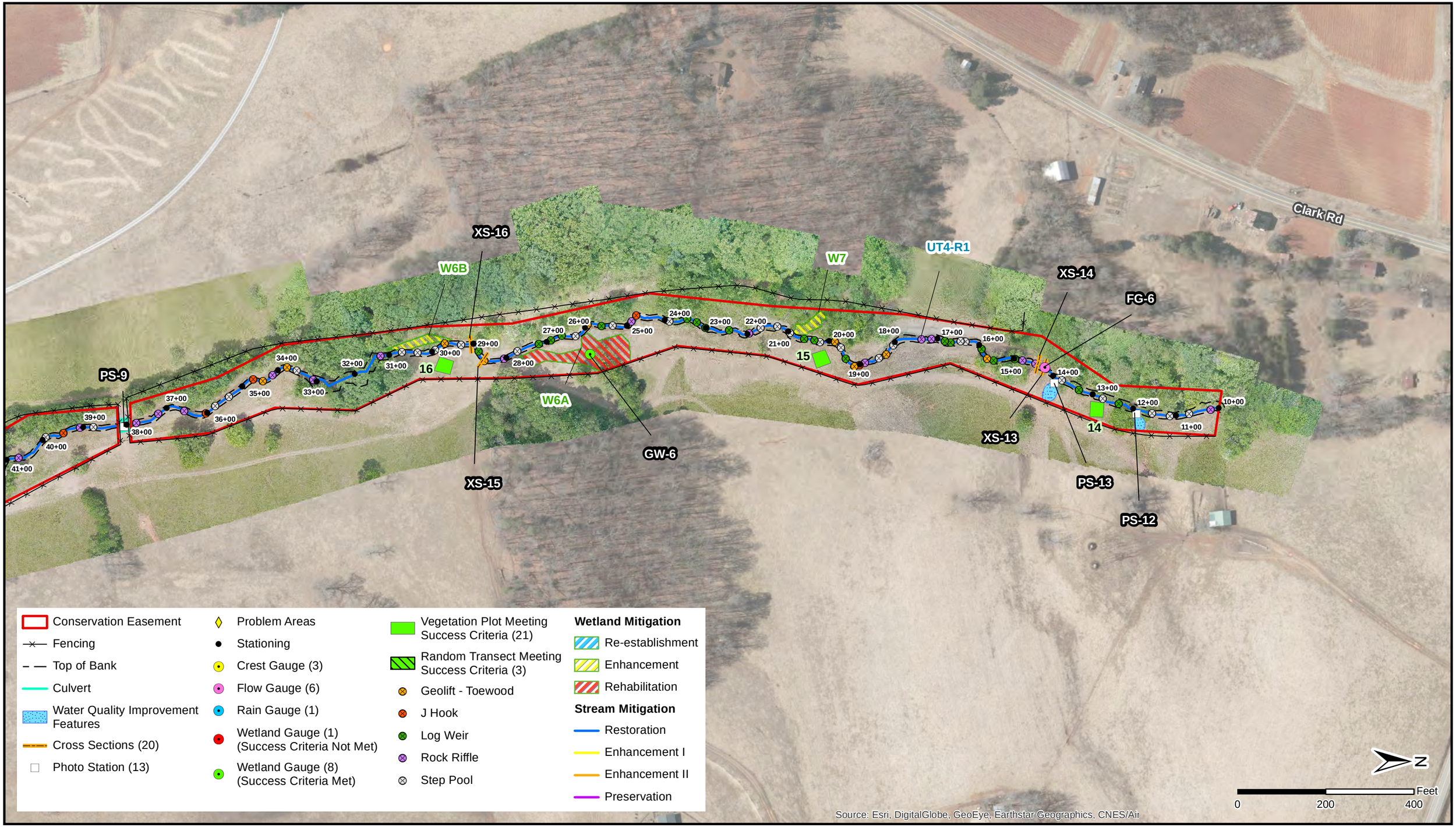
Banner Branch Mitigation Project
Stokes County, North Carolina

USACE Action ID Number:
SAW-2018-01760
December 2021
MY1

USACE
Current Conditions Plan View
Monitoring Year 1

NAD 1983 2011 State Plane
North Carolina FIPS 3200 FT US

FIGURE
1a



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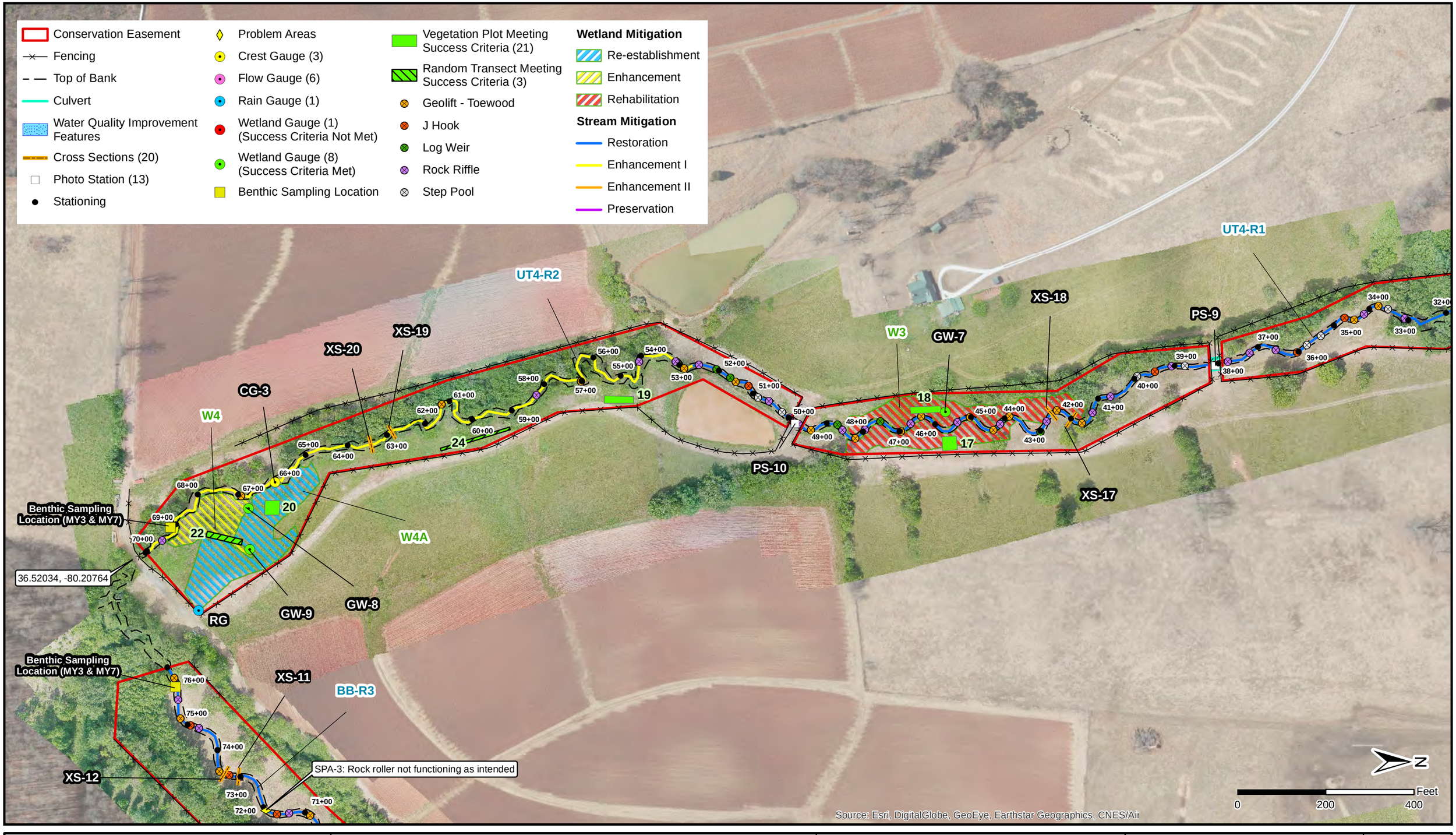
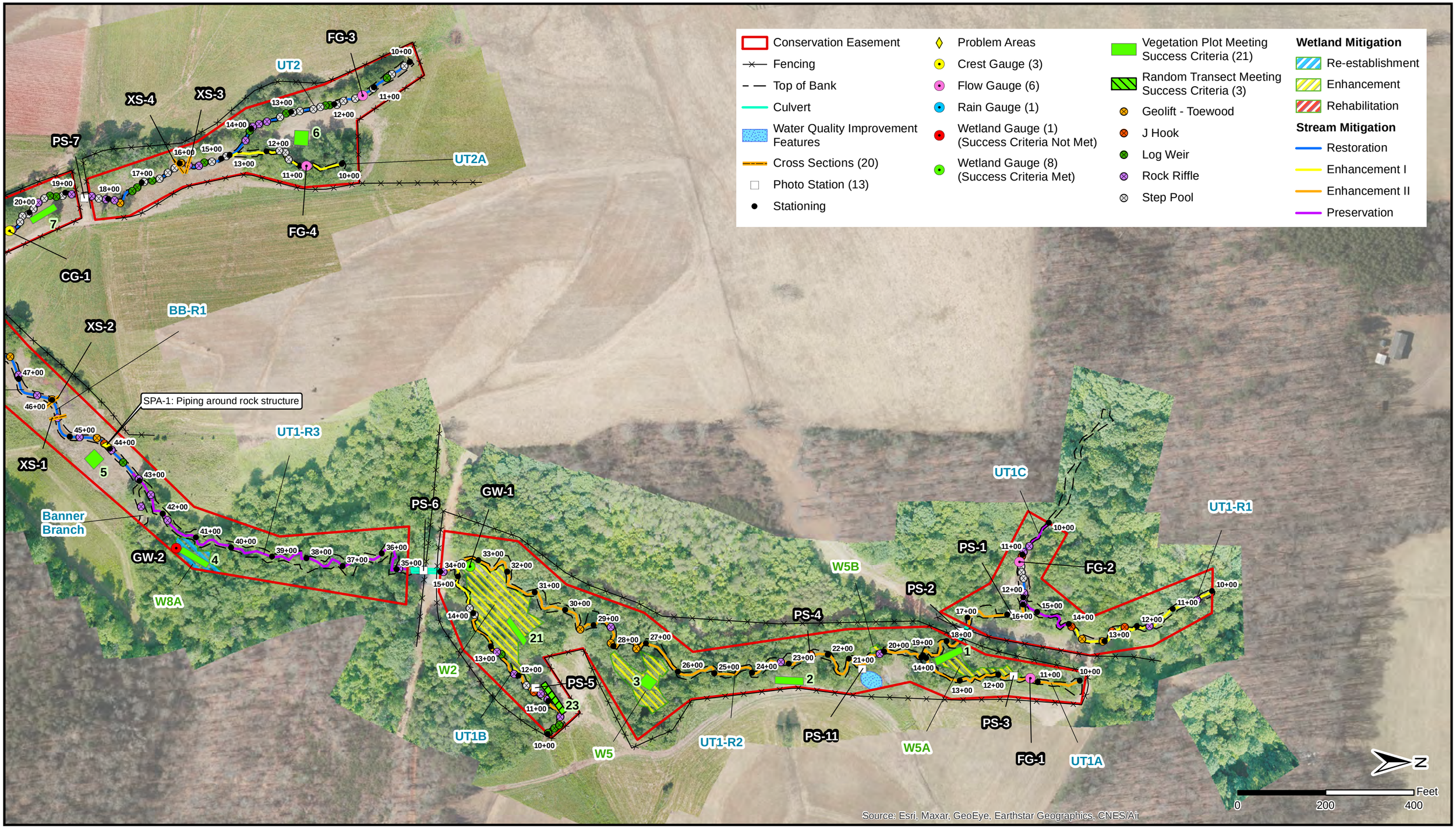
USACE
Current Conditions Plan View
Monitoring Year 1

NAD 1983 2011 State Plane
North Carolina FIPS 3200 FT US

FIGURE
1b



WATER & LAND™ SOLUTIONS	**Banner Branch Mitigation Project** **Stokes County, North Carolina**	USACE Action ID Number: SAW-2018-01760 December 2021 MY1	USACE Current Conditions Plan View Monitoring Year 1 NAD 1983 2011 State Plane North Carolina FIPS 3200 FT US	FIGURE 1c



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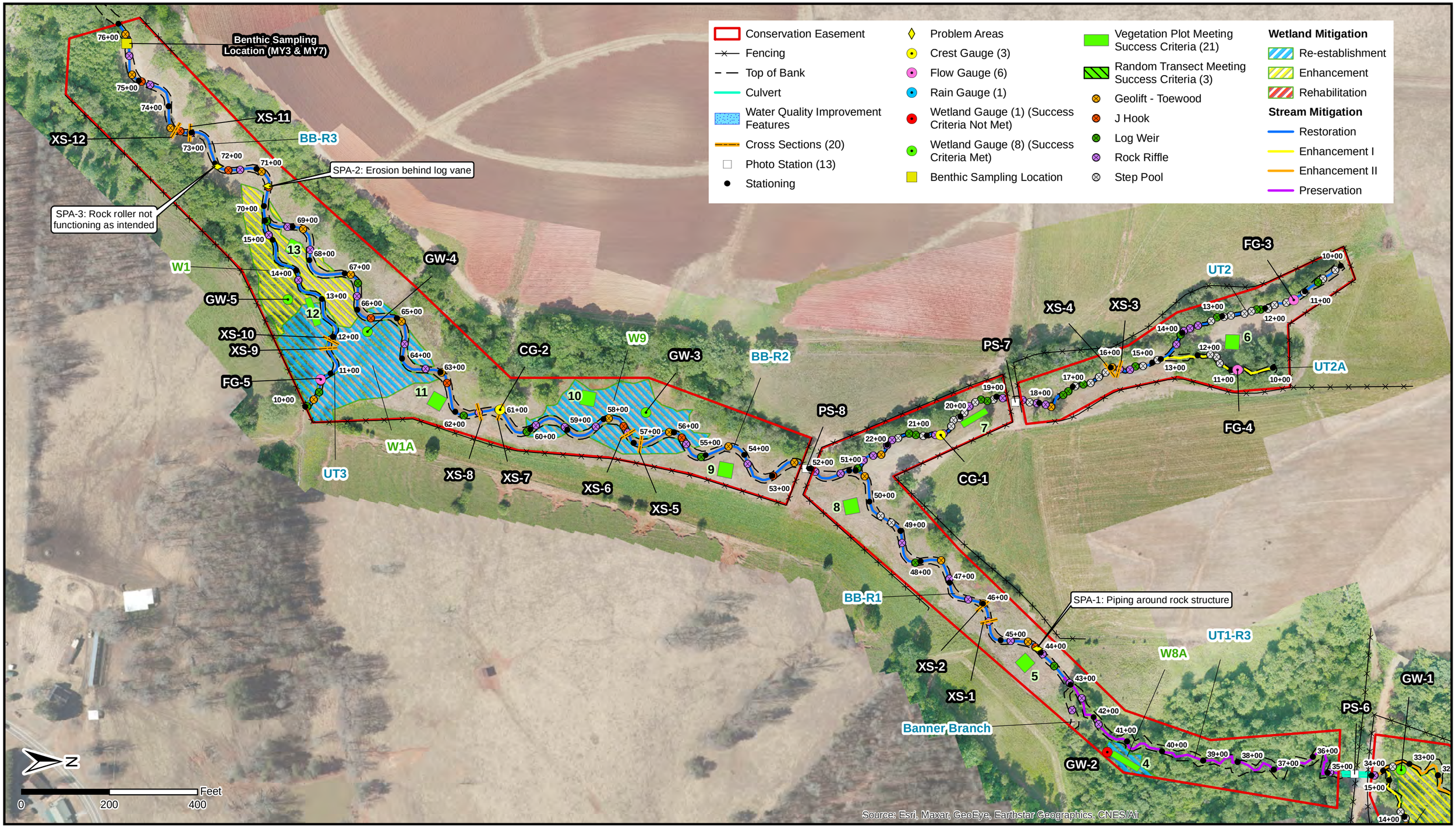


WATER & LAND™ SOLUTIONS	**Banner Branch Mitigation Project** **Stokes County, North Carolina**	USACE Action ID Number: SAW-2018-01760 December 2021 MY1	USACE Current Conditions Plan View Monitoring Year 1 NAD 1983 2011 State Plane North Carolina FIPS 3200 FT US	FIGURE 1e

2 Goals, Performance Criteria, and Functional Improvements

2.1 Project Goals and Objectives

The Project will meet the goals and objectives described in the Banner Branch Final Approved Mitigation Plan and will address general restoration goals and opportunities outlined in the DMS Roanoke River Basin RBRP. More specifically, watershed goals and management strategies described in the RBRP will be met by:

- Reducing sediment, soil erosion, turbidity, and nutrient inputs such as fecal coliform bacteria, nitrogen, and phosphorus to the Banner Branch Watershed.
- Restoring, enhancing, preserving, and protecting headwater streams, wetlands, riparian buffers, and aquatic habitat functions.
- Improving riparian corridor management and targeting restoration of impacted streams, wetlands, and riparian buffer areas.
- Promoting agronomic farm management techniques and implementing agricultural BMPs and water quality features such as livestock exclusion fencing, alternative watering systems, and nutrient management devices, and wetlands restoration.

To accomplish these project-specific goals, the following objectives will be measured to document overall project success:

- Restore stream, wetland and floodplain hydrology by reconnecting historic flow paths and promoting geomorphically stable conditions and more natural flood processes;
- Improve and protect water quality by reducing streambank erosion, nutrient and sediment inputs;
- Restore and protect stream, wetland, and riparian buffer functions and habitat connectivity in perpetuity by recording a permanent conservation easement; and
- Implement agricultural BMPs to reduce nonpoint source inputs to receiving waters.

Table 2: Summary - Goals, Performance and Results					
Goal	**Objective/Treatment**	**Likely Functional Uplift**	**Performance Criteria**	**Measurement**	**Cumulative Monitoring Results**
Improve Stream Base Flow Duration	Improve and/or remove existing stream crossings and restore a more natural flow regime and aquatic passage.	Create a more natural and higher functioning headwater flow regime and provide aquatic passage; re-establish appropriate wetland hydroperiods and provide hydrologic storage	Maintain seasonal flow on intermittent stream for a minimum of 30 consecutive days during normal annual rainfall	6 Flow Gauges (UT1A, UT1C, UT2, UT2A, UT3, UT4-R1). Devices record 2x/day and inspected quarterly.	6/6 Flow Gauges documented flow for a minimum of 30 consective days.
Reconnect channels with floodplains and riparian wetlands to allow a natural flooding regime.	Design BHRs to not exceed 1.2 and increase ERs no less than 2.2 for Rosgen 'C' and 'E' stream types and 1.4 for 'B' stream types.	Provide temporary water storage and reduce erosive forces (shear stress) in channel during larger flow events.	Minimum of four bankfull events in separate years. Wetland hydrology for 8% of growing season.	3 Crest gauges/pressure transducers (UT2, BB-R2, UT4-R2); Devices record hourly & inspected quarterly. 9 Wetland gauges (W1,W1A, W2, W3, W4, W4A, W6A, W8A, W9); inspected quarterly.	3/3 crest guages recorded out of bank events in MY1. 8/9 wetland gauges met hydrology criteria of 8%.
Improve stabilty of stream channels	Construct stream channels that will maintain stable cross-sections, patterns, and profiles over time.	Reduction in sediment inputs from bank erosion, reduction of shear stress, and improved overall hydraulic function.	Bank height ratios remain below 1.2 over the monitoring period. Visual assessments showing progression towards stability.	20 Cross sections surveys and visual assessment; Cross-sections in Years 1, 2, 3, 5, and 7.	20/20 cross sections BHR<1.2
Establish Riparian Buffer Vegetation	Plant native species vegetation a minimum 30' wide from the top of the streambanks with a composition/density comparable to downstream reference condition.	Increase woody and herbaceous vegetation will provide channel stability and reduce streambank erosion, runoff rates and exotic species vegetation.	Within planted portions of the site, a minimum of 320 stems per acre must be present at year three; a minimum of 260 stems per acre must be present at year five with average height of six feet; and a minimum of 210 stems per acre and average eight foot tree heights must be present at year seven.	CVS Level I & II Protocol Tree for 21 fixed veg plots (Strata Composition, Vigor, and Density), 3 random transects/plots, and visual assessment. Years 1, 2, 3, 5, and 7 for veg plots.	21/21 Fixed Veg Plots met in 2021 and 3/3 Random Veg Plots met in 2021
Improve streambed material and stability	Improve bedform diversity and increase lateral stability.	Reduce embeddedness to allow for interstitial flow habitat.	N/A	N/A	N/A
Improve Benthic Macroinverebrate Communities and Aquatic Habitat	Increase native woody debris and structures in channel.	Increase leaf litter and organic matter critical to provide in-stream cover/shade, wood recruitment, and carbon sourcing.	N/A	Evaluate BMI Communities at two sites (BB-R3 and UT4-R2) in MY3 and MY7	Data in MY3 and MY7

2.2 Project Success Criteria

The success criteria for the Project will follow the approved performance standards and monitoring protocols from the final approved mitigation plan; which was developed in compliance with the USACE October 2016 Guidance, USACE Stream Mitigation Guidelines (April 2003 and October 2005), and 2008 Compensatory Mitigation Final Rule. Cross-section and vegetation plot data will be collected in Years 0, 1, 2, 3, 5, and 7. Stream hydrology data and visual monitoring will be reported annually. Specific success criteria components and evaluation methods are described below.

2.2.1 Streams

***Stream Hydrology*:** Four separate bankfull or over bank events must be documented within the seven-year monitoring period and the stream hydrology monitoring will continue until four bankfull events have been documented in separate years. Stream hydrology monitoring will be accomplished with pressure transducers installed in pools and correlating sensor depth to top of bank elevation (see Appendix D for installation diagrams). Recorded water depth above the top of bank elevation will document a bankfull event. The devices will record water depth hourly and will be inspected quarterly. In addition to the pressure transducers, traditional cork gauges will be installed at bankfull elevation and will be used to document bankfull events with photographs.

Stream Profiles, Vertical Stability, and Floodplain Access: Stream profiles, as a measure of vertical stability and floodplain access will be evaluated by looking at Bank Height Ratios (BHR). In addition, observed bedforms should be consistent with those observed for channels of the design stream type(s). The BHR shall not exceed 1.2 along the restored Project stream reaches. This standard only applies to restored reaches of the channel where BHRs were corrected through design and construction. Vertical stability will be evaluated with visual assessment, cross-sections and, if directed by the IRT, longitudinal profile.

Stream Horizontal Stability: Cross-sections will be used to evaluate horizontal stream stability on restored streams. There should be little change expected from as-built restoration cross-sections. If measurable changes do occur, they should be evaluated to determine if the changes represent a movement toward a more unstable condition (e.g., downcutting, erosion) or a movement towards increased stability (e.g., settling, vegetation establishment, deposition along the streambanks, decrease in width/depth ratio). Cross-sections shall be classified using the Rosgen Stream Classification method and all monitored cross-sections should fall within the quantitative parameters defined for channels of the design stream type.

Stream cross-section monitoring will be conducted using a Topcon Total Station. Three-dimensional coordinates associated with cross-section data will be collected in the field (NAD83 State Plane feet FIPS 3200). Morphological data will be collected at 20 cross-sections. Survey data will be imported into Microsoft Excel® and the DMS Shiny App for data processing and analysis.

Reference photo transects will be taken at each permanent cross-section. Lateral photos should not indicate excessive erosion or continuing degradation of the streambanks. Photographs will be taken of both streambanks at each cross-section. A survey tape stretched between the permanent cross-section monuments/pins will be centered in each of the streambank photographs. The water elevation will be shown in the lower edge of the frame, and as much of the streambank as possible will be included in each photo. Photographers will attempt to consistently maintain the same area in each photo over time.

Streambed Material Condition and Stability: Pebble counts or streambed material samples will not be collected per the DMS Pebble Count Data Requirements memo sent on October 19, 2021. The IRT reserves the right to request pebble count data/particle distributions if deemed necessary during the monitoring period.

Jurisdictional Stream Flow: Monitoring of stream flow will be conducted to demonstrate that the restored stream systems classified as intermittent exhibit surface flow for a minimum of 30 consecutive days throughout some portion of the year during a year with normal rainfall conditions. Stream flow monitoring will be accomplished with pressure transducers installed in pools and correlating sensor depth to the downstream top of riffle elevation. If the pool water depth is at or above the top of riffle elevation, then the channel will be assumed to have surface flow. The devices will record water elevation twice per day and will be inspected quarterly to document surface hydrology and provide a basis for evaluating flow response to rainfall events.

The stage recorders include an automatic pressure transducer (HOBO Water Level (13 ft) Logger) set in PVC piping in the channel. The elevation of the bed and top of bank at each stage recorder location will be recorded to be able to document presence of water in the channel and out of bank events. Visual observations (i.e. wrack or debris lines) and traditional cork crest gauges will also be used to document out of bank events.

2.2.2 Wetlands

Wetland Hydrology: The performance standard for wetland hydrology will be eight percent based on the suggested wetland saturation thresholds for soils taxonomic subgroups. The proposed success criteria for wetland hydrology will be when the soils are saturated within 12 inches of the soil surface for eight percent (14 days) of the 177-day growing season (April 21st through October 16th) based on WETS data table for Stokes County, NC. The saturated conditions should occur during a period when antecedent precipitation has been normal or drier than normal for a minimum frequency of 5 years in 10 (USACE, 2005 and 2010b). Precipitation data will be obtained from an on-site rain gauge and the Danbury WETS Station, approximately 11 miles south of the Project site. If a normal year of precipitation does not occur during the first seven years of monitoring, WLS will continue to monitor the Project hydrology until the Project site has been saturated for the appropriate hydroperiod. If rainfall amounts for any given year during the monitoring period are abnormally low, reference wetland hydrology data will be compared to determine if there is a correlation with the weather conditions and site variability.

2.2.3 Vegetation

Vegetation monitoring will occur in the fall each required monitoring year, prior to leaf drop. Plots will be monitored in years 1, 2, 3, 5, and 7. Vegetative success for the Project during the intermediate monitoring years will be based the survival of at least 320, three-year-old trees per acre at the end of Year 3 of the monitoring period; and at least 260, five-year-old, trees per acre that must average six feet in height at the end of Year 5 of the monitoring period. The final vegetative restoration success criteria will be achieving a density of no less than 210, seven-year-old stems per acre that must average eight feet in height in Year 7 of monitoring. Volunteer species on the approved planting list that meet success criteria standards will be counted towards success criteria.

Vegetation success is being monitored at a total of 21 permanent/fixed vegetation plots and three random (2m x 50m or 4m 25m) transects. Vegetation plot monitoring follows the CVS-EEP Level 2 Protocol for

Recording Vegetation, version 4.2 (Lee et al. 2008) and includes analysis of species composition, height, and density of planted species. Data are processed using the DMS ShinyApp tool. In the field, the four corners of each fixed plot were permanently marked with PVC at the origin and rebar at the other corners. Tree species and height will be recorded for each planted stem and photos of each plot are to be taken from the origin each monitoring year.

2.2.4 Visual Assessment

WLS will conduct visual assessments in support of mitigation performance monitoring. Visual assessments of all stream reaches will be conducted twice per monitoring year with at least five months in between each site visit for each of the seven years of monitoring. Photographs will be used to visually document system performance and any areas of concern related to streambank and bed stability, condition of in-stream structures, channel migration, active headcuts, live stake mortality, invasive plant species or animal browsing, easement boundary encroachments, cattle exclusion fence damage, and general streambed conditions.

3 Project Attributes

3.1 Design Approach

The Project stream design approach included a combination of Stream Restoration, Enhancement, and Preservation activities (Table 1). Priority Level I and Level II Restoration approaches incorporated the design of both single-thread meandering channels and step-pool channels. All non-vegetated areas within the easement were planted with native vegetation and any areas of invasive species were removed and/ or treated.

3.2 Project Attributes

See Table 3 for Project Attributes.

Table 3. Project Attribute Table	
Project Name	Banner Branch Mitigation Project
County	Stokes
Project Area (acres)	40.87
Project Coordinates (latitude and longitude decimal degrees)	36.525421° N, -80.203265° W
Project Watershed Summary Information	
Physiographic Province	Piedmont
River Basin	Roanoke
USGS Hydrologic Unit 8-digit	03010103
DWR Sub-basin	03-02-01
Project Drainage Area (acres)	563 (BB-R3) and 224 (UT4-R2); 0.88 (BB-R3) and 0.35 (UT4-R2)
Project Drainage Area Percentage of Impervious Area	<2
Land Use Classification	2.01.03, 3.02 (50% pasture/hay, 48% mixed forest)

Reach Summary Information														
Parameters	**UT1-R1**	**UT1-R2**	**UT1-R3**	**UT1A**	**UT1B**	**UT1C**	**UT2**	**UT2A**	**UT3**	**BB-R1**	**BB-R2**	**BB-R3**	**UT4-R1**	**UT4-R2**
Pre-project length (feet)	535	1,827	822	410	391	227	1,315	289	338	986	2,080	478	4,624	1,722
Post-project (feet)	538	1,822	851	410	531	215	1,270	287	551	865	1,746	678	4,200	1,760
Valley confinement (Confined, moderately confined, unconfined)	mod confined	mod confined	mod confined	mod confined	mod confined	mod confined	confined	mod confined	unconfined	unconfined	unconfined	unconfined	unconfined	unconfined
Drainage area (acres)	41.2	135	166.4	4.6	41.6	15.8	28.3	3.1	76.8	409.6	480	563.2	153.6	224
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Intermittent	Intermittent	Intermittent	Perennial/Int	Intermittent	Perennial/Int	Perennial	Perennial	Perennial	Perennial/Int	Perennial
NCDWR Water Quality Classification	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Dominant Stream Classification (existing)	G4c/B4c	F4	E4	G5	E5	F4	F4	B4a	E5 (incised)	B4c	E4 (incised)	E4 (incised)	B4c/F4	E5
Dominant Stream Classification (proposed)	B4	F4	E4	G5	E5	B4	B4	B4a	C4	C4	C4	C4	B4/C4b	E5
Dominant Evolutionary class (Simon) if applicable	II/III	V/VI	V/VI	VI	III	I	III/IV	III	II/III	IV	IV/V	IV	IV/V	III/IV

Wetland Summary Information														
Parameters	**W1**	**W1A**	**W2**	**W3**	**W4**	**W4A**	**W5**	**W5A**	**W5B**	**W6A**	**W6B**	**W7**	**W8A**	**W9**
Pre-project (acres)	0.859	0.000	0.524	0.906	0.321	0.000	0.203	0.097	0.010	0.251	0.045	0.041	0.000	0.000
Post-project (acres)	0.783	1.227	0.511	0.886	0.319	0.807	0.203	0.097	0.007	0.251	0.045	0.041	0.107	0.817
Wetland Type (non-riparian, riparian)	riparian riverine	riparian riverine	riparian riverine	riparian riverine	riparian riverine	riparian riverine	riparian riverine	riparian riverine	riparian riverine	riparian riverine	riparian riverine	riparian riverine	riparian riverine	riparian riverine
Mapped Soil Series	Codorus loam	Codorus loam & Dan River & Comus	Fairview-Poplar Forest Complex	Fairview-Poplar Forest Complex	Codorus loam	Codorus loam	Clifford sandy clay loam	Clifford sandy clay loam	Fairview-Poplar Forest Complex	Fairview-Poplar Forest Complex	Fairview-Poplar Forest Complex	Fairview-Poplar Forest Complex	Dan River & Comus	Dan River & Comus
Soil Hydric Status	Hydric	Hydric	Hydric	Hydric	Hydric	Hydric	Hydric	Hydric	Hydric	Hydric	Hydric	Hydric	Hydric	Hydric

Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	Yes	Yes	PCN
Water of the United States - Section 401	Yes	Yes	PCN
Endangered Species Act	Yes	Yes	Categorical Exclusion
Historic Preservation Act	Yes	Yes	Categorical Exclusion
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

4 Monitoring Year 1 Assessment and Results

The dates of Year 1 monitoring activities are detailed in Appendix E. All year 1 monitoring data is presented in this report and in the appendices. The Project is on track for meeting stream, wetland, and vegetation interim success criteria. All monitoring device locations are depicted on the CCPV (Figure 1).

4.1 Morphological Assessment

Morphological data for MY1 was collected in November 2021. Refer to Appendices A and C for summary data tables, morphological plots, and stream photographs.

4.1.1 Stream Horizontal Pattern & Longitudinal Profile

Visual assessment and cross-section surveys were utilized for MY1 horizontal and vertical stream stability. The visual assessments for each stream reach concluded that the MY1 stream channel pattern and longitudinal profiles, and in-stream structure location/function, still closely match the MY0/baseline conditions (Appendix D). Overall, the MY1 planform geometry and dimensions fall within acceptable ranges of the baseline parameters for all restored reaches. Minor channel adjustments in riffle slopes, pool depths and pattern do not present a stability concern or indicate a need for remedial action and will be assessed visually during the annual assessments.

Three potential stream problem areas were noted during MY1 (see CCPV).

- **SPA-1:** On BB-R1 near station 44+00, piping is occurring on the left bank around a rock structure. Livestakes were added around the structure to prevent erosion on 11/3/2021. The structure is not functioning as intended but remains stable. WLS will continue to monitor this area closely.
- **SPA-2:** On BB-R3 near station 70+50, erosion is occurring on the right bank upstream of a log vane. The structure is functioning and stable. Livestakes were added to prevent further bank erosion on 11/3/2021. WLS will continue to monitor this area closely.
- **SPA-3:** On BB-R3 near station 72+00, a rock roller is rolling water toward the right bank, and not toward the log vane. The structure is not functioning as intended but remains stable. The right bank is currently stable and not actively eroding. Livestakes were added on 11/3/2021 and WLS will continue to monitor this area closely.

4.1.2 Stream Horizontal Dimension

The MY1 channel dimensions generally match the design parameters and are within acceptable and stable ranges of tolerance. Twenty cross-sections are located in restoration reaches across the project, with ten located in pools and ten located in riffles. All 10 of the riffle cross-sections show little change in the bankfull area and all bank height ratios are less than 1.2. Maximum riffle depths are expected to fluctuate slightly throughout the monitoring period as the channels adjust to the new flow regime. Four of the ten pool cross-sections (XS-4 on UT2, XS-5 on BB-R2, XS-13 on UT4-R1, and XS-15 on UT4-R1) show minor aggradation within the bankfull area due to vegetation establishment and the formation of point bars. It is expected over time that some pools may accumulate fine sediment and organic matter, however, this may not be an indicator of channel instability.

4.2 Stream Hydrology

4.2.1 Stream Flow

Six pressure transducers (flow gauges) were installed in April 2021 on reaches UT1A, UT1C, UT2, UT2A, UT3, and UT4-R1 to document flow conditions. The flow gauge locations are within the upper one-third of the project reaches as shown on the CCPVs. All six flow gauges exhibited surface flow for a minimum of 30 consecutive days throughout the monitoring year (Appendix D). Data for FG-2 2021 was lost due to a transducer malfunction (data lost May 27, 20201 to November 2, 2021). The malfunctioning gauge was replaced on November 2nd, 2021. Additionally, to determine if rainfall amounts are normal for the given year, precipitation data was obtained from CRONOS station Danbury, approximately 11 miles south of the site.

Flow Gauge Data

Flow Gauge Name	Flow Gauge Location	Longest Period of Consecutive Flow	Total Days of Cumulative Flow	Total Days of No Flow
FG-1	UT1A	202 days 4/15/2021 – 11/2/2021	202 days	0 days
FG-2	UT1C	43 days 4/15/2021 – 5/27/2021	43 days	0 days
FG-3	UT2	202 days 4/15/2021 – 11/2/2021	202 days	0 days
FG-4	UT2A	202 days 4/15/2021 – 11/2/2021	202 days	0 days
FG-5	UT3	202 days 4/15/2021 – 11/2/2021	202 days	0 days
FG-6	UT4-R1	202 days 4/15/2021 – 11/2/2021	202 days	0 days

4.2.2 Bankfull Events

Three crest gauges were installed in April 2021 to document bankfull events. WLS installed a conventional cork crest gauge, along with a pressure transducer to validate flood status on UT2, BB-R2, UT4-R2. During MY1, bankfull events were recorded on all three pressure transducer crest gauges. CG-1 (UT2) recorded one event with a maximum event of 0.23 feet above bankfull. CG-2 (BB-R2) recorded two events with a maximum event of 0.80 feet above bankfull. CG-3 (UT4-R2) recorded two events with a maximum event of 0.24 feet above bankfull. Additionally, the cork crest gauge located adjacent to CG-3 pressure transducer recorded one bankfull event. The associated data and photographs are located in Appendix D.

4.3 Wetlands

Nine groundwater wells were installed in April 2021 to monitor wetland hydrology. Groundwater well locations are shown on the CCPV. During MY1, eight of the nine wetland groundwater wells are meeting the eight percent wetland hydrology criterion. GW-2 (W8a) had a hydroperiod of 1.7 percent which is not meeting the eight percent criteria. No remedial action is proposed at this time.

4.4 Vegetation

Monitoring of the 21 permanent vegetation plots and three random transects was completed during November 2021. Vegetation data photos can be found in Appendix B. The MY1 average density is 661 stems per acre, which exceeds the interim measure of vegetative success of at least 320 stems per acre at the end of the third monitoring year. Each vegetation plot is also meeting the interim measure requirements and has 364 – 931 stems per acre. Volunteer river birch (*Betula nigra*), persimmon (*Diospyros virginiana*), and silky dogwood (*Cornus amomum*) were noted in MY1, and more species are expected to establish in future years.

Visual assessment of vegetation outside of the monitoring plots indicates that the herbaceous vegetation is becoming well established throughout the project.

No areas of significant invasive plant species were observed post-construction. The site will be monitored closely, and any invasive plant species will be treated as needed.

Appendix A:

Visual Assessment Data

Visual Stream Morphology Stability Assessment Table
Vegetation Condition Assessment Table
Photos: Cross-section Photos
Photos: Stream Photo Points (Culvert & Ford Crossings, EII Reaches, BMPs,)
Photos: Problem Areas

Visual Stream Stability Assessment						
Reach		BB-R1				
Assessed Stream Length		865				
Assessed Bank Length		1,730				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	12	13		92%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	8	8		100%

Visual Stream Stability Assessment						
Reach		BB-R2				
Assessed Stream Length		1,746				
Assessed Bank Length		3,492				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	26	26		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	19	19		100%

Visual Stream Stability Assessment						
Reach		BB-R3				
Assessed Stream Length		678				
Assessed Bank Length		1,356				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	10	11		91%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	7	8		88%

Visual Stream Stability Assessment						
Reach		UT1A				
Assessed Stream Length		410				
Assessed Bank Length		820				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	N/A	N/A		N/A
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	N/A	N/A		N/A

Visual Stream Stability Assessment						
Reach		UT1B				
Assessed Stream Length		531				
Assessed Bank Length		1,062				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	13	13		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	3	3		100%

Visual Stream Stability Assessment						
Reach		UT1C				
Assessed Stream Length		215				
Assessed Bank Length		430				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	10	10		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	6	6		100%

Visual Stream Stability Assessment						
Reach		UT1-R1				
Assessed Stream Length		538				
Assessed Bank Length		1,076				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	9	9		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	3	3		100%

Visual Stream Stability Assessment						
Reach		UT1-R2				
Assessed Stream Length		1,822				
Assessed Bank Length		3,644				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	7	7		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	5	5		100%

Visual Stream Stability Assessment						
Reach		UT1-R3				
Assessed Stream Length		851				
Assessed Bank Length		1,702				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	3	3		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	N/A	N/A		N/A

Visual Stream Stability Assessment						
Reach		UT2				
Assessed Stream Length		1,270				
Assessed Bank Length		2,540				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	65	65		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	35	35		100%

Visual Stream Stability Assessment						
Reach		UT2A				
Assessed Stream Length		287				
Assessed Bank Length		574				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	5	5		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	N/A	N/A		N/A

Visual Stream Stability Assessment						
Reach		UT3				
Assessed Stream Length		551				
Assessed Bank Length		1,102				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	17	17		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	2	2		100%

Visual Stream Stability Assessment						
Reach		UT4-R1				
Assessed Stream Length		4,200				
Assessed Bank Length		8,400				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	83	83		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	66	66		100%

Visual Stream Stability Assessment						
Reach		UT4-R2				
Assessed Stream Length		1,760				
Assessed Bank Length		3,520				
Major Channel Category		**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-built**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	7	7		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	3	3		100%

Visual Vegetation Assessment				
Planted acreage	**30**			
Vegetation Category	**Definitions**	**Mapping Threshold**	**Combined Acreage**	**% of Planted Acreage**
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10 acres	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10 acres	0.00	0.0%
		Total	0.00	0.0%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10 acres	0.00	0.0%
		Cumulative Total	0.00	0.0%
Easement Acreage	**41**			
Vegetation Category	**Definitions**	**Mapping Threshold**	**Combined Acreage**	**% of Easement Acreage**
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Species included in summation above should be identified in report summary.	0.10 acres	0.00	0.0%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	none	0.00	

BB-R1, XS1, Upstream (MY-00)

BB-R1, XS1, Upstream (MY-01)

BB-R1, XS1, Downstream (MY-00)

BB-R1, XS1, Downstream (MY-01)

BB-R1, XS1, Left Bank (MY-00)

BB-R1, XS1, Left Bank (MY-01)

BB-R1, XS1, Right Bank (MY-00)

BB-R1, XS1, Right Bank (MY-01)

BB-R1, XS2, Upstream (MY-00)

BB-R1, XS2, Upstream (MY-01)

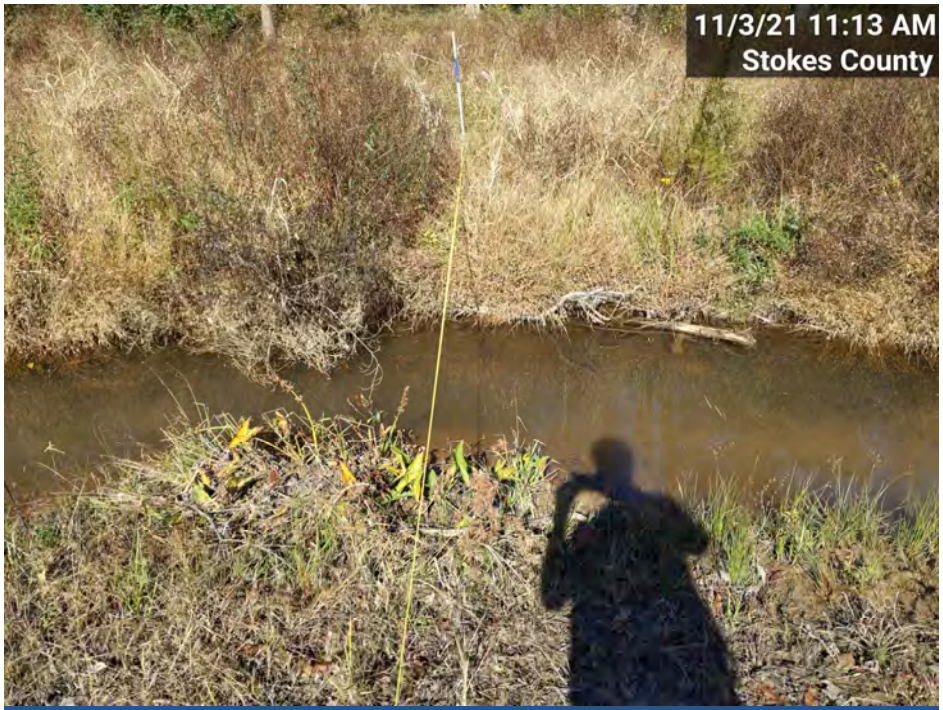
BB-R1, XS2, Downstream (MY-00)

BB-R1, XS2, Downstream (MY-01)

BB-R1, XS2, Left Bank (MY-00)

BB-R1, XS2, Left Bank (MY-01)

BB-R1, XS2, Right Bank (MY-00)



BB-R1, XS2, Right Bank (MY-01)

UT2, XS3, Upstream (MY-00)

UT2, XS3, Upstream (MY-01)

UT2, XS3, Downstream (MY-00)

UT2, XS3, Downstream (MY-01)

UT2, XS3, Left Bank (MY-00)

UT2, XS3, Left Bank (MY-01)

UT2, XS3, Right Bank (MY-00)

UT2, XS3, Right Bank (MY-01)

UT2, XS4, Upstream (MY-00)

UT2, XS4, Upstream (MY-01)

UT2, XS4, Downstream (MY-00)

UT2, XS4, Downstream (MY-01)

UT2, XS4, Left Bank (MY-00)

UT2, XS4, Left Bank (MY-01)

UT2, XS4, Right Bank (MY-00)

UT2, XS4, Right Bank (MY-01)

BB-R2, XS5, Upstream (MY-00)

BB-R2, XS5, Upstream (MY-01)

BB-R2, XS5, Downstream (MY-00)

BB-R2, XS5, Downstream (MY-01)

BB-R2, XS5, Left Bank (MY-00)

BB-R2, XS5, Left Bank (MY-01)

BB-R2, XS5, Right Bank (MY-00)

BB-R2, XS5, Right Bank (MY-01)

BB-R2, XS6, Upstream (MY-00)

BB-R2, XS6, Upstream (MY-01)

BB-R2, XS6, Downstream (MY-00)

BB-R2, XS6, Downstream (MY-01)

BB-R2, XS6, Left Bank (MY-00)

BB-R2, XS6, Left Bank (MY-01)

BB-R2, XS6, Right Bank (MY-00)

BB-R2, XS6, Right Bank (MY-01)

BB-R2, XS7, Upstream (MY-00)

BB-R2, XS7, Upstream (MY-01)

BB-R2, XS7, Downstream (MY-00)

BB-R2, XS7, Downstream (MY-01)

BB-R2, XS7, Left Bank (MY-00)

BB-R2, XS7, Left Bank (MY-01)

BB-R2, XS7, Right Bank (MY-00)

BB-R2, XS7, Right Bank (MY-01)

BB-R2, XS8, Upstream (MY-00)

BB-R2, XS8, Upstream (MY-01)

BB-R2, XS8, Downstream (MY-00)

BB-R2, XS8, Downstream (MY-01)

BB-R2, XS8, Left Bank (MY-00)

BB-R2, XS8, Left Bank (MY-01)

BB-R2, XS8, Right Bank (MY-00)

BB-R2, XS8, Right Bank (MY-01)

UT3, XS9, Upstream (MY-00)

UT3, XS9, Upstream (MY-01)

UT3, XS9, Downstream (MY-00)

UT3, XS9, Downstream (MY-01)

UT3, XS9, Left Bank (MY-00)

UT3, XS9, Left Bank (MY-01)

UT3, XS9, Right Bank (MY-00)

UT3, XS9, Right Bank (MY-01)

UT3, XS10, Upstream (MY-00)

UT3, XS10, Upstream (MY-01)

UT3, XS10, Downstream (MY-00)

UT3, XS10, Downstream (MY-01)

UT3, XS10, Left Bank (MY-00)

UT3, XS10, Left Bank (MY-01)

UT3, XS10, Right Bank (MY-00)

UT3, XS10, Right Bank (MY-01)

BB-R3, XS11, Upstream (MY-00)

BB-R3, XS11, Upstream (MY-01)

BB-R3, XS11, Downstream (MY-00)

BB-R3, XS11, Downstream (MY-01)

BB-R3, XS11, Left Bank (MY-00)

BB-R3, XS11, Left Bank (MY-01)

BB-R3, XS11, Right Bank (MY-00)

BB-R3, XS11, Right Bank (MY-01)

BB-R3, XS12, Upstream (MY-00)

BB-R3, XS12, Upstream (MY-01)

BB-R3, XS12, Downstream (MY-00)

BB-R3, XS12, Downstream (MY-01)

BB-R3, XS12, Left Bank (MY-00)

BB-R3, XS12, Left Bank (MY-01)

BB-R3, XS12, Right Bank (MY-00)

BB-R3, XS12, Right Bank (MY-01)

UT4-R1, XS13, Upstream (MY-00)

UT4-R1, XS13, Upstream (MY-01)

UT4-R1, XS13, Downstream (MY-00)

UT4-R1, XS13, Downstream (MY-01)

UT4-R1, XS13, Left Bank (MY-00)

UT4-R1, XS13, Left Bank (MY-01)

UT4-R1, XS13, Right Bank (MY-00)

UT4-R1, XS13, Right Bank (MY-01)

UT4-R1, XS14, Upstream (MY-00)

UT4-R1, XS14, Upstream (MY-01)

UT4-R1, XS14, Downstream (MY-00)

UT4-R1, XS14, Downstream (MY-01)

UT4-R1, XS14, Left Bank (MY-00)

UT4-R1, XS14, Left Bank (MY-01)

UT4-R1, XS14, Right Bank (MY-00)

UT4-R1, XS14, Right Bank (MY-01)

UT4-R1, XS15, Upstream (MY-00)

UT4-R1, XS15, Upstream (MY-01)

UT4-R1, XS15, Downstream (MY-00)

UT4-R1, XS15, Downstream (MY-01)

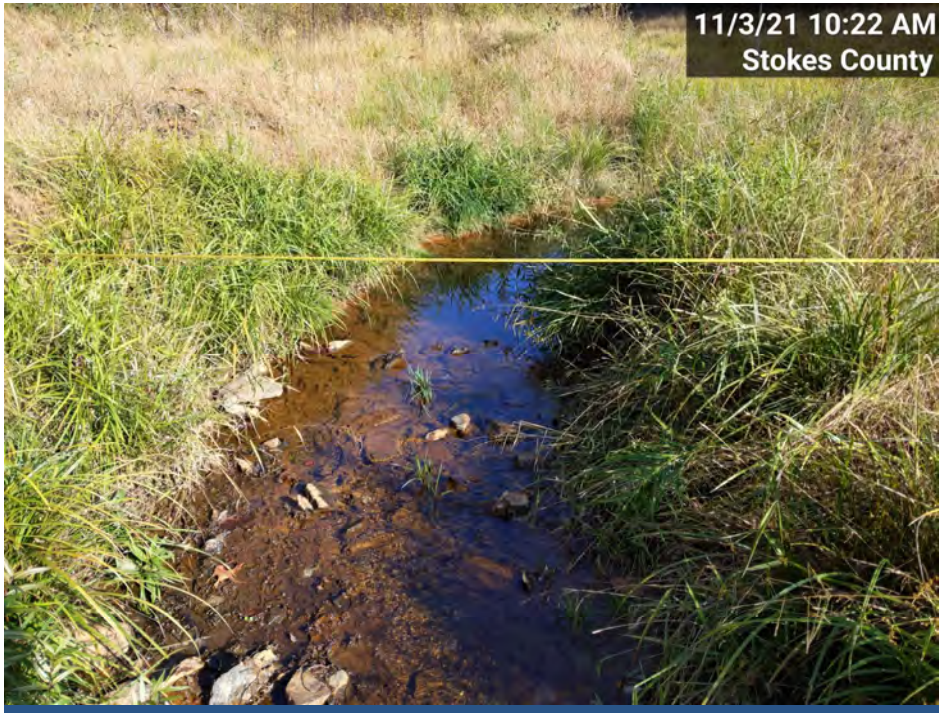
UT4-R1, XS15, Left Bank (MY-00)

UT4-R1, XS15, Left Bank (MY-01)

UT4-R1, XS15, Right Bank (MY-00)

UT4-R1, XS15, Right Bank (MY-01)

UT4-R1, XS16, Upstream (MY-00)



UT4-R1, XS16, Upstream (MY-01)

UT4-R1, XS16, Downstream (MY-00)

UT4-R1, XS16, Downstream (MY-01)

UT4-R1, XS16, Left Bank (MY-00)

UT4-R1, XS16, Left Bank (MY-01)

UT4-R1, XS16, Right Bank (MY-00)

UT4-R1, XS16, Right Bank (MY-01)

UT4-R1, XS17, Upstream (MY-00)

UT4-R1, XS17, Upstream (MY-01)

UT4-R1, XS17, Downstream (MY-00)

UT4-R1, XS17, Downstream (MY-01)

UT4-R1, XS17, Left Bank (MY-00)

UT4-R1, XS17, Left Bank (MY-01)

UT4-R1, XS17, Right Bank (MY-00)

UT4-R1, XS17, Right Bank (MY-01)

UT4-R1, XS18, Upstream (MY-00)

UT4-R1, XS18, Upstream (MY-01)

UT4-R1, XS18, Downstream (MY-00)

UT4-R1, XS18, Downstream (MY-01)

UT4-R1, XS18, Left Bank (MY-00)

UT4-R1, XS18, Left Bank (MY-01)

UT4-R1, XS18, Right Bank (MY-00)

UT4-R1, XS18, Right Bank (MY-01)

UT4-R2, XS19, Upstream (MY-00)

UT4-R2, XS19, Upstream (MY-01)

UT4-R2, XS19, Downstream (MY-00)

UT4-R2, XS19, Downstream (MY-01)

UT4-R2, XS19, Left Bank (MY-00)

UT4-R2, XS19, Left Bank (MY-01)

UT4-R2, XS19, Right Bank (MY-00)

UT4-R2, XS19, Right Bank (MY-01)

UT4-R2, XS20, Upstream (MY-00)

UT4-R2, XS20, Upstream (MY-01)

UT4-R2, XS20, Downstream (MY-00)

UT4-R2, XS20, Downstream (MY-01)

UT4-R2, XS20, Left Bank (MY-00)

UT4-R2, XS20, Left Bank (MY-01)

UT4-R2, XS20, Right Bank (MY-00)

UT4-R2, XS20, Right Bank (MY-01)

PS-1 – UT1-R1, EII, Upstream (MY-00)

PS-1 – UT1-R1, EII, Upstream (MY-01)

PS-1 – UT1-R1, EII, Downstream (MY-00)

PS-1 – UT1-R1, EII, Downstream (MY-01)

PS-2 – UT1-R1 Culvert Crossing, Upstream (MY-00)

PS-2 – UT1-R1 Culvert Crossing, Upstream (MY-01)

PS-2 – UT1-R1 Culvert Crossing, Downstream (MY-00)

PS-2 – UT1-R1 Culvert Crossing, Downstream (MY-01)

PS-3 – UT1A, EII, Upstream (MY-00)

PS-3 – UT1A, EII, Upstream (MY-01)

PS-3 – UT1A, EII, Downstream (MY-00)

PS-3 – UT1A, EII, Downstream (MY-01)

PS-4 – UT1-R2, EII, Upstream (MY-00)

PS-4 – UT1-R2, EII, Upstream (MY-01)

PS-4 – UT1-R2, EII, Downstream (MY-00)

PS-4 – UT1-R2, EII, Downstream (MY-01)

PS-5 – UT1B, EII, Upstream (MY-00)

PS-5 – UT1B, EII, Upstream (MY-01)

PS-5 – UT1B, EII, Downstream (MY-00)

PS-5 – UT1B, EII, Downstream (MY-01)

PS-6 – UT1-R2 Culvert Crossing, Upstream (MY-00)

PS-6 – UT1-R2 Culvert Crossing, Upstream (MY-01)

PS-6 – UT1-R2 Culvert Crossing, Downstream (MY-00)

PS-6 – UT1-R2 Culvert Crossing, Downstream (MY-01)

PS-7 – UT2 Ford Crossing, Upstream (MY-00)

PS-7 – UT2 Ford Crossing, Upstream (MY-01)

PS-7 – UT2 Ford Crossing, Downstream (MY-00)

PS-7 – UT2 Ford Crossing, Downstream (MY-01)

PS-8 – BB-R2 Ford Crossing, Upstream (MY-00)

PS-8 – BB-R2 Ford Crossing, Upstream (MY-01)

PS-8 – BB-R2 Ford Crossing, Downstream (MY-00)

PS-8 – BB-R2 Ford Crossing, Downstream (MY-01)

PS-9 – UT4-R1 Culvert Crossing, Upstream (MY-00)

PS-9 – UT4-R1 Culvert Crossing, Upstream (MY-01)

PS-9 – UT4-R1 Culvert Crossing, Downstream (MY-00)

PS-9 – UT4-R1 Culvert Crossing, Downstream (MY-01)

PS-10 – UT4-R1 Ford Crossing, Upstream (MY-00)

PS-10 – UT4-R1 Ford Crossing, Upstream (MY-01)

PS-10 – UT4-R1 Ford Crossing, Downstream (MY-00)

PS-10 – UT4-R1 Ford Crossing, Downstream (MY-01)

PS-11 – UT1-R1, BMP @ STA 21+00 (MY-01)

PS-13 – UT4-R1, BMP @ STA 14+00 (MY-01)

PS-12 – UT4-R1, BMP @ STA 12+00 (MY-01)

SPA-1 – BB-R1, Piping around rock structure @ STA 44+00 (MY-01)

SPA-2 – BB-R3, Erosion around log vane @ STA 70+50 (MY-01)

SPA-3 – BB-R3, Rock roller not functioning as intended @ STA 72+00 (MY-01)

Appendix B:
Vegetation Plot Data

Redline Plant List
Vegetation Plot Counts and Densities Table
Vegetation Performance Standards Summary Table
Vegetation Plot Photos

Banner Branch Mitigation Project Red-line Planting List				
Species	**Common Name**	**Stems**	**% Planted**	**Mitigation Plan %**
Fraxinus pennsylvanica	Green ash	805	4%	4%
Betula nigra	River birch	1,409	7%	8%
Tilia americana	Basswood	1,409	7%	7%
Quercus michauxii	Swamp chestnut oak	1,409	7%	8%
Platanus occidentalis	American sycamore	2,013	10%	10%
Liriodendron tulipifera	Tulip poplar	2,013	10%	10%
Quercus phellos	Willow oak	1,409	7%	7%
Nyssa sylvatica	Black gum	1,409	7%	8%
Quercus alba	White oak	1,409	7%	7%
Quercus falcata	Southern red oak	1,409	7%	7%
Carpinus caroliniana	American hornbeam	604	3%	3%
Diospyros virginiana	Persimmon	604	3%	3%
Amelanchier arborea	Common serviceberry	604	3%	3%
Hamamelis virginiana	Witch-hazel	604	3%	3%
Asimina triloba	Pawpaw	604	3%	3%
Lindera benzoin	Spicebush	604	3%	3%
Alnus serrulata	Hazel alder	604	3%	3%
Corylus americana	Hazelnut	604	3%	3%
Magnolia tripetala	Umbrella magnolia	604	3%	0%
Total		**20,130**	**100%**	

* changes from mitigation plan in red

Riparian Buffer Live Stake Plantings – Streambanks (Proposed 2'-3' Spacing @ Meander Bends and 6'- 8' Spacing @ Riffle Sections)			
Sambucus canadensis	Elderberry	20%	FACW
Salix sericea	Silky Willow	30%	OBL
Salix nigra	Black Willow	10%	OBL
Cornus amomum	Silky Dogwood	40%	FACW

Banner Branch Planted Stems and Densities Table	
Planted Acreage	30
Date of Initial Plant	2021-04-07
Date(s) of Supplemental Plant(s)	#N/A
Date(s) Mowing	#N/A
Date of Current Survey	2021-11-03
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F		Veg Plot 5 F		Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F		Veg Plot 9 F		Veg Plot 10 F		Veg Plot 11 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Alnus serrulata	hazel alder	Tree	OBL																						
	Amelanchier arborea	common serviceberry	Tree	FAC									1	1					2	2			1	1	1	1
	Asimina triloba	pawpaw	Tree	FAC			1	1									1	1	3	3			1	1	1	1
	Betula nigra	river birch	Tree	FACW			1	1	1	1	2	2			3	3					3	3	4	4	2	2
	Carpinus caroliniana	American hornbeam	Tree	FAC	1	1	1	1					1	1	1	1			1	1	1	1	2	2	3	3
	Cornus amomum	silky dogwood	Shrub	FACW																						
	Corylus americana	American hazelnut	Shrub	FACU			1	1									1	1	1	1					1	1
	Diospyros virginiana	common persimmon	Tree	FAC							1	1											1	1		
	Fraxinus pennsylvanica	green ash	Tree	FACW	6	6							1	1					3	3	2	2			1	1
	Hamamelis virginiana	American witchhazel	Tree	FACU			1	1							1	1	1	1			1	1				
	Lindera benzoin	northern spicebush	Tree	FAC			1	1							1	1									1	1
	Liriodendron tulipifera	tuliptree	Tree	FACU			1	1	1	1	3	3	2	2	2	2			2	2			2	2	1	1
	Nyssa sylvatica	blackgum	Tree	FAC			1	1					4	4	2	2			1	1			2	2	2	2
	Platanus occidentalis	American sycamore	Tree	FACW	7	7	1	1	7	7			2	2	1	1	4	4			2	2			3	3
	Quercus alba	white oak	Tree	FACU			1	1	1	1			2	2	5	5	3	3					1	1	1	1
	Quercus falcata	southern red oak	Tree	FACU									3	3	2	2	1	1			1	1			1	1
	Quercus michauxii	swamp chestnut oak	Tree	FACW			2	2	3	3	1	1	3	3	1	1	1	1			1	1	2	2		
	Quercus phellos	willow oak	Tree	FAC	1	1	3	3	2	2	5	5	2	2	1	1							1	1	2	2
	Tilia americana	American basswood	Tree	FACU	1	1	1	1							2	2			1	1						
Sum	Performance Standard				16	16	16	16	15	15	12	12	21	21	22	22	12	12	14	14	11	11	17	17	20	20
Post Mitigation Plan Species	Magnolia tripetala	umbrella-tree	Tree	FACU															2	2	2	2			1	1
Sum	Proposed Standard				16	16	16	16	15	15	12	12	21	21	22	22	12	12	16	16	13	13	17	17	21	21
Mitigation Plan Performance Standard	Current Year Stem Count				16		16		15		12		21		22		12		14		11		17		20	
	Stems/Acre				648		648		607		486		850		891		486		567		445		688		810	
	Species Count				5		13		6		5		10		12		7		8		7		10		13	
	Dominant Species Composition (%)				44		19		47		42		19		23		33		19		23		24		14	
	Average Plot Height				1		1		1		1		2		2		2		2		2		2		2	
	% Invasives				0		0		0		0		0		0		0		0		0		0		0	
Post Mitigation Plan Performance Standard	Current Year Stem Count				16		16		15		12		21		22		12		16		13		17		21	
	Stems/Acre				648		648		607		486		850		891		486		648		526		688		850	
	Species Count				5		13		6		5		10		12		7		9		8		10		14	
	Dominant Species Composition (%)				44		19		47		42		19		23		33		19		23		24		14	
	Average Plot Height				1		1		1		1		2		2		2		2		2		2		2	
	% Invasives				0		0		0		0		0		0		0		0		0		0		0	

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Banner Branch Planted Stems and Densities Table	
Planted Acreage	30
Date of Initial Plant	2021-04-07
Date(s) of Supplemental Plant(s)	#N/A
Date(s) Mowing	#N/A
Date of Current Survey	2021-11-03
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 12 F		Veg Plot 13 F		Veg Plot 14 F		Veg Plot 15 F		Veg Plot 16 F		Veg Plot 17 F		Veg Plot 18 F		Veg Plot 19 F		Veg Plot 20 F		Veg Plot 21 F		Veg Plot 22 R	Veg Plot 23 R	Veg Plot 24 R
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total	Total	Total
Species Included in Approved Mitigation Plan	Alnus serrulata	hazel alder	Tree	OBL	1	1							1	1	2	2	2	2			1	1			1		1
	Amelanchier arborea	common serviceberry	Tree	FAC			4	4							1	1	1	1			1	1	1	1			1
	Asimina triloba	pawpaw	Tree	FAC			2	2			2	2	1	1	3	3					1	1				1	
	Betula nigra	river birch	Tree	FACW							3	3			1	1			1	1							1
	Carpinus caroliniana	American hornbeam	Tree	FAC							1	1	1	1			1	1							1	1	
	Cornus amomum	silky dogwood	Shrub	FACW																				1			
	Corylus americana	American hazelnut	Shrub	FACU	1	1	1	1			2	2	1	1	1	1	1	1	1	1			1	1			
	Diospyros virginiana	common persimmon	Tree	FAC					2	2	1	1	1	1					2	2					2		
	Fraxinus pennsylvanica	green ash	Tree	FACW	4	4	3	3					2	2	1	1			2	2	1	1	2	2	1	1	1
	Hamamelis virginiana	American witchhazel	Tree	FACU	1	1			3	3	1	1					2	2	1	1						1	1
	Lindera benzoin	northern spicebush	Tree	FAC									2	2	1	1			2	2	1	1	1	1		1	
	Liriodendron tulipifera	tuliptree	Tree	FACU			2	2			1	1	2	2	4	4	1	1	2	2	2	2					
	Nyssa sylvatica	blackgum	Tree	FAC	1	1			2	2			3	3			2	2			1	1	1	1		1	
	Platanus occidentalis	American sycamore	Tree	FACW	2	2					2	2	1	1	1	1			3	3	3	3	4	4	3	2	2
	Quercus alba	white oak	Tree	FACU	2	2	1	1	3	3	2	2	1	1	1	1					1	1			1		1
	Quercus falcata	southern red oak	Tree	FACU	1	1	1	1	5	5			1	1	2	2	3	3			3	3	3	3	1		
	Quercus michauxii	swamp chestnut oak	Tree	FACW	2	2	3	3	1	1					1	1	2	2									
	Quercus phellos	willow oak	Tree	FAC	2	2	1	1	1	1	2	2			2	2	1	1	3	3	2	2			3	1	1
	Tilia americana	American basswood	Tree	FACU	2	2	1	1	1	1			3	3	2	2	2	2			1	1	1	1		1	
Sum	Performance Standard				19	19	19	19	18	18	17	17	20	20	23	23	18	18	17	17	18	18	14	15	13	10	9
Post Mitigation Plan Species	Magnolia tripetala	umbrella-tree	Tree	FACU			1	1	1	1			1	1	1	1			1	1							
Sum	Proposed Standard				19	19	20	20	19	19	17	17	21	21	24	24	18	18	18	18	18	18	14	15	13	10	9
Mitigation Plan Performance Standard	Current Year Stem Count				19		19		18		17		20		23		18		17		18		15		13	10	9
	Stems/Acre				769		769		729		688		810		931		729		688		729		607		526	405	364
	Species Count				11		10		8		10		13		14		11		9		12		9		8	9	8
	Dominant Species Composition (%)				21		20		26		18		14		17		17		17		17		27		23	20	22
	Average Plot Height				2		2		2		2		2		2		2		2		2		2		2	2	2
	% Invasives				0		0		0		0		0		0		0		0		0		0		0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count				19		20		19		17		21		24		18		18		18		15		13	10	9
	Stems/Acre				769		810		769		688		850		972		729		729		729		607		526	405	364
	Species Count				11		11		9		10		14		15		11		10		12		9		8	9	8
	Dominant Species Composition (%)				21		20		26		18		14		17		17		17		17		27		23	20	22
	Average Plot Height				2		2		2		2		2		2		2		2		2		2		2	2	2
	% Invasives				0		0		0		0		0		0		0		0		0		0		0	0	0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Vegetation Performance Standards Summary Table												
	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	648	1	5	0	648	1	13	0	607	1	6	0
Monitoring Year 0	769	2	6	0	810	2	13	0	729	1	7	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	486	1	5	0	850	2	10	0	891	2	12	0
Monitoring Year 0	729	1	6	0	850	2	10	0	1012	2	12	0
	Veg Plot 7 F				Veg Plot 8 F				Veg Plot 9 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	486	2	7	0	567	2	8	0	445	2	7	0
Monitoring Year 0	810	2	9	0	567	2	8	0	567	2	10	0
	Veg Plot 10 F				Veg Plot 11 F				Veg Plot 12 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	688	2	10	0	810	2	13	0	769	2	11	0
Monitoring Year 0	729	2	10	0	810	2	13	0	931	2	13	0
	Veg Plot 13 F				Veg Plot 14 F				Veg Plot 15 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	769	2	10	0	729	2	8	0	688	2	10	0
Monitoring Year 0	891	2	13	0	850	2	10	0	972	2	13	0
	Veg Plot 16 F				Veg Plot 17 F				Veg Plot 18 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	810	2	13	0	931	2	14	0	729	2	11	0
Monitoring Year 0	1052	2	15	0	1093	2	15	0	891	2	12	0
	Veg Plot 19 F				Veg Plot 20 F				Veg Plot 21 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	688	2	9	0	729	2	12	0	607	2	9	0
Monitoring Year 0	850	2	10	0	810	2	14	0				
	Veg Plot Group 22 R				Veg Plot Group 23 R				Veg Plot Group 24 R			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	526	2	8	0	405	2	9	0	364	2	8	0
Monitoring Year 0	769	2	9	0	729	1	11	0	769	2	9	0

*Each monitoring year represents a different plot for the random vegetation plot "groups". Random plots are denoted with an R, and fixed plots with an F.

Fixed Veg Plot 1 (MY-00)

Fixed Veg Plot 1 (MY-01)

Fixed Veg Plot 2 (MY-00)

Fixed Veg Plot 2 (MY-01)

Fixed Veg Plot 3 (MY-00)

Fixed Veg Plot 3 (MY-01)

Fixed Veg Plot 4 (MY-00)

Fixed Veg Plot 4 (MY-01)

Fixed Veg Plot 5 (MY-00)

Fixed Veg Plot 5 (MY-01)

Fixed Veg Plot 6 (MY-00)

Fixed Veg Plot 6 (MY-01)

Fixed Veg Plot 7 (MY-00)

Fixed Veg Plot 7 (MY-01)

Fixed Veg Plot 8 (MY-00)

Fixed Veg Plot 8 (MY-01)

Fixed Veg Plot 9 (MY-00)

Fixed Veg Plot 9 (MY-01)

Fixed Veg Plot 10 (MY-00)

Fixed Veg Plot 10 (MY-01)

Fixed Veg Plot 11 (MY-00)

Fixed Veg Plot 11 (MY-01)

Fixed Veg Plot 12 (MY-00)

Fixed Veg Plot 12 (MY-01)

Fixed Veg Plot 13 (MY-00)

Fixed Veg Plot 13 (MY-01)

Fixed Veg Plot 14 (MY-00)

Fixed Veg Plot 14 (MY-01)

Fixed Veg Plot 15 (MY-00)

Fixed Veg Plot 15 (MY-01)

Fixed Veg Plot 16 (MY-00)

Fixed Veg Plot 16 (MY-01)

Fixed Veg Plot 17 (MY-00)

Fixed Veg Plot 17 (MY-01)

Fixed Veg Plot 18 (MY-00)

Fixed Veg Plot 18 (MY-01)

Fixed Veg Plot 19 (MY-00)

Fixed Veg Plot 19 (MY-01)

Fixed Veg Plot 20 (MY-00)

Fixed Veg Plot 20 (MY-01)

Fixed Veg Plot 21 (New Plot MY-01)

Random Veg Plot 22 (View North) (MY-01)

Random Veg Plot 22 (View South) (MY-01)

Random Veg Plot 23 (View Northeast) (MY-01)

Random Veg Plot 23 (View Southwest) (MY-01)

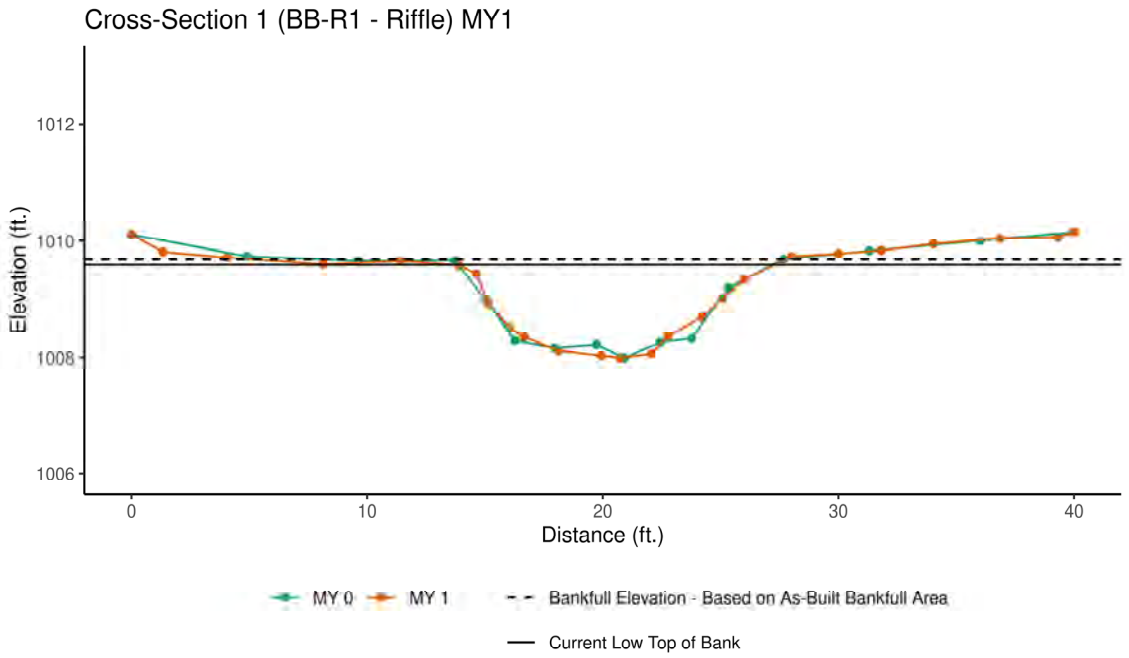
Random Veg Plot 24 (View North) (MY-01)

Random Veg Plot 24 (View South) (MY-01)

Appendix C:

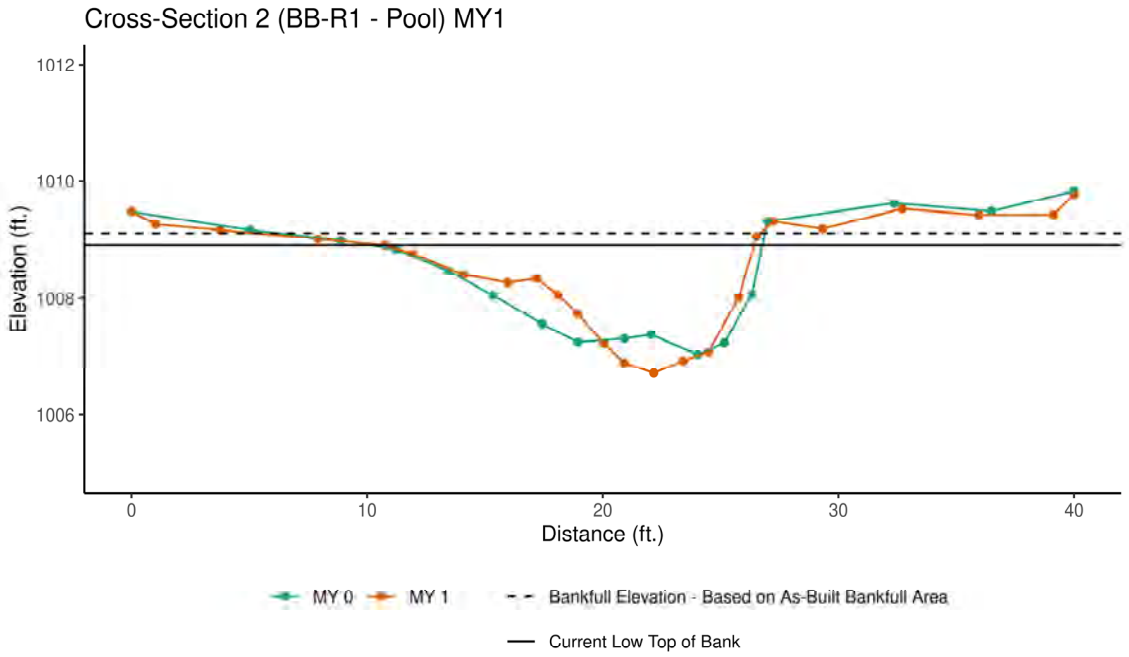
Stream Geomorphology Data

Cross-Sections with Annual Overlays
Baseline Stream Data Summary Tables
Cross-Section Morphology Data



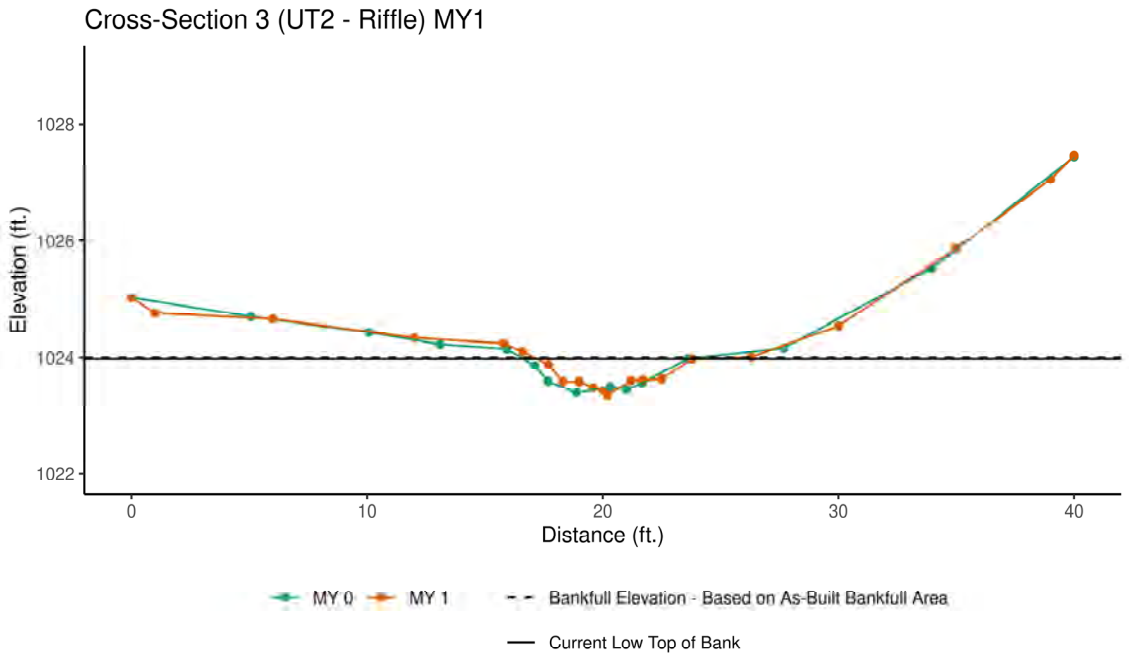
Distance	Elevation	Features
0	1010.108	TLP
1.3389466	1009.814	
4.07553898	1009.718	
8.1176908	1009.601	
11.4263951	1009.657	
13.869781	1009.59	TLB, BKF
14.6432198	1009.433	
15.1384687	1008.934	
16.0364117	1008.51	
16.6691406	1008.35	LEW
18.1405878	1008.117	
19.9388095	1008.032	
20.7284572	1007.996	THW
22.0602767	1008.062	
22.7640087	1008.364	REW
24.2181165	1008.692	
25.0922346	1009.011	
25.9888115	1009.336	
28.0167209	1009.736	TRB
30.0075161	1009.783	
31.8122016	1009.84	
34.0363548	1009.951	
36.8668601	1010.045	
39.325791	1010.063	
40	1010.152	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1009.67	1009.68						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.94						
Thalweg Elevation	1008.00	1008.00						
LTOB Elevation	1009.67	1009.59						
LTOB Max Depth	1.675	1.594						
LTOB Cross Sectional Area	14.77	13.52						



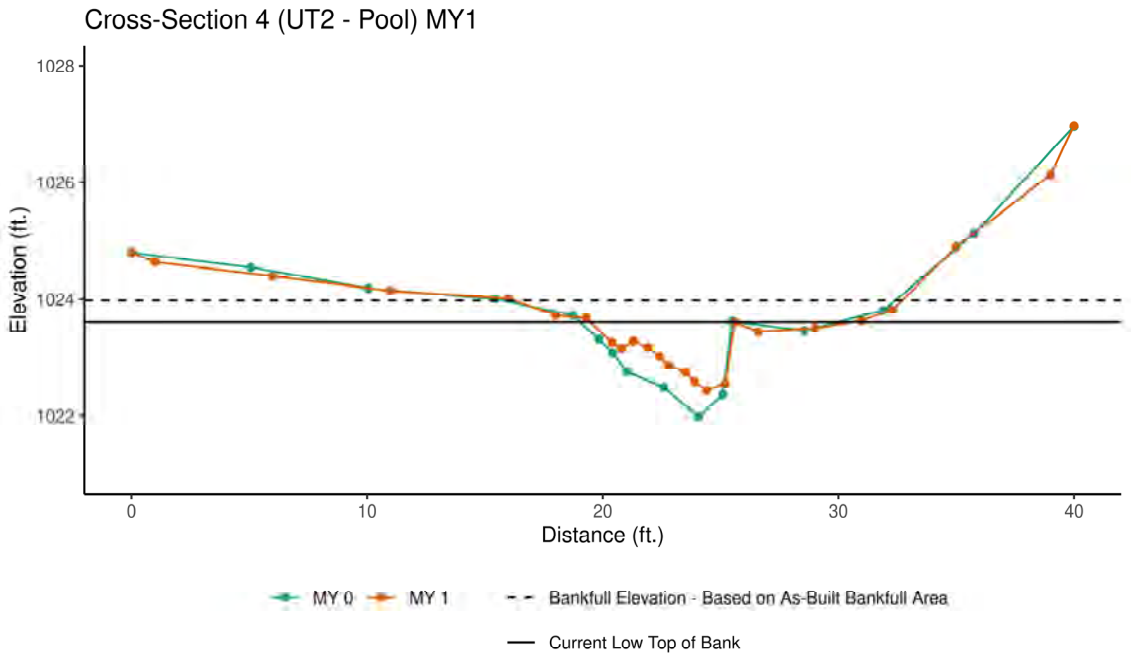
Distance	Elevation	Features
0	1009.489	TLP
1.02530483	1009.273	
3.76523279	1009.174	
7.9195003	1009.015	
10.7785756	1008.907	TLB, BKF
11.9372964	1008.766	
14.0897112	1008.403	
15.9882592	1008.268	
17.192098	1008.337	
18.1026414	1008.055	LEW
18.9302855	1007.729	
20.0482426	1007.227	
20.9117106	1006.887	
22.1632947	1006.715	THW
23.3976794	1006.919	
24.4870183	1007.075	
25.7670177	1008.009	REW
26.5274338	1009.056	
27.2279319	1009.325	TRB
29.3299576	1009.195	
32.7101898	1009.541	
35.9515717	1009.432	
39.1320853	1009.437	
40	1009.778	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1008.99	1009.12						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.91						
Thalweg Elevation	1007.03	1006.72						
LTOB Elevation	1008.99	1008.91						
LTOB Max Depth	1.961	2.192						
LTOB Cross Sectional Area	19.91	16.61						



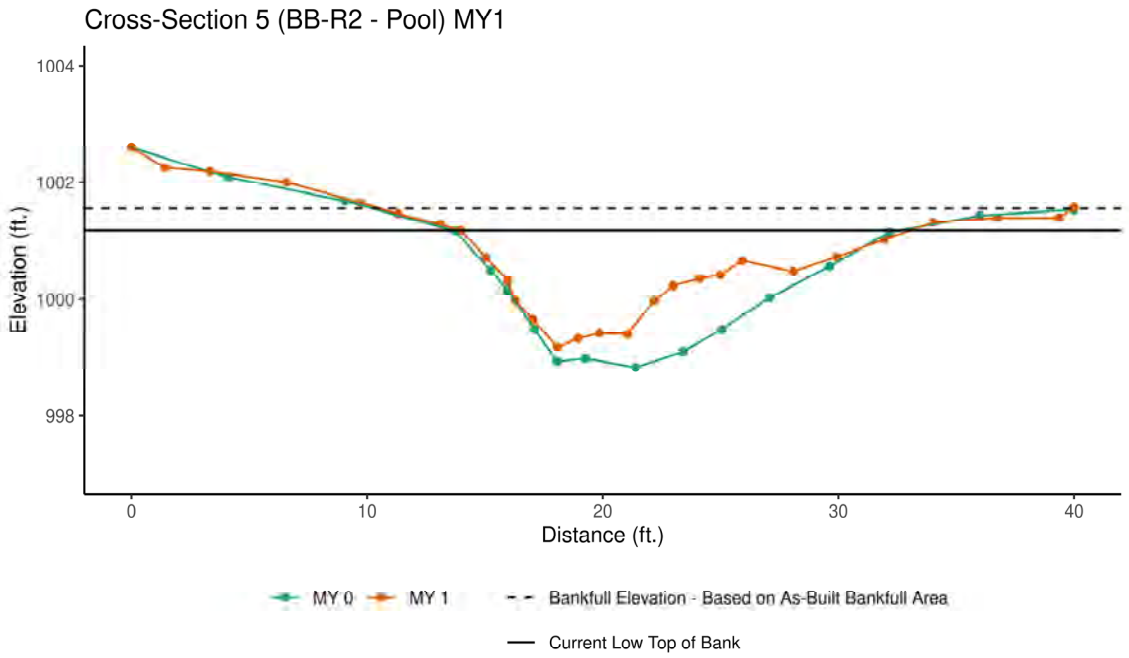
Distance	Elevation	Features
0	1025.028	TLP
1	1024.758	
6	1024.658	
12	1024.338	
15.8	1024.238	TLB
16.6	1024.098	
17.7	1023.878	
18.3	1023.588	LEW
19	1023.588	
19.6	1023.488	
20	1023.438	
20.2	1023.358	THW
21.2	1023.608	
21.7	1023.618	REW
22.5	1023.638	
23.8	1023.978	TRB, BKF
26.3	1024.008	
30	1024.538	
35	1025.878	
39	1027.048	
40	1027.458	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1023.98	1024.00						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.96						
Thalweg Elevation	1023.45	1023.36						
LTOB Elevation	1023.98	1023.98						
LTOB Max Depth	0.527	0.62						
LTOB Cross Sectional Area	2.36	2.21						



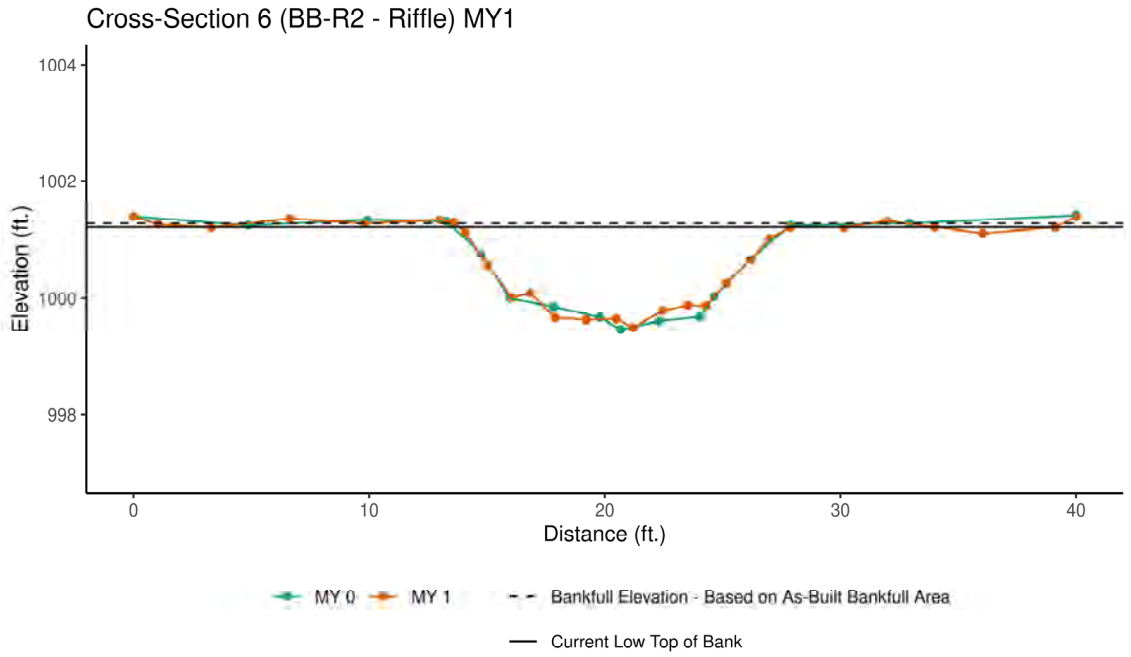
Distance	Elevation	Features
0	1024.802	TLP
1	1024.642	
6	1024.392	
11	1024.142	
16	1024.012	
18	1023.722	
19.3	1023.672	TLB
20.4	1023.252	
20.8	1023.152	
21.3	1023.282	
21.9	1023.172	
22.4	1023.022	LEW
22.8	1022.862	
23.5	1022.752	
23.9	1022.592	
24.4	1022.442	THW
25.2	1022.552	REW
25.6	1023.602	TRB, BKF
26.6	1023.442	
29	1023.502	
31	1023.632	
32.3	1023.812	
35	1024.902	
39	1026.132	
40	1026.972	TLP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1023.62	1023.98						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.75						
Thalweg Elevation	1021.98	1022.44						
LTOB Elevation	1023.62	1023.60						
LTOB Max Depth	1.635	1.16						
LTOB Cross Sectional Area	6.12	3.82						



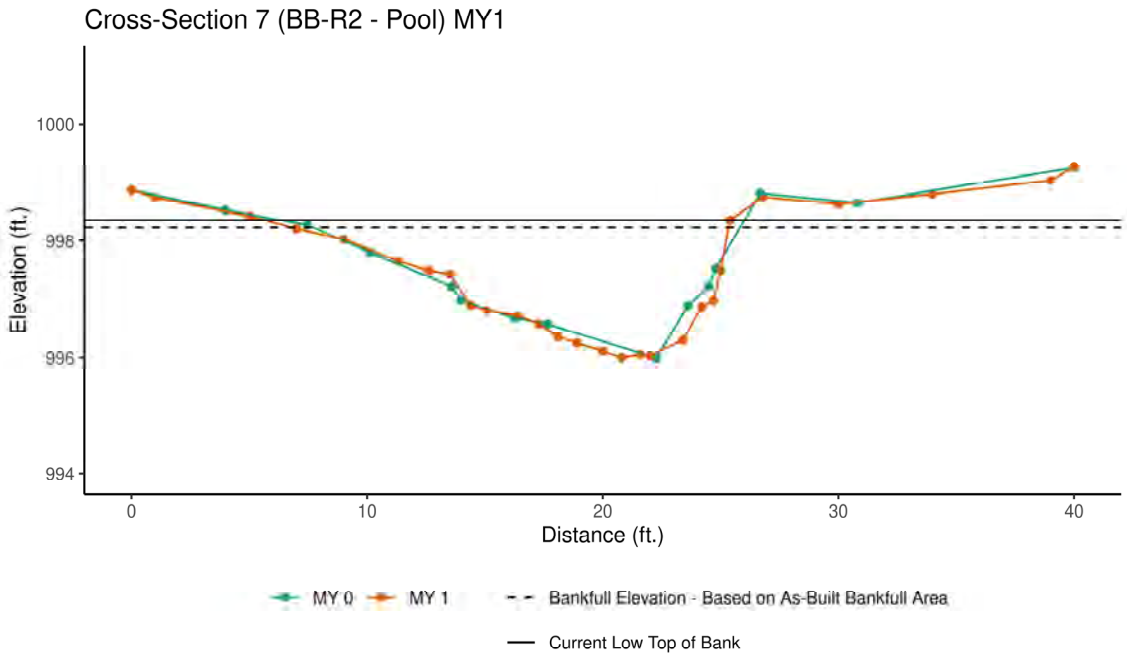
Distance	Elevation	Features
0	1002.598	TLP
1.42007922	1002.259	
3.32587101	1002.193	
6.58253811	1002	
9.72084899	1001.657	
11.3186918	1001.469	
13.1223841	1001.288	
13.9691221	1001.184	TLB, BKF
15.0348119	1000.724	
15.9748515	1000.314	
16.279566	999.98	LEW
17.0345986	999.649	
18.0712042	999.179	THW
18.951778	999.329	
19.8665947	999.417	
21.052279	999.402	
22.1858844	999.968	REW
22.9841453	1000.232	
24.1163374	1000.355	
24.9949796	1000.415	
25.9226102	1000.665	
28.0679565	1000.474	
29.9325753	1000.728	
31.9507291	1001.027	
34.0369774	1001.324	TRB
36.7479634	1001.4	
39.3703453	1001.402	
40	1001.572	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1001.15	1001.56						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.84						
Thalweg Elevation	998.94	999.18						
LTOB Elevation	1001.15	1001.18						
LTOB Max Depth	2.217	2.005						
LTOB Cross Sectional Area	24.67	17.50						



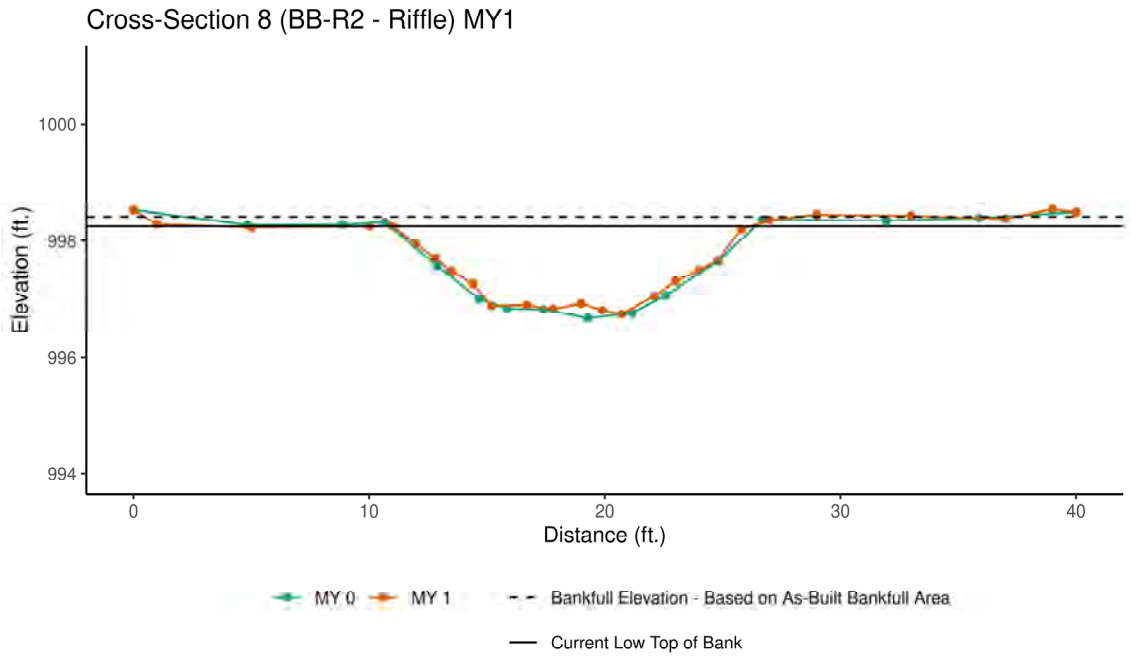
Distance	Elevation	Features
0	1001.408	TLP
1.04339111	1001.273	
3.2938564	1001.221	
6.64277088	1001.372	
9.80513916	1001.289	
13.0038158	1001.353	
13.5868386	1001.313	TLB
14.0726297	1001.123	
15.0319584	1000.568	
16.0586203	1000.01	
16.846915	1000.092	LEW
17.8951077	999.661	
19.2167022	999.625	
20.4847039	999.643	
21.2107697	999.494	THW
22.4665383	999.781	
23.5193191	999.876	
24.297892	999.867	REW
25.1441337	1000.254	
26.2090442	1000.658	
27.0008379	1001.028	
27.8832635	1001.223	TRB, BKF
30.1478998	1001.22	
31.9753299	1001.334	
34.0101073	1001.227	
36.045805	1001.117	
39.1192548	1001.222	
40	1001.407	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1001.25	1001.29						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.96						
Thalweg Elevation	999.46	999.49						
LTOB Elevation	1001.25	1001.22						
LTOB Max Depth	1.792	1.729						
LTOB Cross Sectional Area	16.63	15.67						



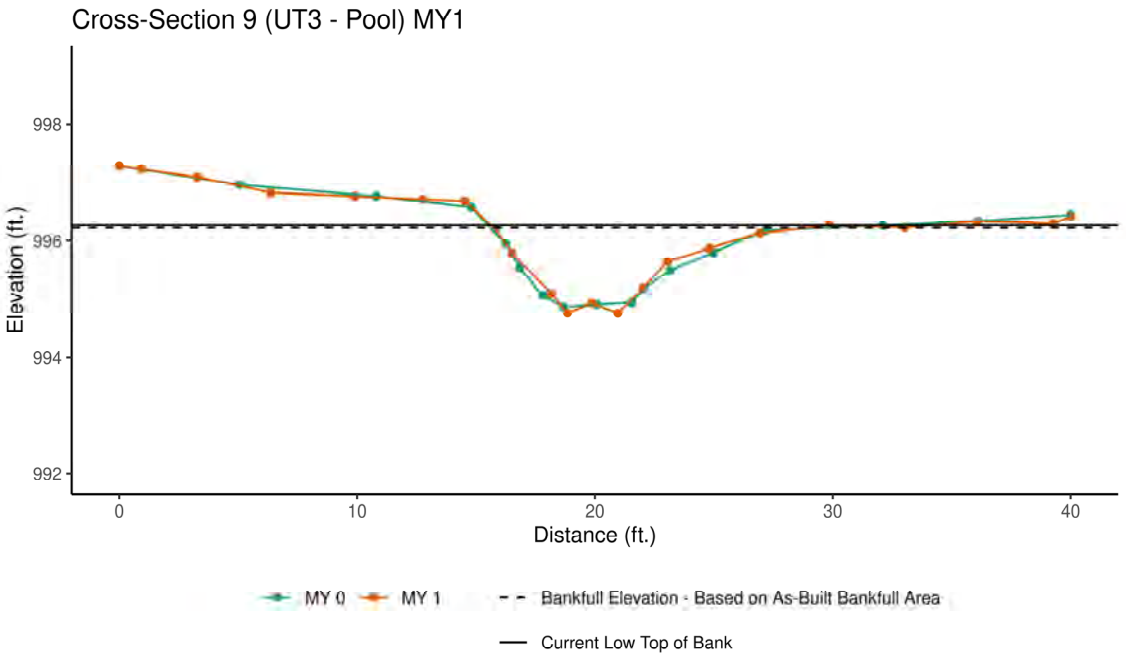
Distance	Elevation	Features
0	998.871	TLP
1	998.741	
5	998.431	TLB
7	998.211	
9	998.031	
11.3	997.661	
12.6	997.491	
13.5	997.431	
14.4	996.891	
15.1	996.801	
16.4	996.711	
17.3	996.571	
18.1	996.351	
18.9	996.251	
20	996.111	
20.8	996.001	THW
21.6	996.051	
22	996.031	
23.4	996.301	
24.2	996.861	
24.7	996.971	
25	997.491	
25.4	998.361	TRB, BKF
26.8	998.751	
30	998.631	
34	998.801	
39	999.031	
40	999.271	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	998.28	998.23						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.06						
Thalweg Elevation	995.99	996.00						
LTOB Elevation	998.28	998.36						
LTOB Max Depth	2.283	2.36						
LTOB Cross Sectional Area	22.81	25.31						



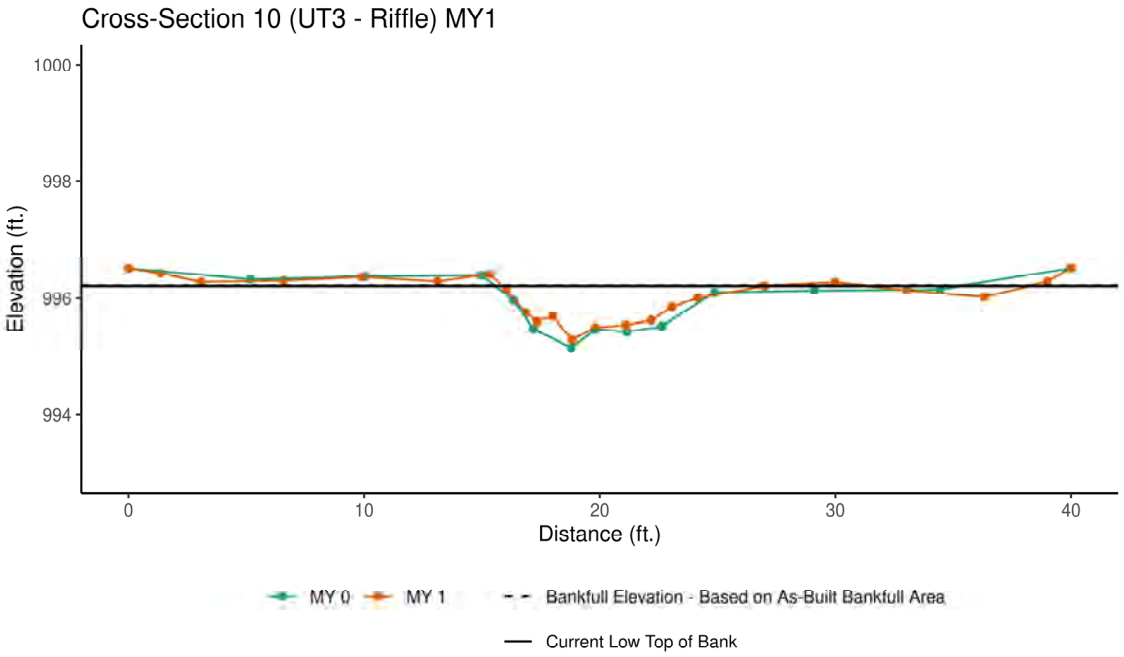
Distance	Elevation	Features
0	998.535	TLP
1	998.295	
5	998.235	
10	998.255	
11	998.255	TLB, BKF
12	997.935	
12.8	997.715	
13.5	997.475	
14.4	997.265	
15.2	996.885	LEW
16.7	996.895	
17.8	996.825	
19	996.925	
19.9	996.805	
20.7	996.735	THW
22.1	997.055	REW
23	997.305	
24	997.485	
24.8	997.675	
25.8	998.205	
27	998.365	TRB
29	998.455	
33	998.435	
37	998.385	
39	998.545	
40	998.495	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	998.33	998.42						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.90						
Thalweg Elevation	996.67	996.74						
LTOB Elevation	998.33	998.26						
LTOB Max Depth	1.659	1.52						
LTOB Cross Sectional Area	17.48	14.98						



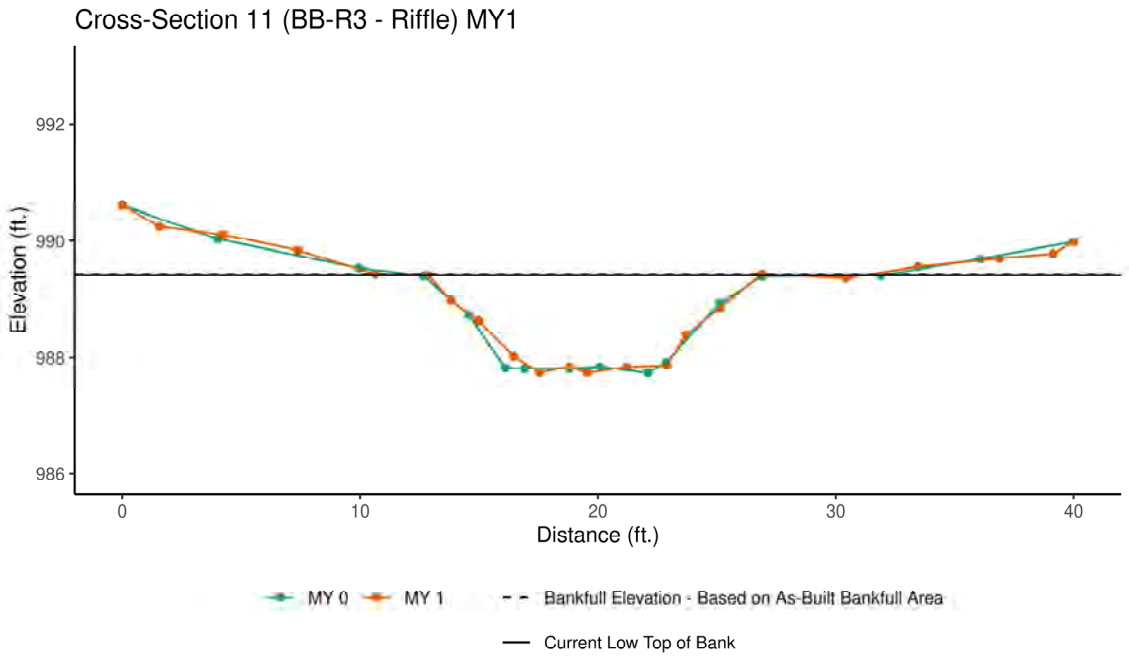
Distance	Elevation	Features
0	997.283	TLP
0.94100213	997.231	
3.3026942	997.089	
6.36884519	996.826	
9.89867516	996.763	
12.7685946	996.712	
14.529063	996.684	TLB
15.8110161	996.209	
16.5113805	995.791	LEW
18.1779441	995.094	
18.8492516	994.757	
19.8703283	994.932	
20.9654678	994.754	THW
22.0254677	995.19	
23.044198	995.646	REW
24.8097448	995.875	
26.9310473	996.136	
29.8471084	996.274	TRB, BKF
33.0385514	996.235	
36.0546204	996.342	
39.2776237	996.305	
40	996.422	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	996.19	996.23						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.03						
Thalweg Elevation	994.86	994.75						
LTOB Elevation	996.19	996.27						
LTOB Max Depth	1.323	1.52						
LTOB Cross Sectional Area	8.82	9.44						



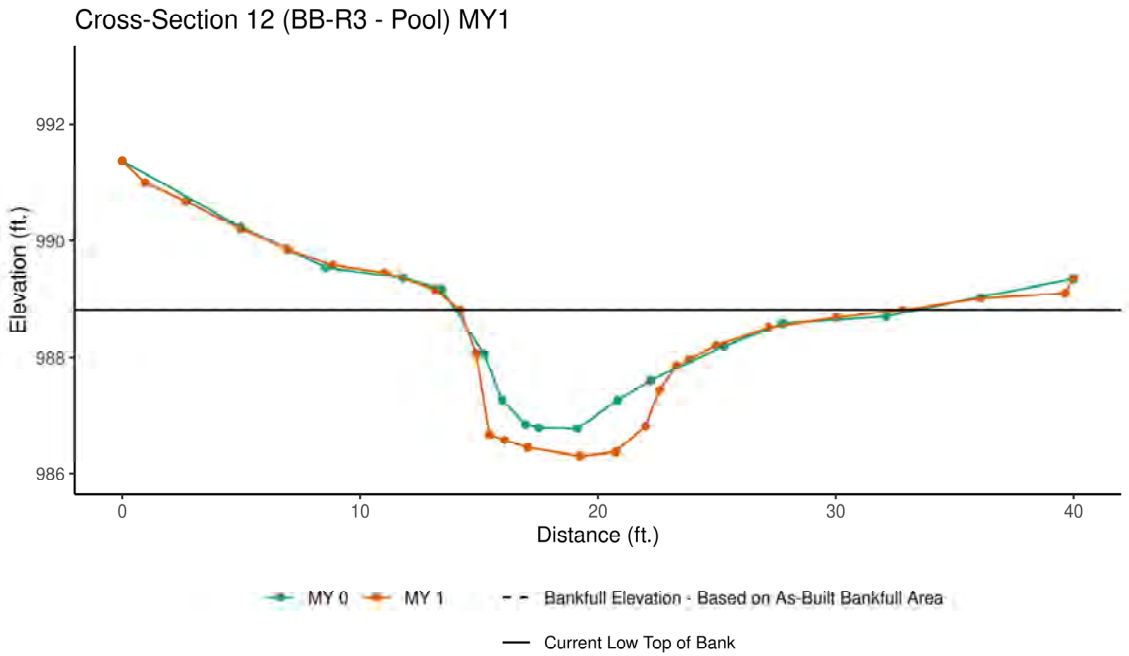
Distance	Elevation	Features
0	996.512	TLP
1.34735333	996.427	
3.05889604	996.275	
6.56734931	996.297	
9.9084793	996.362	
13.1131127	996.283	
15.3190246	996.413	TLB
16.0296304	996.145	
16.8666972	995.749	
17.333357	995.6	LEW
18.0027156	995.684	
18.8295127	995.287	THW
19.8105509	995.494	
21.0972002	995.535	REW
22.1859568	995.619	
23.0584627	995.849	
24.1646171	996.006	
26.9636679	996.209	TRB, BKF
29.9868655	996.268	
33.0070753	996.137	
36.3049607	996.024	
38.9929333	996.281	
40	996.518	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	996.10	996.21						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.99						
Thalweg Elevation	995.15	995.29						
LTOB Elevation	996.10	996.21						
LTOB Max Depth	0.955	0.922						
LTOB Cross Sectional Area	4.91	4.85						



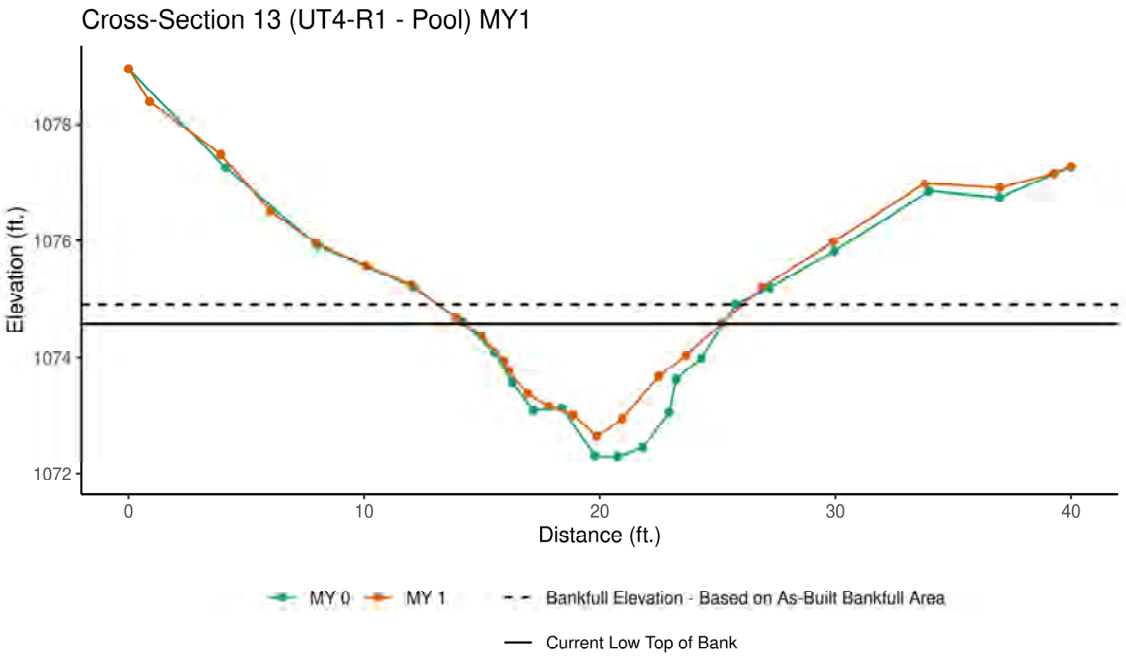
Distance	Elevation	Features
0	990.615	TLP
1.58446237	990.25	
4.22376905	990.11	
7.40645799	989.841	
10.6378805	989.428	
12.8459023	989.413	TLB, BKF
13.8198909	988.979	
14.982943	988.628	
16.4592626	988.019	LEW
17.5481411	987.743	
18.8087262	987.845	
19.5527319	987.739	THW
21.2193155	987.836	
22.9087337	987.864	REW
23.6932028	988.384	
25.1444699	988.849	
26.8928675	989.431	TRB
30.4440107	989.356	
33.4725403	989.561	
36.880266	989.704	
39.1344688	989.781	
40	989.987	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	989.39	989.43						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.99						
Thalweg Elevation	987.74	987.74						
LTOB Elevation	989.39	989.41						
LTOB Max Depth	1.654	1.674						
LTOB Cross Sectional Area	15.65	15.44						



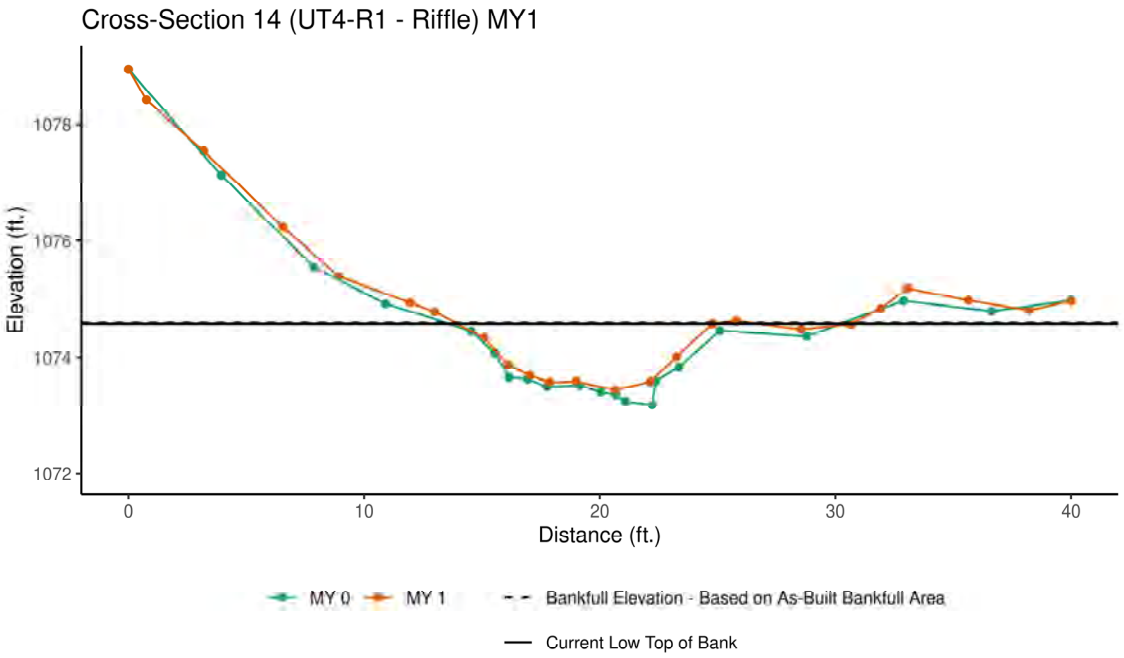
Distance	Elevation	Features
0	991.368	TLP
0.96664626	990.993	
2.69351685	990.677	
4.97867221	990.216	
6.94436009	989.859	
8.84351316	989.583	
11.0610171	989.452	
13.1475866	989.167	
14.2031628	988.814	TLB, BKF
14.8857376	988.061	
15.4402877	986.677	LEW
16.0791683	986.579	
17.0492851	986.453	
19.2630215	986.306	THW
20.7520544	986.38	
22.0059611	986.822	
22.5807559	987.445	REW
23.3037615	987.859	
23.8654949	987.974	
24.9744051	988.203	
27.1920631	988.516	
30.0457706	988.683	
32.817284	988.809	
36.098866	989.016	TRB
39.638426	989.104	
40	989.37	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	989.04	988.82						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.00						
Thalweg Elevation	986.79	986.31						
LTOB Elevation	989.04	988.81						
LTOB Max Depth	2.249	2.508						
LTOB Cross Sectional Area	21.50	21.45						



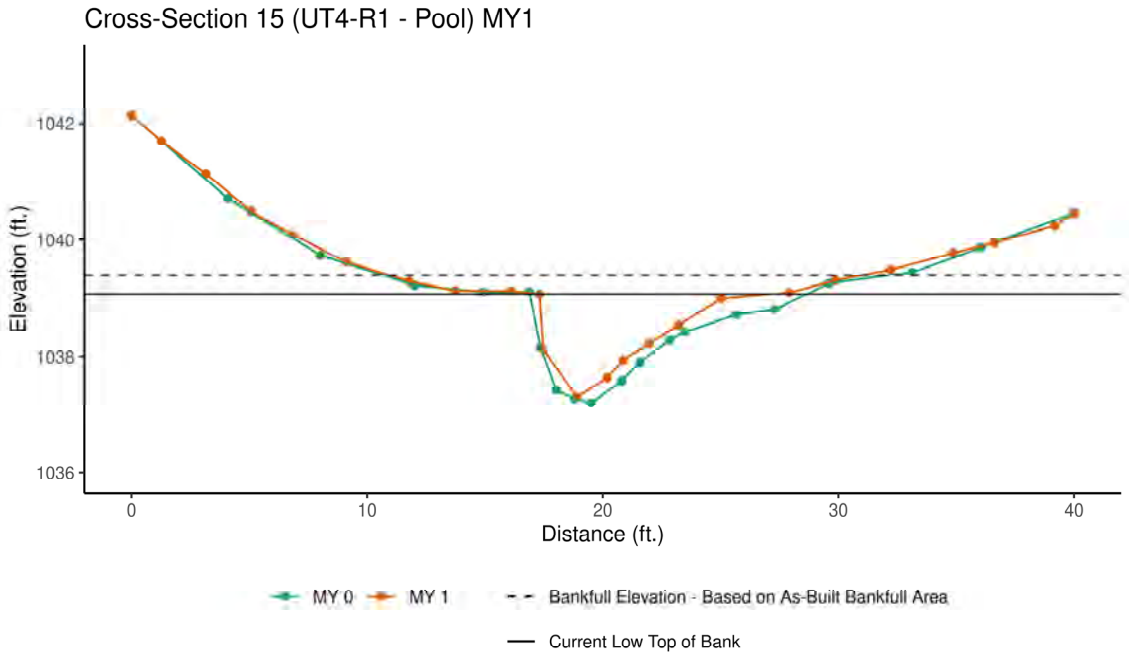
Distance	Elevation	Features
0	1078.95	TLP
0.89619306	1078.391	
3.91647916	1077.483	
6.03067575	1076.515	
7.95166259	1075.965	
10.083123	1075.575	
12.0103197	1075.243	
13.9254542	1074.666	TLB, BKF
14.9831506	1074.365	
15.9466404	1073.938	
16.1404019	1073.775	LEW
16.9428197	1073.383	
17.8382856	1073.158	
18.88113	1073.016	
19.8802095	1072.649	THW
20.9602757	1072.95	
22.5064294	1073.685	REW
23.6498153	1074.028	
25.1550613	1074.575	TRB
26.8978722	1075.2	
29.9154983	1075.989	
33.7968219	1076.982	
36.9765679	1076.907	
39.2814612	1077.151	
40	1077.28	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1074.60	1074.91						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.85						
Thalweg Elevation	1072.31	1072.65						
LTOB Elevation	1074.60	1074.58						
LTOB Max Depth	2.289	1.926						
LTOB Cross Sectional Area	14.60	10.98						



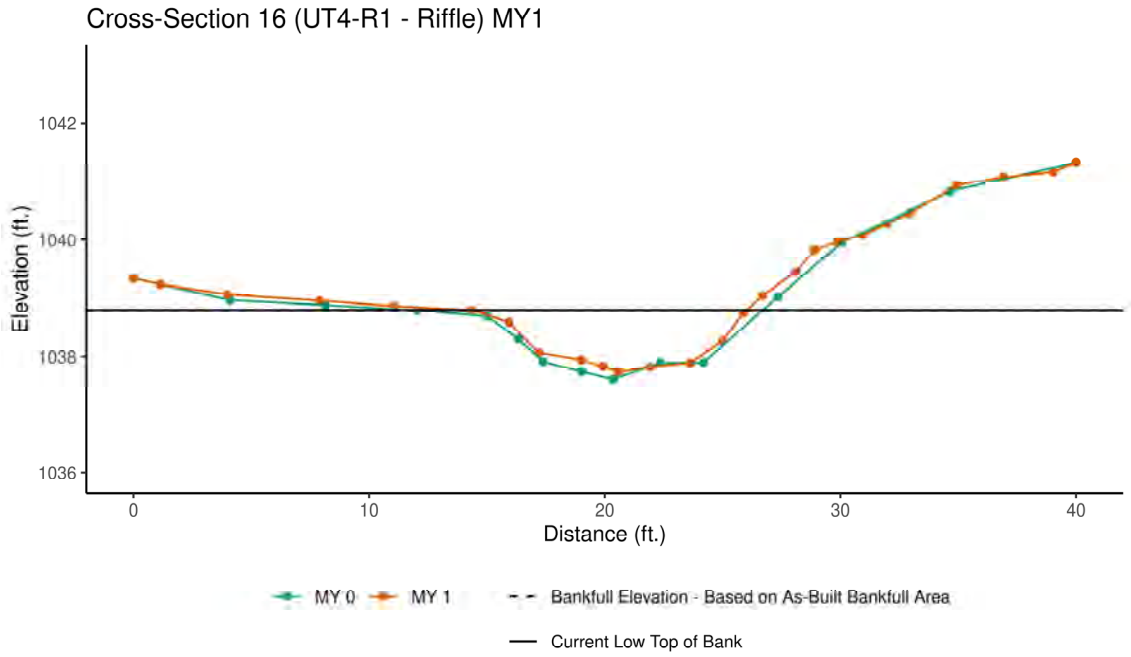
Distance	Elevation	Features
0	1078.94	TLP
0.76377025	1078.42	
3.19290839	1077.536	
6.54654138	1076.244	
8.92523081	1075.388	
11.9441903	1074.943	
12.9947114	1074.778	TLB
15.0940362	1074.336	
16.1099088	1073.869	
17.0371836	1073.693	LEW
17.8740597	1073.576	THW
19.0000921	1073.59	
20.650208	1073.449	
22.1498891	1073.586	REW
23.2569678	1074.015	
24.7828304	1074.577	TRB
25.8046861	1074.624	
28.5329313	1074.484	
30.6583784	1074.57	
31.9233292	1074.833	
33.042202	1075.188	
35.6445489	1074.98	
38.2207401	1074.806	
40	1074.971	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1074.45	1074.59						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.99						
Thalweg Elevation	1073.24	1073.58						
LTOB Elevation	1074.45	1074.58						
LTOB Max Depth	1.211	1.001						
LTOB Cross Sectional Area	7.83	7.67						



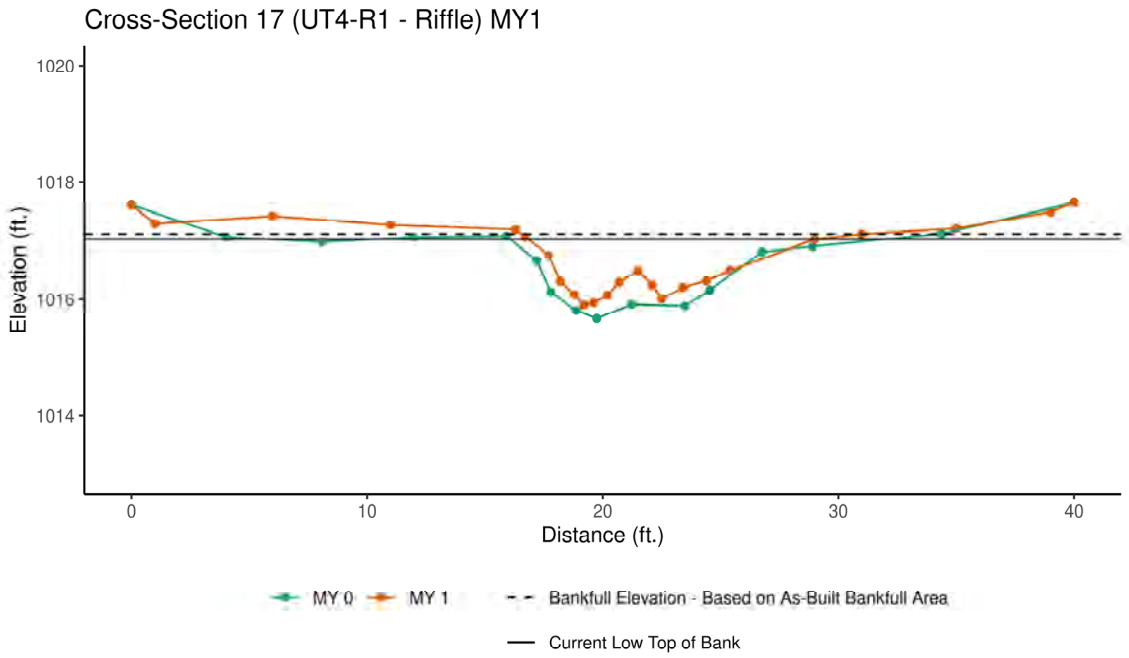
Distance	Elevation	Features
0	1042.14	TLP
1.27512548	1041.692	
3.15700143	1041.13	
5.08232043	1040.493	
6.84950465	1040.089	
9.10677253	1039.626	
11.77607	1039.289	
13.735975	1039.132	
16.0980087	1039.126	
17.3157531	1039.071	TLB, BKF
17.4801229	1038.119	
18.9049647	1037.307	THW
20.1862554	1037.638	
20.8706177	1037.938	
21.9742578	1038.22	
23.2275374	1038.538	REW
25.0179639	1038.99	
27.9058006	1039.097	TRB
29.8759987	1039.304	
32.2196515	1039.488	
34.8700489	1039.78	
36.6062726	1039.949	
39.1726605	1040.245	
40	1040.456	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1039.11	1039.39						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.85						
Thalweg Elevation	1037.27	1037.31						
LTOB Elevation	1039.11	1039.07						
LTOB Max Depth	1.84	1.764						
LTOB Cross Sectional Area	10.71	7.54						



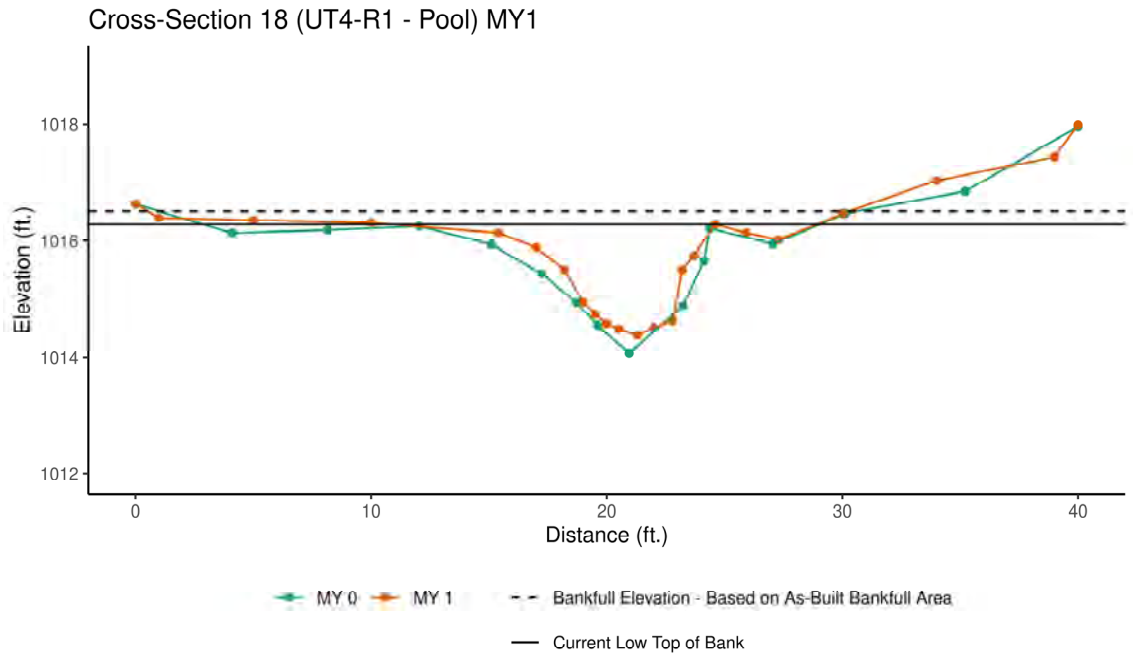
Distance	Elevation	Features
0	1039.34	TLP
1.13315886	1039.238	
3.99218599	1039.066	
7.90580654	1038.959	
11.0568843	1038.86	
14.3346117	1038.793	TLB, BKF
15.9334265	1038.583	
17.1992407	1038.066	
19.0123853	1037.94	LEW
19.9221989	1037.831	
20.5864276	1037.731	THW
21.924643	1037.822	
23.6334071	1037.887	REC
24.9948781	1038.269	
25.8920409	1038.742	
26.7035752	1039.046	
28.0984118	1039.448	
28.9036856	1039.832	TRB
29.8908212	1039.962	
30.9476968	1040.081	
31.9778928	1040.278	
32.9640136	1040.464	
34.9475604	1040.936	
36.9196335	1041.074	
39.0319225	1041.161	
40	1041.329	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1038.68	1038.79						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.01						
Thalweg Elevation	1037.61	1037.73						
LTOB Elevation	1038.68	1038.79						
LTOB Max Depth	1.074	1.062						
LTOB Cross Sectional Area	7.80	7.89						



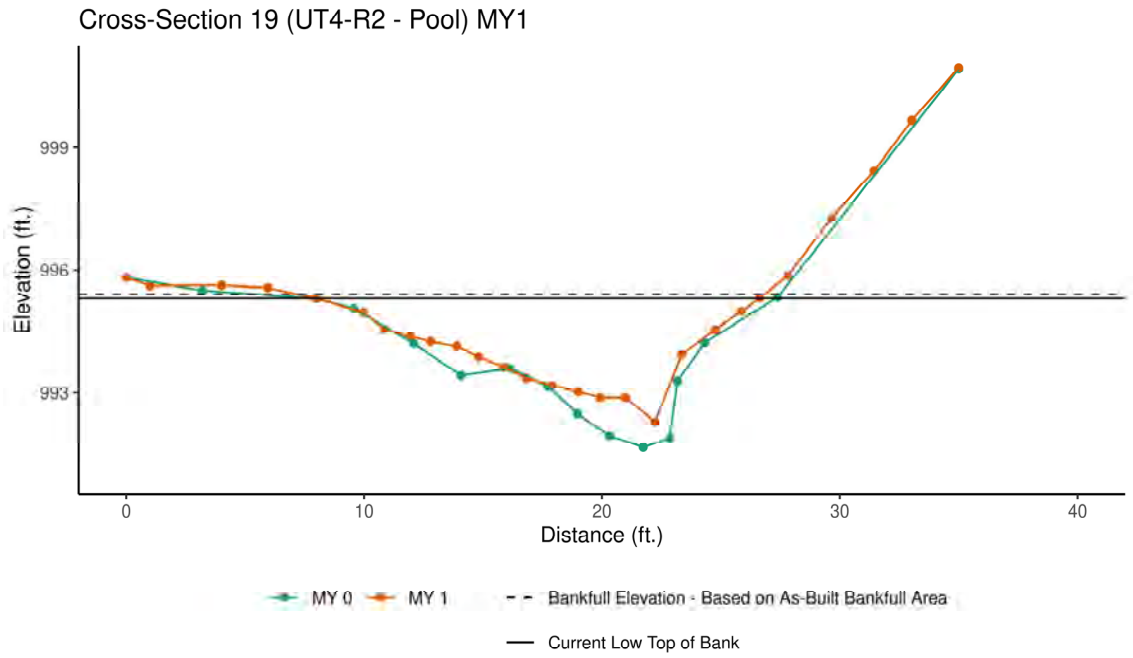
Distance	Elevation	Features
0	1017.62	TLP
1	1017.3	
6	1017.43	
11	1017.28	
16.3	1017.2	TLB
16.7	1017.07	
17.7	1016.76	
18.2	1016.3	LEW
18.8	1016.08	
19.2	1015.9	THW
19.6	1015.94	
20.2	1016.07	
20.7	1016.29	
21.5	1016.48	
22.1	1016.24	
22.5	1016.01	
23.4	1016.2	
24.4	1016.31	REW
25.4	1016.49	
29	1017.03	TRB, BKF
31	1017.12	
35	1017.22	
39	1017.5	
40	1017.66	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1016.91	1017.12						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.93						
Thalweg Elevation	1015.66	1015.90						
LTOB Elevation	1016.91	1017.03						
LTOB Max Depth	1.245	1.13						
LTOB Cross Sectional Area	8.36	7.26						



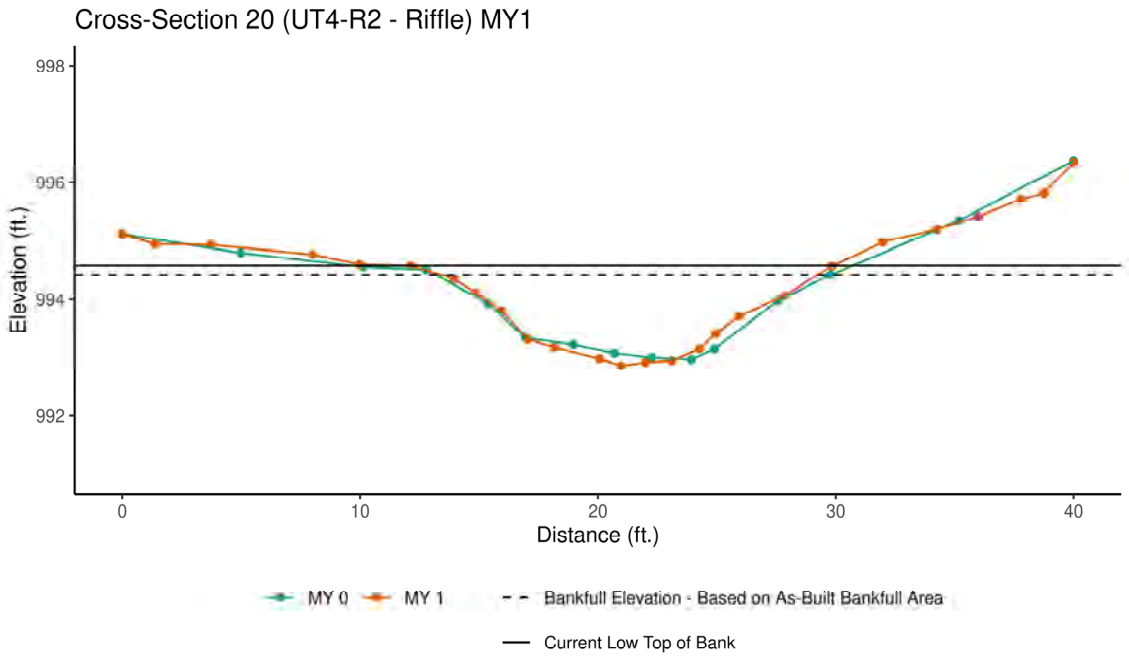
Distance	Elevation	Features
0	1016.64	TLP
1	1016.4	
5	1016.36	
10	1016.32	TLB
15.4	1016.14	
17	1015.89	
18.2	1015.5	
19	1014.95	LEW
19.5	1014.74	
20	1014.58	
20.5	1014.49	
21.3	1014.38	THW
22	1014.51	
22.8	1014.63	REW
23.2	1015.5	
23.7	1015.75	
24.6	1016.29	TRB, BKF
25.9	1016.14	
27.3	1016.02	
30	1016.47	
34	1017.03	
39	1017.44	
40	1017.99	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1016.26	1016.51						
Bank Height Ratio - Based on As-Built Bankfull Area	0.96	0.90						
Thalweg Elevation	1014.07	1014.38						
LTOB Elevation	1016.22	1016.29						
LTOB Max Depth	2.147	1.91						
LTOB Cross Sectional Area	11.81	9.98						



Distance	Elevation	Features
0	995.816	TLP
0.99530749	995.616	
4.01229336	995.628	
5.95897181	995.565	
7.9408123	995.309	TLB, BKF
9.98044969	994.956	
10.8491189	994.549	
11.9485187	994.371	
12.7961967	994.248	
13.905358	994.131	
14.8198227	993.876	
15.8818314	993.618	
16.8156371	993.356	LEW
17.909128	993.184	
19.0150011	993.018	
19.9347761	992.877	
20.9917653	992.875	
22.226884	992.278	THW
23.3540065	993.927	
24.7566674	994.537	
25.8749535	994.988	
26.636961	995.314	
27.8095466	995.861	TRB
29.670828	997.292	
31.4446524	998.426	
33.0312948	999.671	
35	1000.955	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	995.05	995.40						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.97						
Thalweg Elevation	991.65	992.28						
LTOB Elevation	995.05	995.31						
LTOB Max Depth	3.406	3.031						
LTOB Cross Sectional Area	27.60	25.94						



Distance	Elevation	Features
0	995.117	TLP
1.37275089	994.949	
3.72739104	994.936	
8.00083121	994.768	
9.98922384	994.598	
12.1484294	994.575	TLB
13.946928	994.35	
14.8677042	994.112	
15.9538685	993.803	
17.0691938	993.314	LEW
18.1844439	993.17	
20.0710775	992.979	
20.981256	992.857	THW
21.9978345	992.915	
23.1127023	992.946	
24.2756142	993.151	REW
24.9659488	993.411	
25.9487818	993.705	
27.8283056	994.056	
29.8410689	994.569	
31.9825498	994.982	TRB, BKF
34.2536515	995.199	
35.9816767	995.425	
37.801928	995.716	
38.7582887	995.816	
40	996.341	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	994.42	994.41						
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.10						
Thalweg Elevation	993.07	992.86						
LTOB Elevation	994.42	994.58						
LTOB Max Depth	1.342	1.718						
LTOB Cross Sectional Area	14.51	17.20						

Baseline Stream Data Summary
Banner Branch, UT2

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)		11.8			1		6.0		7.0	
Floodprone Width (ft)		14.0			1	9.0	15.0		21.9	
Bankfull Mean Depth (ft)		0.4			1		0.4		0.4	
Bankfull Max Depth (ft)		0.8			1		0.5		0.6	
Bankfull Cross Sectional Area (ft^2)		4.5			1		2.3		2.6	
Width/Depth Ratio		30.9			1		16.0		19.1	
Entrenchment Ratio		1.2			1	1.5	2.5		3.1	
Bank Height Ratio		1.0			1		1.0		1.0	
Max part size (mm) mobilized at bankfull	125.0					121.0		123.0		
Rosgen Classification	F4					B4		B4		
Bankfull Discharge (cfs)	10.00					10.00		10.00		
Sinuosity (ft)	1.14					1.10		1.10		
Water Surface Slope (Channel) (ft/ft)	0.0341					0.0352		0.0358		
Other										

Banner Branch, UT1C (lower)

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)		4.4			1		4.5		3.1	
Floodprone Width (ft)		6.4			1	12.0	20.0		4.6	
Bankfull Mean Depth (ft)		0.6			1		0.4		0.1	
Bankfull Max Depth (ft)		0.9			1		0.5		0.2	
Bankfull Cross Sectional Area (ft^2)		2.6			1		1.6		0.4	
Width/Depth Ratio		7.5			1		12.5		24.0	
Entrenchment Ratio		1.5			1	2.7	4.4		1.5	
Bank Height Ratio		5.3			1		1.0		1.0	
Max part size (mm) mobilized at bankfull	199.0					149.0		184.0		
Rosgen Classification	B4a					B4		B4		
Bankfull Discharge (cfs)	6.00					6.00		6.00		
Sinuosity (ft)	1.10					1.08		1.06		
Water Surface Slope (Channel) (ft/ft)	0.0497					0.0506		0.0779		
Other										

Banner Branch, UT3

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)		5.6			1		8.0		9.0	
Floodprone Width (ft)		32.0			1	20.0	40.0		40.0	
Bankfull Mean Depth (ft)		1.1			1		0.6		0.5	
Bankfull Max Depth (ft)		1.7			1		0.7		1.0	
Bankfull Cross Sectional Area (ft^2)		6.2			1		4.6		4.9	
Width/Depth Ratio		5.1			1		14.1		16.4	
Entrenchment Ratio		5.7			1	2.5	5.0		4.5	
Bank Height Ratio		1.4			1		1.0		1.0	
Max part size (mm) mobilized at bankfull	93.0					59.0		88.0		
Rosgen Classification	E5					C4		C4		
Bankfull Discharge (cfs)	24.00					24.00		24.00		
Sinuosity (ft)	1.03					1.22		1.21		
Water Surface Slope (Channel) (ft/ft)	0.0104					0.0099		0.0157		
Other										

Baseline Stream Data Summary
Banner Branch, BB-R1

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)		14.8			1		13.0		13.9	
Floodprone Width (ft)		26.4			1	35.0	75.0	35.0	75.0	
Bankfull Mean Depth (ft)		1.1			1		1.1		1.1	
Bankfull Max Depth (ft)		1.6			1		1.4		1.7	
Bankfull Cross Sectional Area (ft^2)		16.1			1		14.0		14.8	
Width/Depth Ratio		13.6			1		12.1		13.0	
Entrenchment Ratio		1.8			1	2.7	5.8		>5	
Bank Height Ratio		1.2			1		1.0		1.0	
Max part size (mm) mobilized at bankfull	88.0					96.0		87.0		
Rosgen Classification	B4c					C4		C4		
Bankfull Discharge (cfs)	55.0					55.0		55.0		
Sinuosity (ft)	1.34					1.15		1.14		
Water Surface Slope (Channel) (ft/ft)	0.0082					0.0093		0.0089		
Other										

Banner Branch, BB-R2

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)		13.7			1		14.0		14.4	
Floodprone Width (ft)		93.1			1	65.0	155.0	65.0	140.0	
Bankfull Mean Depth (ft)		1.5			1		1.1		1.2	
Bankfull Max Depth (ft)		2.1			1		1.5		1.8	
Bankfull Cross Sectional Area (ft^2)		21.0			1		16.0		16.6	
Width/Depth Ratio		9.0			1		12.3		12.5	
Entrenchment Ratio		6.8			1	4.6	11.1		>5	
Bank Height Ratio		1.5			1		1.0		1.0	
Max part size (mm) mobilized at bankfull	98.0					86.0		82.0		
Rosgen Classification	E4					C4		C4		
Bankfull Discharge (cfs)	60.0					60.0		60.0		
Sinuosity (ft)	1.31					1.24		1.24		
Water Surface Slope (Channel) (ft/ft)	0.0071					0.0074		0.0073		
Other										

Banner Branch, BB-R3

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)		14.6			1		15.0	17.5		
Floodprone Width (ft)		51.0			1	50.0	120.0	50.0	120.0	
Bankfull Mean Depth (ft)		1.5			1		1.2	1.1		
Bankfull Max Depth (ft)		2.7			1		1.6	1.7		
Bankfull Cross Sectional Area (ft^2)		21.9			1		17.8	17.5		
Width/Depth Ratio		9.7			1		12.6	14.5		
Entrenchment Ratio		3.5			1	3.3	8.0	>5		
Bank Height Ratio		1.4			1		1.0	1.0		
Max part size (mm) mobilized at bankfull	79.0					65.0		78.0		
Rosgen Classification	E4					C4		C4		
Bankfull Discharge (cfs)	70.0					70.0		70.0		
Sinuosity (ft)	1.15					1.20		1.18		
Water Surface Slope (Channel) (ft/ft)	0.0053					0.0061		0.0075		
Other										

Baseline Stream Data Summary
Banner Branch, UT4-R1 (upper)

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	9.9	11.0		12.2	1		11.0	10.5	11.4	
Floodprone Width (ft)	14.7	15.0		15.3	1	25.0	40.0	29.5	32.5	
Bankfull Mean Depth (ft)	0.7	0.7		0.8	1		0.7	0.7	0.8	
Bankfull Max Depth (ft)	1.0	1.1		1.2	1		0.9	1.1	1.3	
Bankfull Cross Sectional Area (ft^2)	8.2	8.3		8.3	1		7.7	7.8	8.1	
Width/Depth Ratio	11.8	14.8		17.8	1		15.8	13.8	16.6	
Entrenchment Ratio	1.3	1.4		1.5	1	2.3	3.6	2.6	3.1	
Bank Height Ratio	1.5	1.9		2.3	1		1.0		1.0	
Max part size (mm) mobilized at bankfull	132.0					147.0		142.0		
Rosgen Classification	B4c/F4					B4c		B4c		
Bankfull Discharge (cfs)	30.0					30.0		30.0		
Sinuosity (ft)	1.23					1.14		1.11		
Water Surface Slope (Channel) (ft/ft)	0.0185					0.0248		0.0235		
Other										

Banner Branch, UT4-R1 (lower)

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)				12.2	1		11.0		12.5	
Floodprone Width (ft)				15.3	1	37.0	70.0		40.0	
Bankfull Mean Depth (ft)				0.7	1		0.7		0.7	
Bankfull Max Depth (ft)				1.0	1		0.7		1.2	
Bankfull Cross Sectional Area (ft^2)				8.3	1		7.7		8.4	
Width/Depth Ratio				17.8	1		15.8		18.6	
Entrenchment Ratio				1.3	1		>2.2		3.2	
Bank Height Ratio				1.8	1		1.0		1.0	
Max part size (mm) mobilized at bankfull	132.0					147.0		96.0		
Rosgen Classification	F4					C4b		B4c		
Bankfull Discharge (cfs)	30.0					30.0		30.0		
Sinuosity (ft)	1.23					1.18		1.19		
Water Surface Slope (Channel) (ft/ft)	0.0185					0.0145		0.0141		
Other										

Banner Branch, UT4-R2

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)				10.7	1		12.0		16.6	
Floodprone Width (ft)				39.0	1	43.0	126.0		37.6	
Bankfull Mean Depth (ft)				1.0	1		0.8		0.9	
Bankfull Max Depth (ft)				1.4	1		1.3		1.5	
Bankfull Cross Sectional Area (ft^2)				10.7	1		9.5		14.9	
Width/Depth Ratio				10.5	1		12.0		18.5	
Entrenchment Ratio				3.7	1	3.6	<6		2.3	
Bank Height Ratio				1.2	1		1.0		1.0	
Max part size (mm) mobilized at bankfull	132.0					103.0		81.0		
Rosgen Classification	incised E4					C5		C5		
Bankfull Discharge (cfs)	40.0					40.0		40.0		
Sinuosity (ft)	1.21					1.23		1.27		
Water Surface Slope (Channel) (ft/ft)	0.0012					0.012		0.011		
Other										

Monitoring Data - Cross Section Morphology Monitoring Summary

Banner Branch/DMS: 100080 Segment/Reach: BB-R1, BB-R2, BB-R3, UT2, UT3, UT4-R1, UT4-R2

	Cross-Section 1 (Riffle - BB-R1)							Cross-Section 2 (Pool - BB-R1)							Cross-Section 3 (Riffle - UT2)							Cross-Section 4 (Pool - UT2)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	1009.67	1009.68						1008.99	1009.12						1023.98	1024.00						1023.62	1023.98					
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	0.94						1.00	0.91						1.00	0.96						1.00	0.75					
Thalweg Elevation	1008.00	1008.00						1007.03	1006.72						1023.45	1023.36						1021.98	1022.44					
LTOB[2] Elevation	1009.67	1009.59						1008.99	1008.91						1023.98	1023.98						1023.62	1023.60					
LTOB[2] Max Depth (ft)	1.68	1.59						1.96	2.19						0.53	0.62						1.63	1.16					
LTOB[2] Cross Sectional Area (ft^2)	14.77	13.52						19.91	16.61						2.36	2.21						6.12	3.82					

	Cross-Section 5 (Pool - BB-R2)							Cross-Section 6 (Riffle - BB-R2)							Cross-Section 7 (Pool - BB-R2)							Cross-Section 8 (Riffle - BB-R2)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	1001.15	1001.56						1001.25	1001.29						998.28	998.23						998.33	998.42					
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	0.84						1.00	0.96						1.00	1.06						1.00	0.90					
Thalweg Elevation	998.94	999.18						999.46	999.49						995.99	996.00						996.67	996.74					
LTOB[2] Elevation	1001.15	1001.18						1001.25	1001.22						998.28	998.36						998.33	998.26					
LTOB[2] Max Depth (ft)	2.22	2.01						1.79	1.73						2.28	2.36						1.66	1.52					
LTOB[2] Cross Sectional Area (ft^2)	24.67	17.50						16.63	15.67						22.81	25.31						17.48	14.98					

	Cross-Section 9 (Pool - UT3)							Cross-Section 10 (Riffle - UT3)							Cross-Section 11 (Riffle - BB-R3)							Cross-Section 12 (Pool - BB-R3)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	996.19	996.23						996.10	996.21						989.39	989.43						989.04	988.82					
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	1.03						1.00	0.99						1.00	0.99						1.00	1.00					
Thalweg Elevation	994.86	994.75						995.15	995.29						987.74	987.74						986.79	986.31					
LTOB[2] Elevation	996.19	996.27						996.10	996.21						989.39	989.41						989.04	988.81					
LTOB[2] Max Depth (ft)	1.32	1.52						0.96	0.92						1.65	1.67						2.25	2.51					
LTOB[2] Cross Sectional Area (ft^2)	8.82	9.44						4.91	4.85						15.65	15.44						21.50	21.45					

	Cross-Section 13 (Pool - UT4-R1)							Cross-Section 14 (Riffle - UT4-R1)							Cross-Section 15 (Pool - UT4-R1)							Cross-Section 16 (Riffle - UT4-R1)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	1074.60	1074.91						1074.45	1074.59						1039.11	1039.39						1038.68	1038.79					
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	0.85						1.00	0.99						1.00	0.85						1.00	1.01					
Thalweg Elevation	1072.31	1072.65						1073.24	1073.58						1037.27	1037.31						1037.61	1037.73					
LTOB[2] Elevation	1074.60	1074.58						1074.45	1074.58						1039.11	1039.07						1038.68	1038.79					
LTOB[2] Max Depth (ft)	2.29	1.93						1.21	1.00						1.84	1.76						1.07	1.06					
LTOB[2] Cross Sectional Area (ft^2)	14.60	10.98						7.83	7.67						10.71	7.54						7.80	7.89					

	Cross-Section 17 (Riffle - UT4-R1)							Cross-Section 18 (Pool - UT4-R1)							Cross-Section 19 (Pool - UT4-R2)							Cross-Section 20 (Riffle - UT4-R2)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	1016.91	1017.12						1016.26	1016.51						995.05	995.40						994.42	994.41					
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	0.93						0.96	0.90						1.00	0.97						1.00	1.10					
Thalweg Elevation	1015.66	1015.90						1014.07	1014.38						991.65	992.28						993.07	992.86					
LTOB[2] Elevation	1016.91	1017.03						1016.22	1016.29						995.05	995.31						994.42	994.58					
LTOB[2] Max Depth (ft)	1.25	1.13						2.15	1.91						3.41	3.03						1.34	1.72					
LTOB[2] Cross Sectional Area (ft^2)	8.36	7.26						11.81	9.98						27.60	25.94						14.51	17.20					

The above morphology parameters reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT and industry mitigation providers/practitioners. The outcome resulted in the focus on three primary morphological parameters of interest for the purposes of tracking channel change moving forward. They are the bank height ratio using a constant As-built bankfull area and the cross sectional area and max depth based on each years low top of bank. These are calculated as follows:

1 - **Bank Height Ratio (BHR)** takes the As-built bankful area as the basis for adjusting each subsequent years bankfull elevation. For example if the As-built bankfull area was 10 ft2, then the MY1 bankfull elevation would be adjusted until the calculated bankfull area within the MY1 cross section survey = 10 ft2. The BHR would then be calculated with the difference between the low top of bank (LTOB) elevation for MY1 and the thalweg elevation for MY1 in the numerator with the difference between the MY1 bankfull elevation and the MY1 thalweg elevation in the denominator. This same process is then carried out in each successive year.
2 - **LTOB Area and Max depth -** These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as above. The difference between the LTOB elevation and the thalweg elevation (same as in the BHR calculation) will be recroded and tracked above as LTOB max depth.

Appendix D:
Hydrologic Data

Verification of Bankfull Events
Flow Gauge and Crest Gauge Installation Diagrams
Flow Gauge and Crest Gauge Graphs
Wetland Hydrology Criteria and Hydrographs
Rainfall Data Table
Wetland Gauge Soil Notes MY0

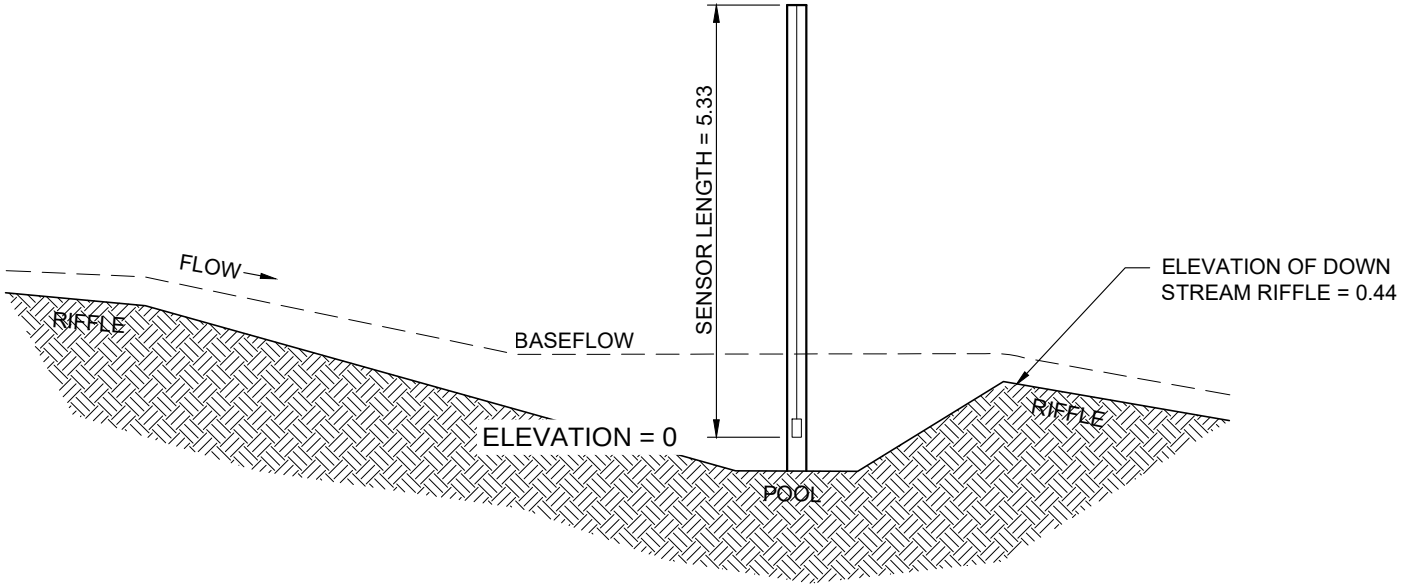
Verification of Bankfull Events: CG-1 (UT2) Banner Branch Mitigation Project					
	Date of Collection	Date of Occurrence	Method	Photos/Notes	Measurement above bankfull (feet)
MY1	11/2/2021	9/22/2021	Pressure Transducer	Recorded bankfull flow	0.23

Verification of Bankfull Events: CG-2 (BB-R2) Banner Branch Mitigation Project					
	Date of Collection	Date of Occurrence	Method	Photos/Notes	Measurement above bankfull (feet)
MY1	11/2/2021	6/4/2021	Pressure Transducer	Recorded bankfull flow	0.24
	11/2/2021	9/22/2021	Pressure Transducer	Recorded bankfull flow	0.80
	11/2/2021	Unknown	Visual Survey	Sediment Deposition in floodplain	N/A

11/2/2021

Verification of Bankfull Events: CG-3 (UT4-R2) Banner Branch Mitigation Project					
	Date of Collection	Date of Occurrence	Method	Photos/Notes	Measurement above bankfull (feet)
MY1	11/2/2021	6/4/2021	Pressure Transducer	Recorded bankfull flow	0.10
	11/2/2021	9/22/2021	Pressure Transducer	Recorded bankfull flow	0.24
	11/3/2021	Unknown	Cork Gauge	Photo included	0.40

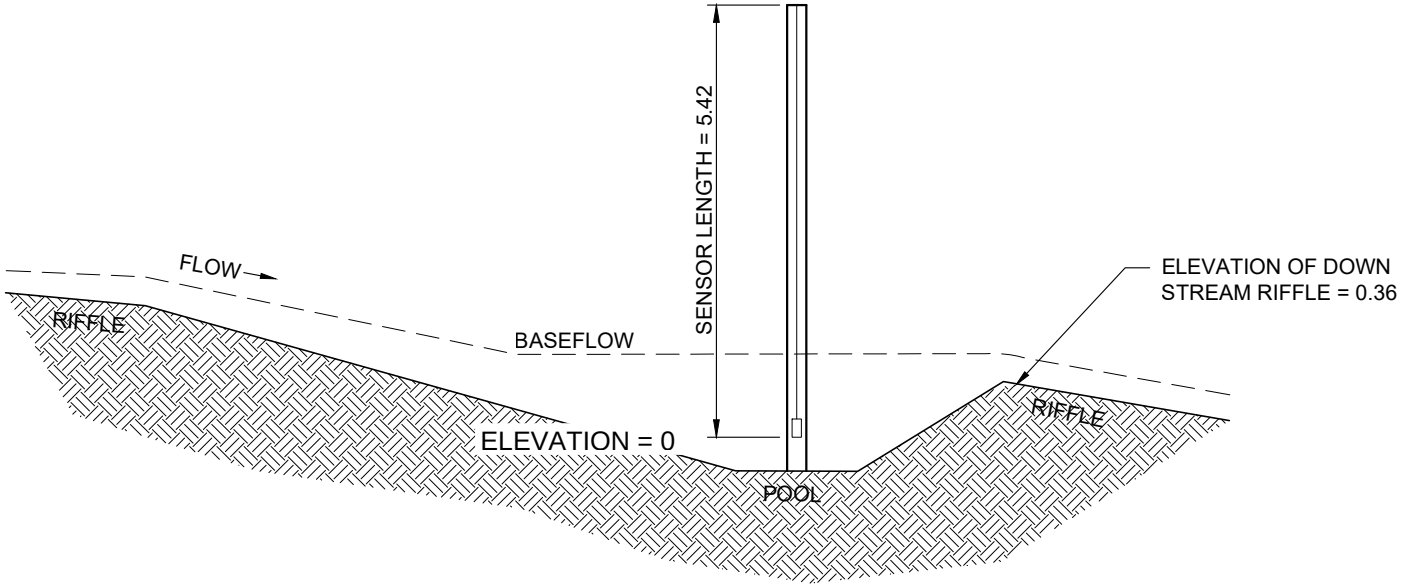
11/3/2021



FLOW GAUGE FG-1 (UT1A)

Flow Depth = 0.44 feet

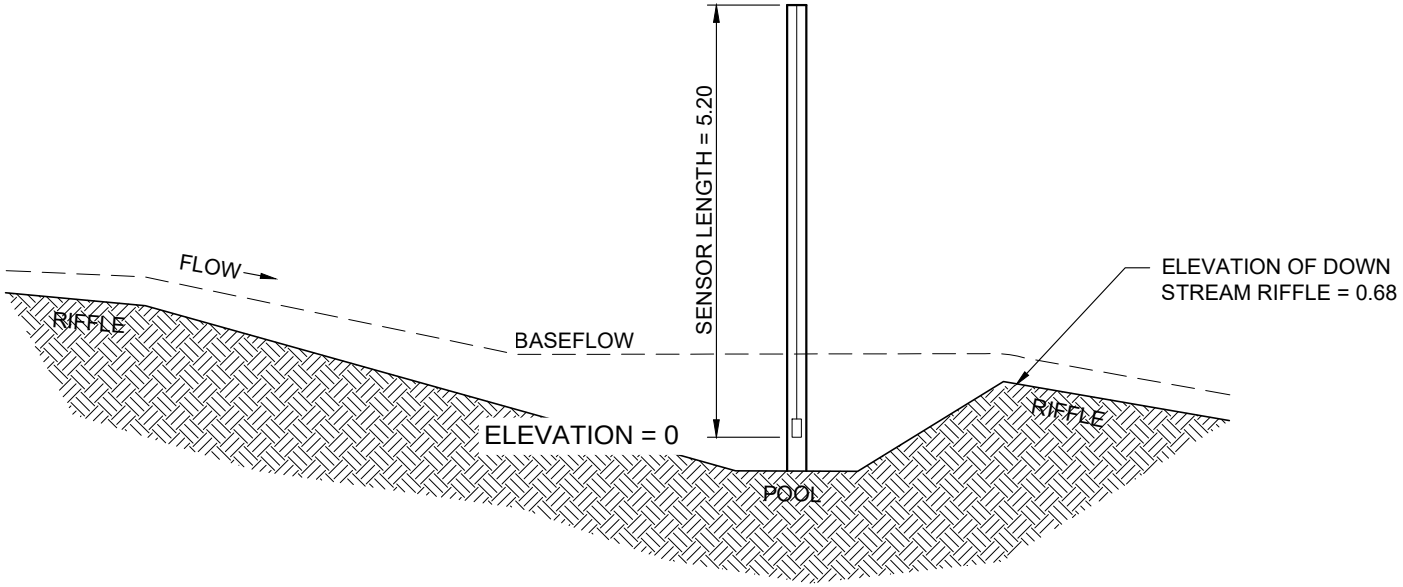
*All elevations relative to sensor depth



FLOW GAUGE FG-2 (UT1C)

Flow Depth = 0.36 feet

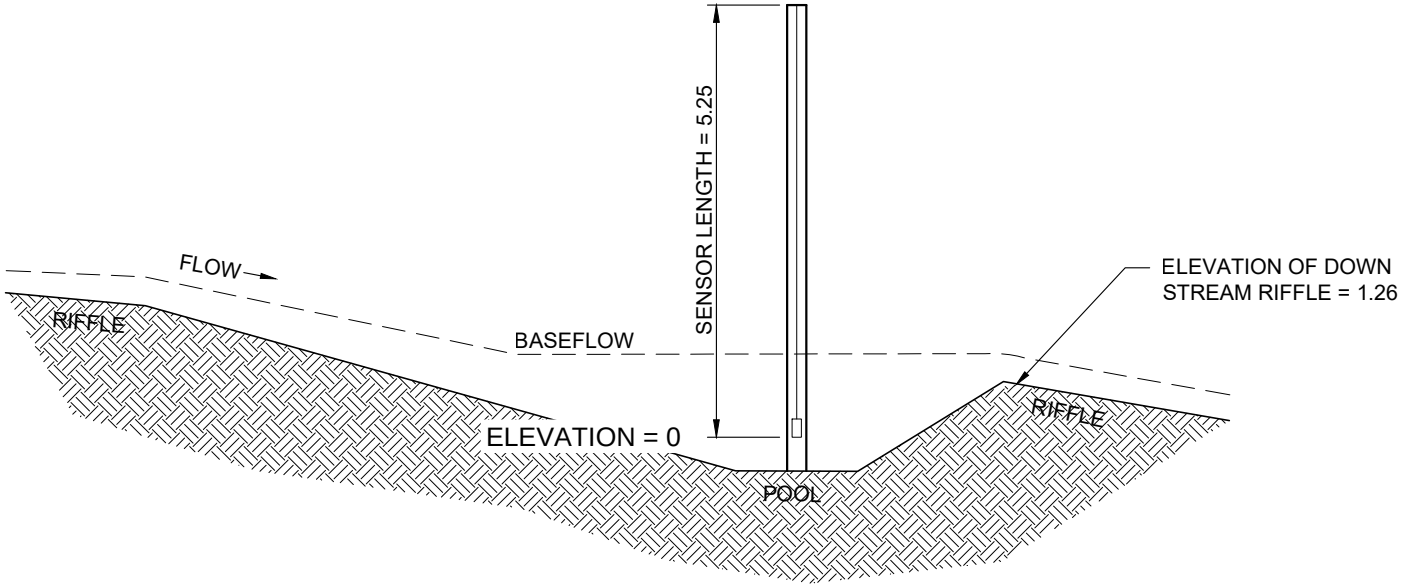
*All elevations relative to sensor depth



FLOW GAUGE FG-3 (UT2)

Flow Depth = 0.68 feet

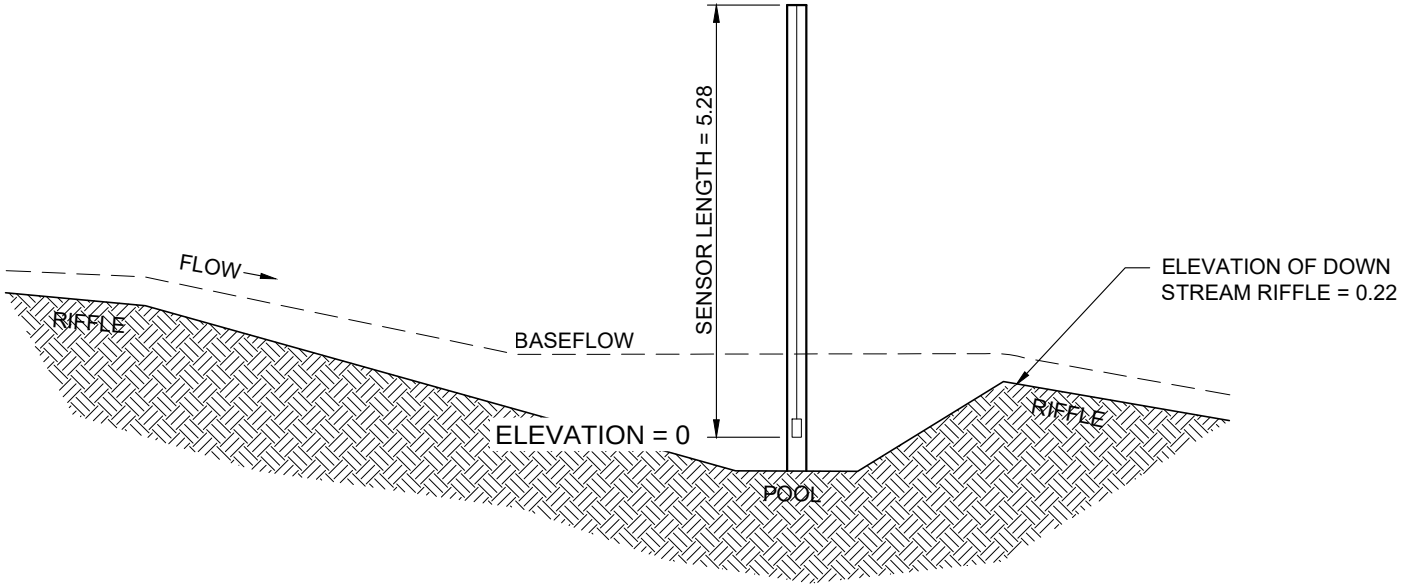
*All elevations relative to sensor depth



FLOW GAUGE FG-4 (UT2A)

Flow Depth = 1.26 feet

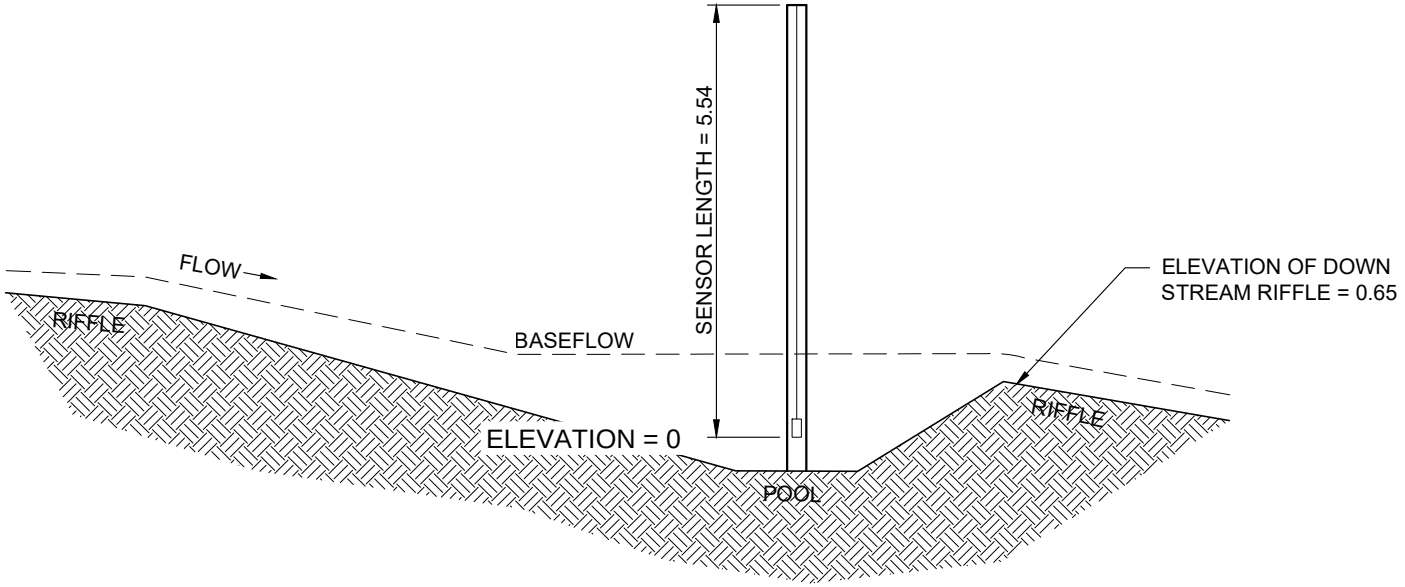
*All elevations relative to sensor depth



FLOW GAUGE FG-5 (UT3)

Flow Depth = 0.22 feet

*All elevations relative to sensor depth

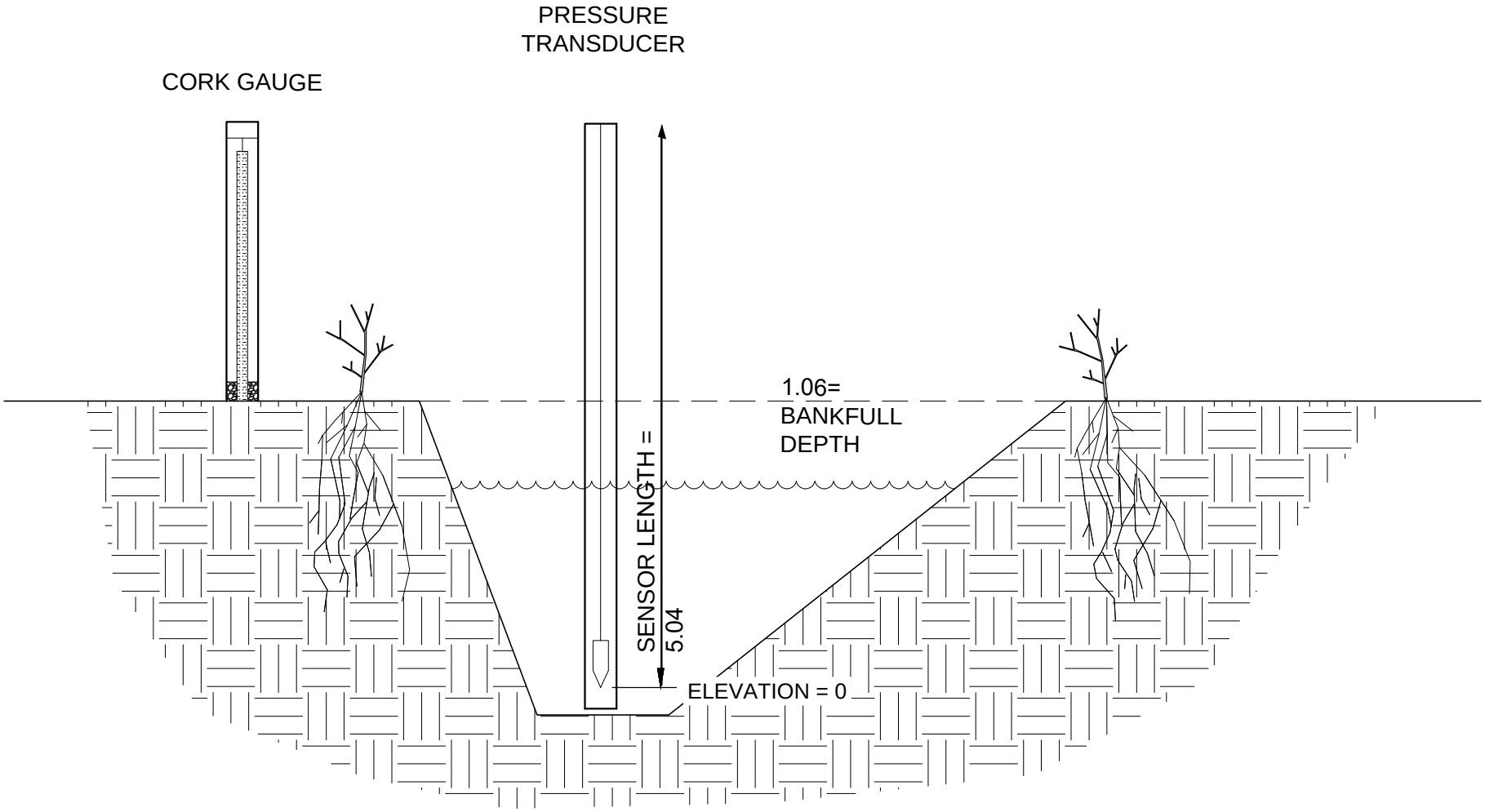


FLOW GAUGE FG-6 (UT4-R1)

Flow Depth = 0.65 feet

*All elevations relative to sensor depth

CROSS SECTIONAL VIEW OF STREAM

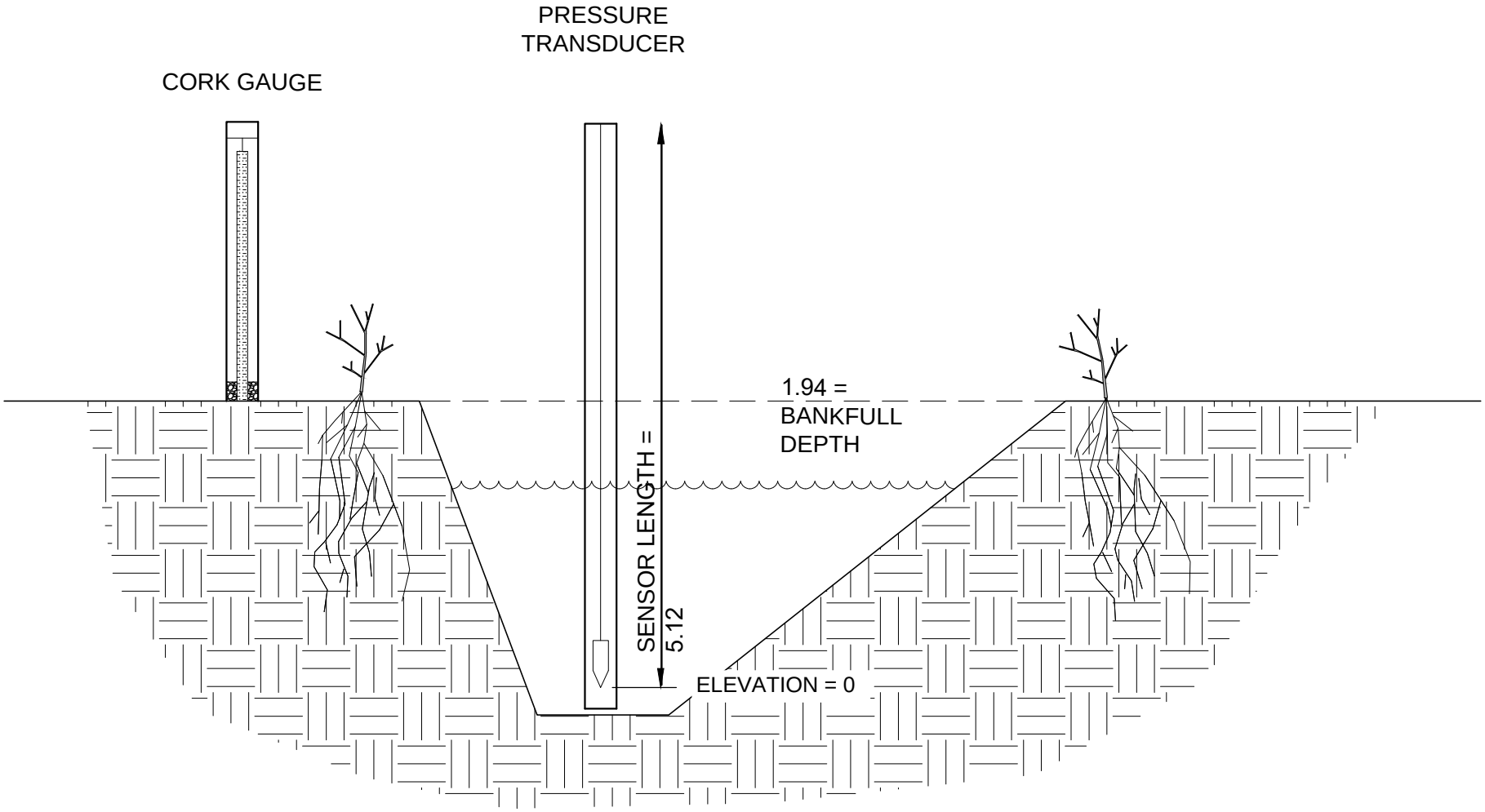


Crest Gauge CG-1 (UT2)

Bankfull Event Depth = 1.06

*All elevations relative to sensor depth

CROSS SECTIONAL VIEW OF STREAM

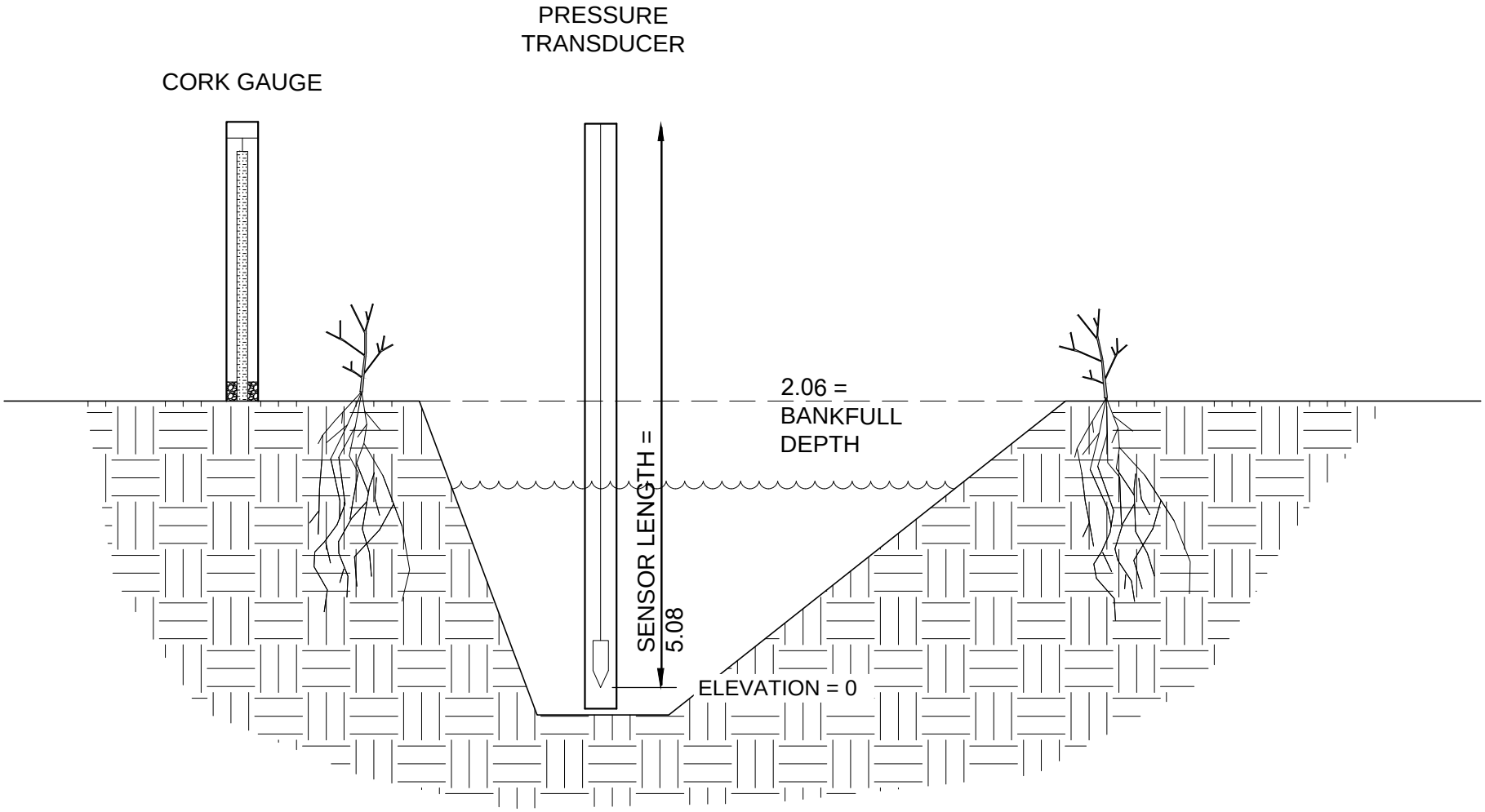


Crest Gauge CG-2 (BB-R2)

Bankfull Event Depth = 1.94

*All elevations relative to sensor depth

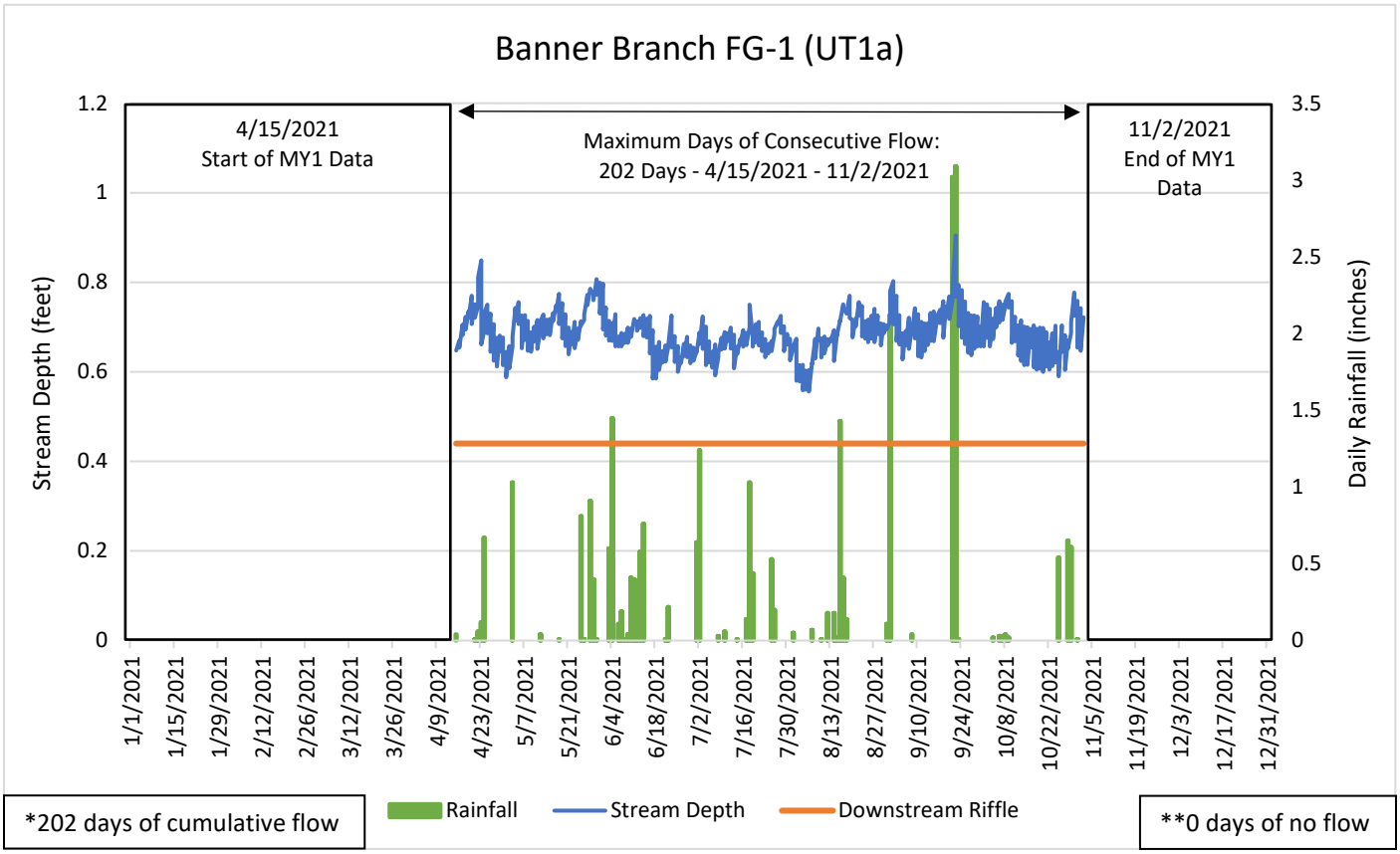
CROSS SECTIONAL VIEW OF STREAM

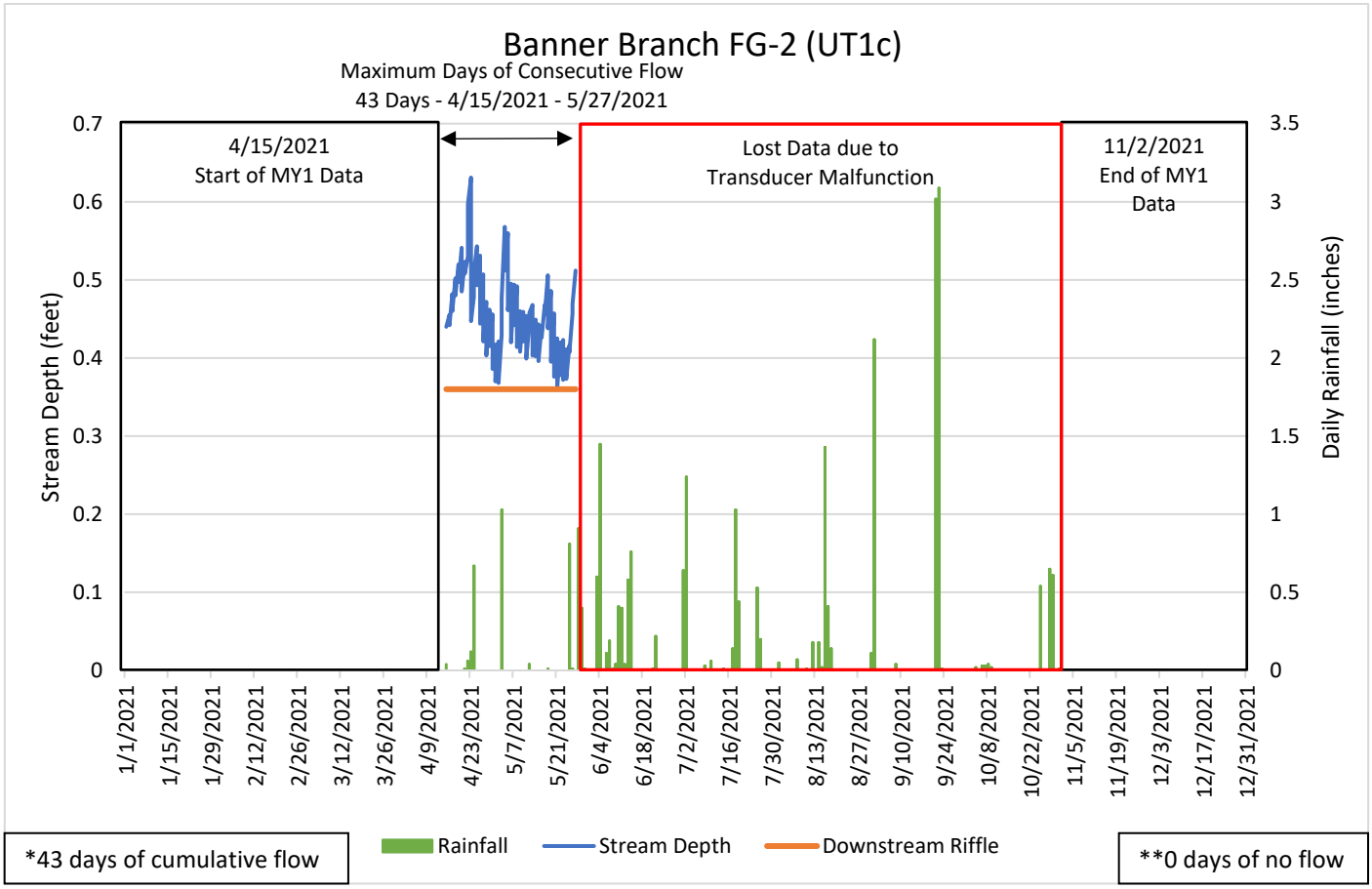


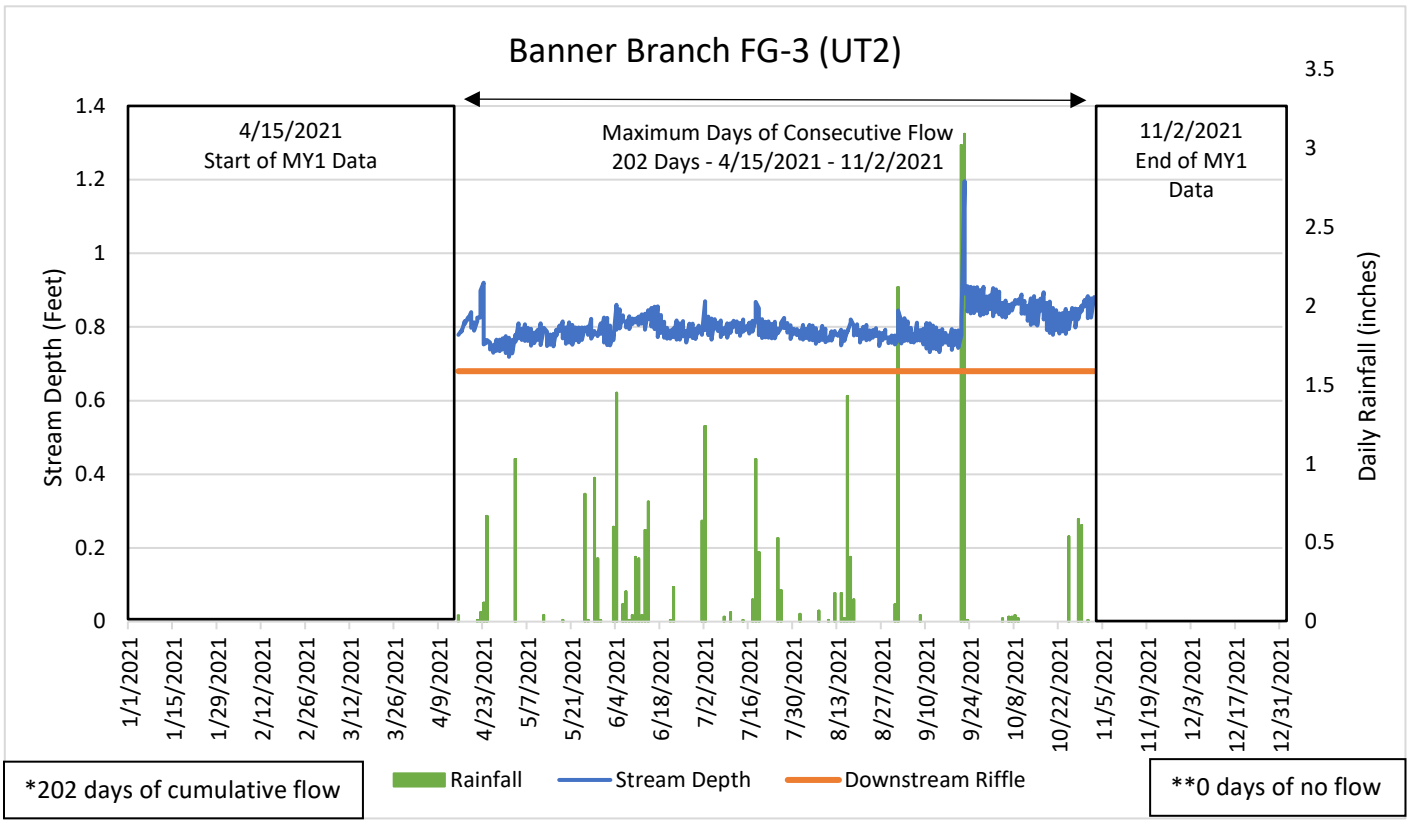
Crest Gauge CG-3 (UT4-R2)

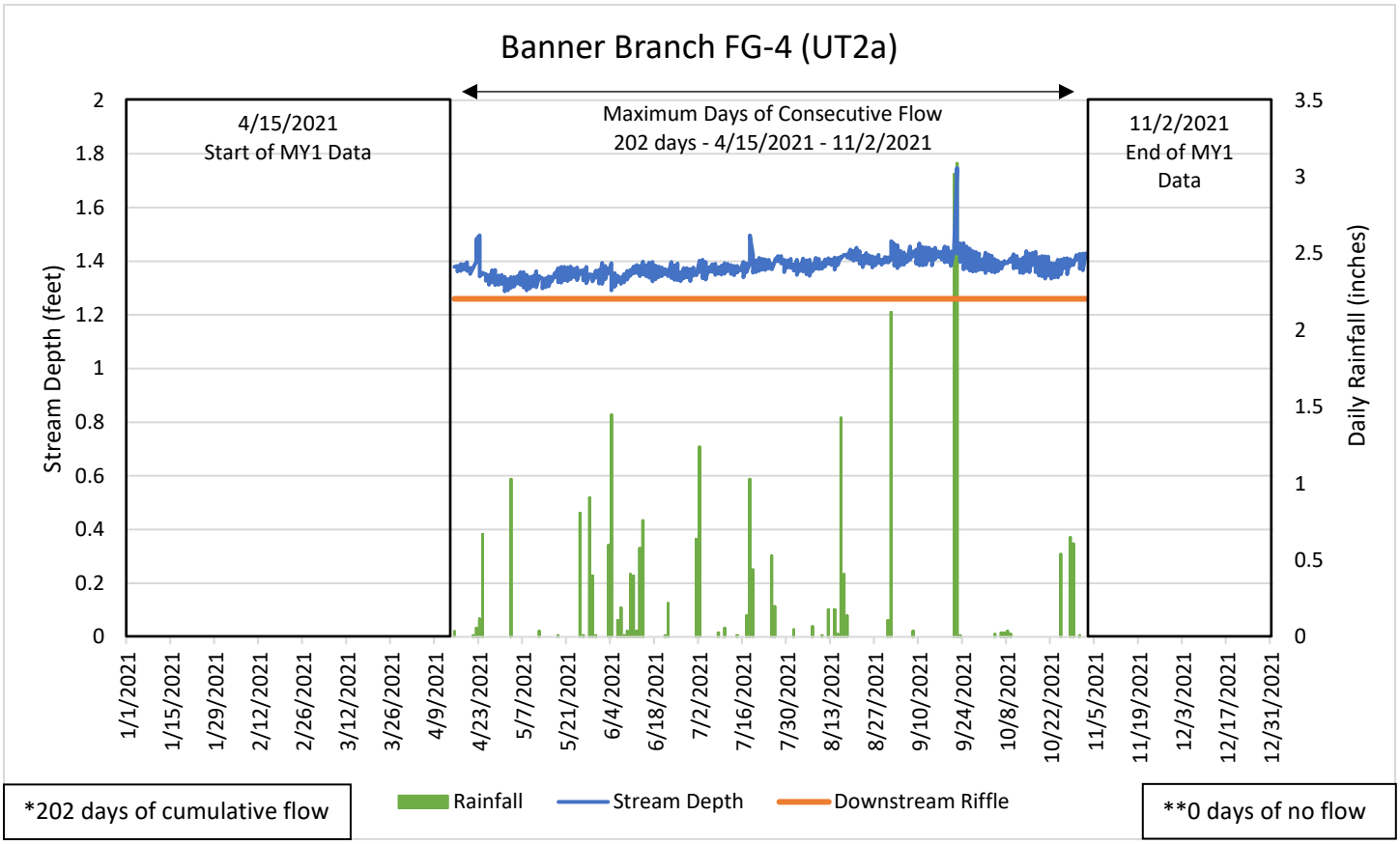
Bankfull Event Depth = 2.06

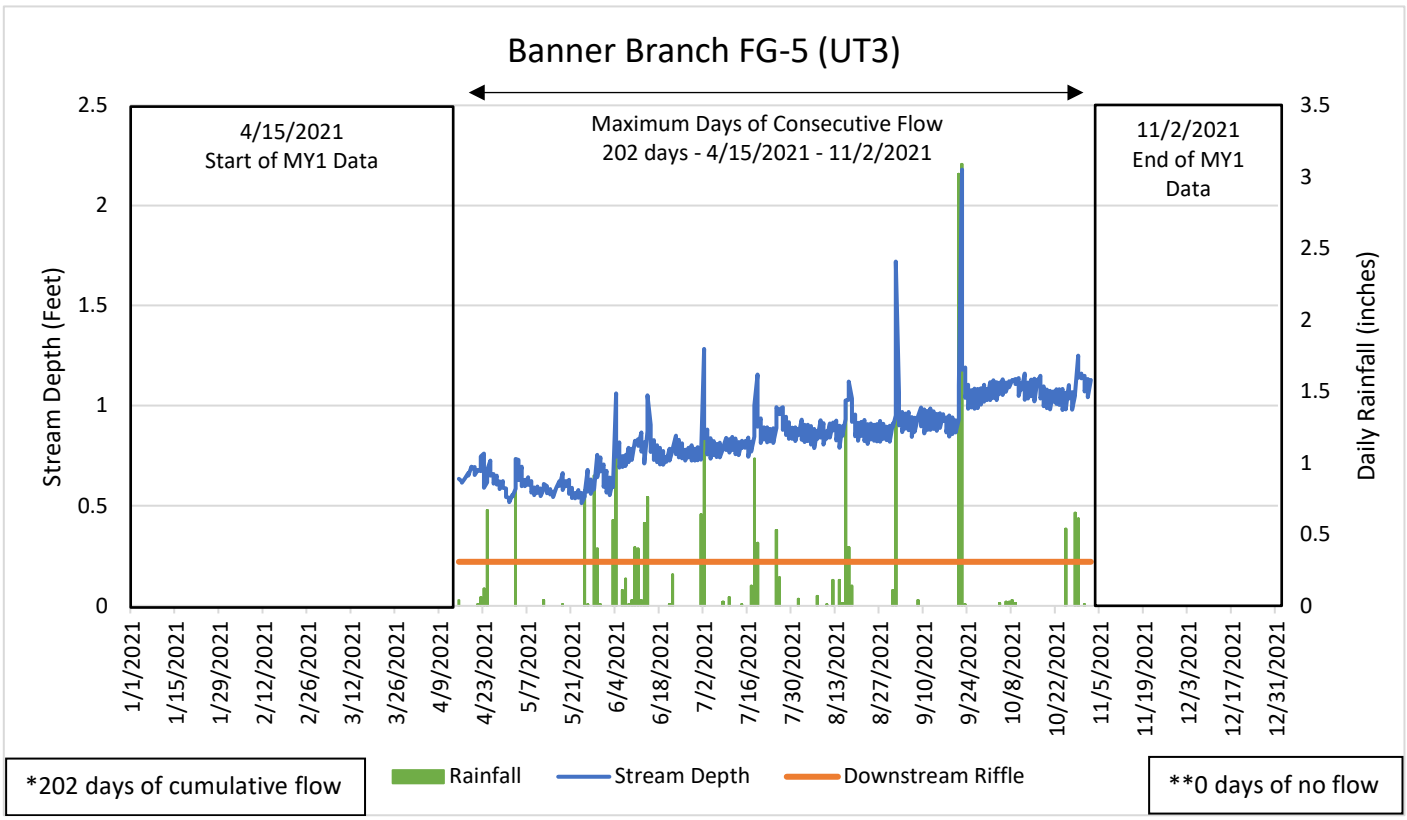
*All elevations relative to sensor depth

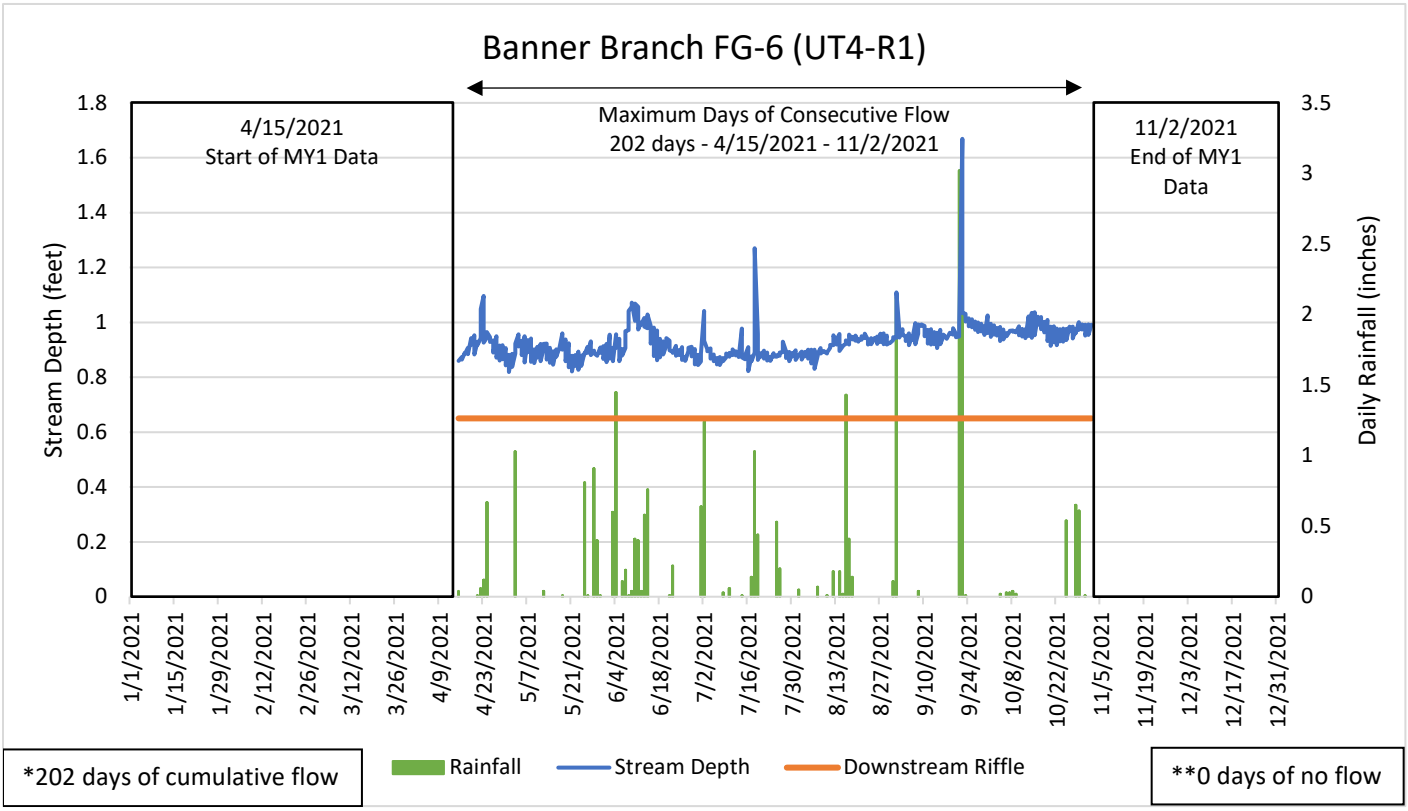

Banner Branch FG-1 (UT1a)
4/15/2021
Start of MY1 Data
Maximum Days of Consecutive Flow:
202 Days - 4/15/2021 - 11/2/2021
11/2/2021
End of MY1
Data
Stream Depth (feet)
Daily Rainfall (inches)
1.2
1
0.8
0.6
0.4
0.2
0
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
*202 days of cumulative flow
Rainfall
Stream Depth
Downstream Riffle
**0 days of no flow

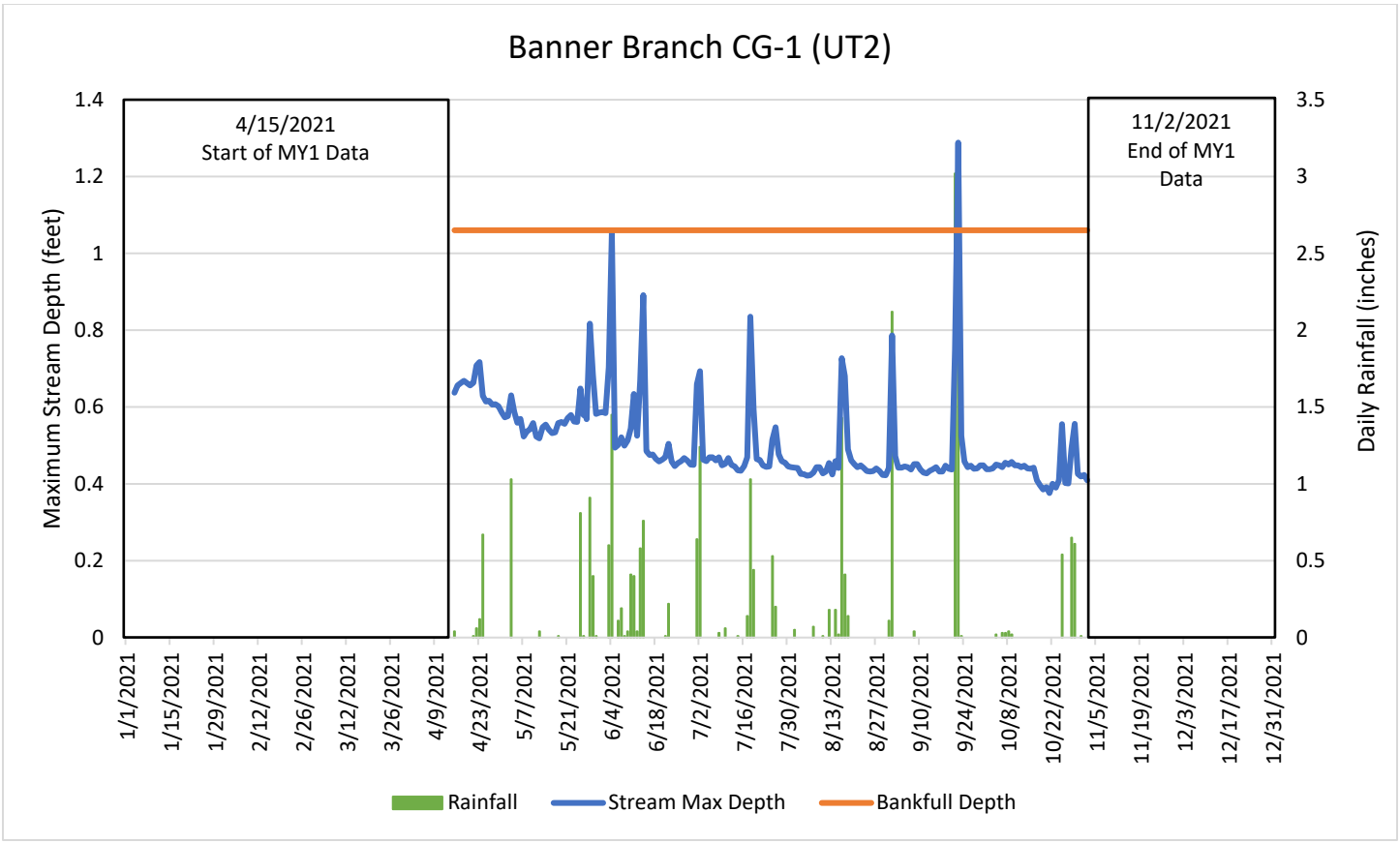

Banner Branch FG-2 (UT1c)
Maximum Days of Consecutive Flow
43 Days - 4/15/2021 - 5/27/2021
4/15/2021
Start of MY1 Data
Lost Data due to
Transducer Malfunction
11/2/2021
End of MY1
Data
Stream Depth (feet)
Daily Rainfall (inches)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
*43 days of cumulative flow
Rainfall
Stream Depth
Downstream Riffle
**0 days of no flow

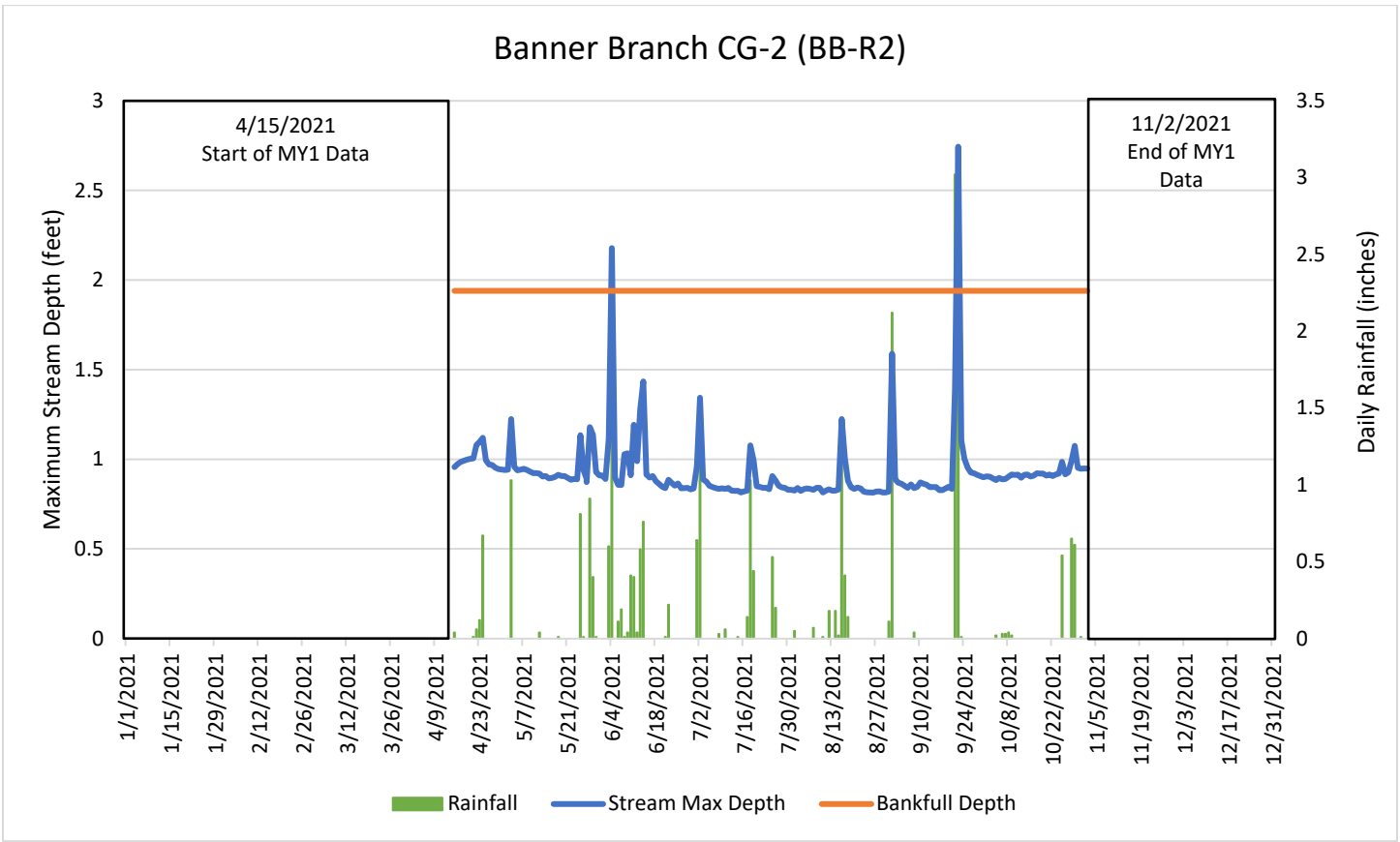

Banner Branch FG-3 (UT2)
4/15/2021
Start of MY1 Data
Maximum Days of Consecutive Flow
202 Days - 4/15/2021 - 11/2/2021
11/2/2021
End of MY1
Data
Stream Depth (Feet)
Daily Rainfall (inches)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
*202 days of cumulative flow
Rainfall
Stream Depth
Downstream Riffle
**0 days of no flow

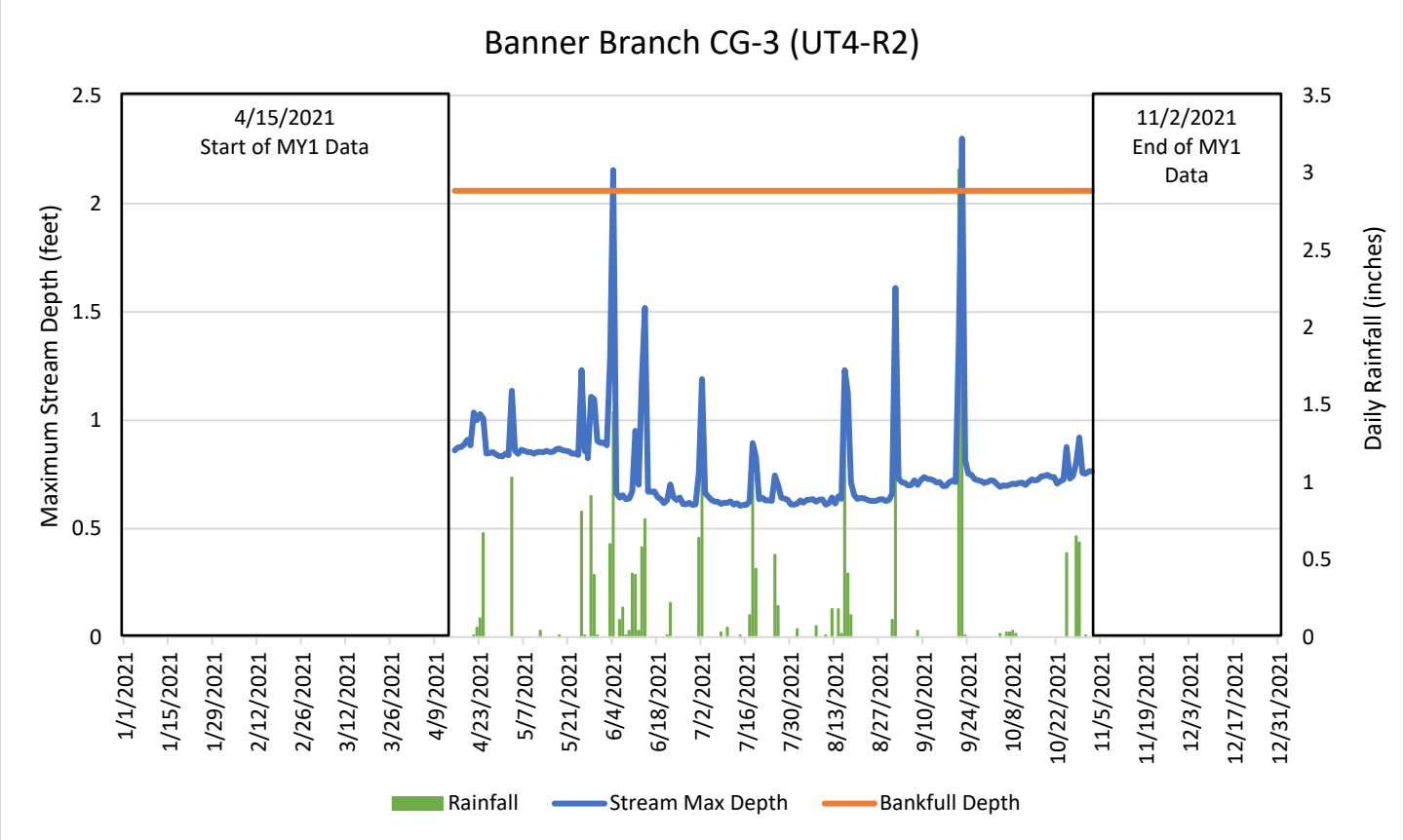

Banner Branch FG-4 (UT2a)
4/15/2021
Start of MY1 Data
Maximum Days of Consecutive Flow
202 days - 4/15/2021 - 11/2/2021
11/2/2021
End of MY1
Data
Stream Depth (feet)
Daily Rainfall (inches)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
*202 days of cumulative flow
Rainfall
Stream Depth
Downstream Riffle
**0 days of no flow


Banner Branch FG-5 (UT3)
4/15/2021
Start of MY1 Data
Maximum Days of Consecutive Flow
202 days - 4/15/2021 - 11/2/2021
11/2/2021
End of MY1
Data
Stream Depth (Feet)
Daily Rainfall (inches)
0
0.5
1
1.5
2
2.5
3
3.5
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
*202 days of cumulative flow
Rainfall
Stream Depth
Downstream Riffle
**0 days of no flow

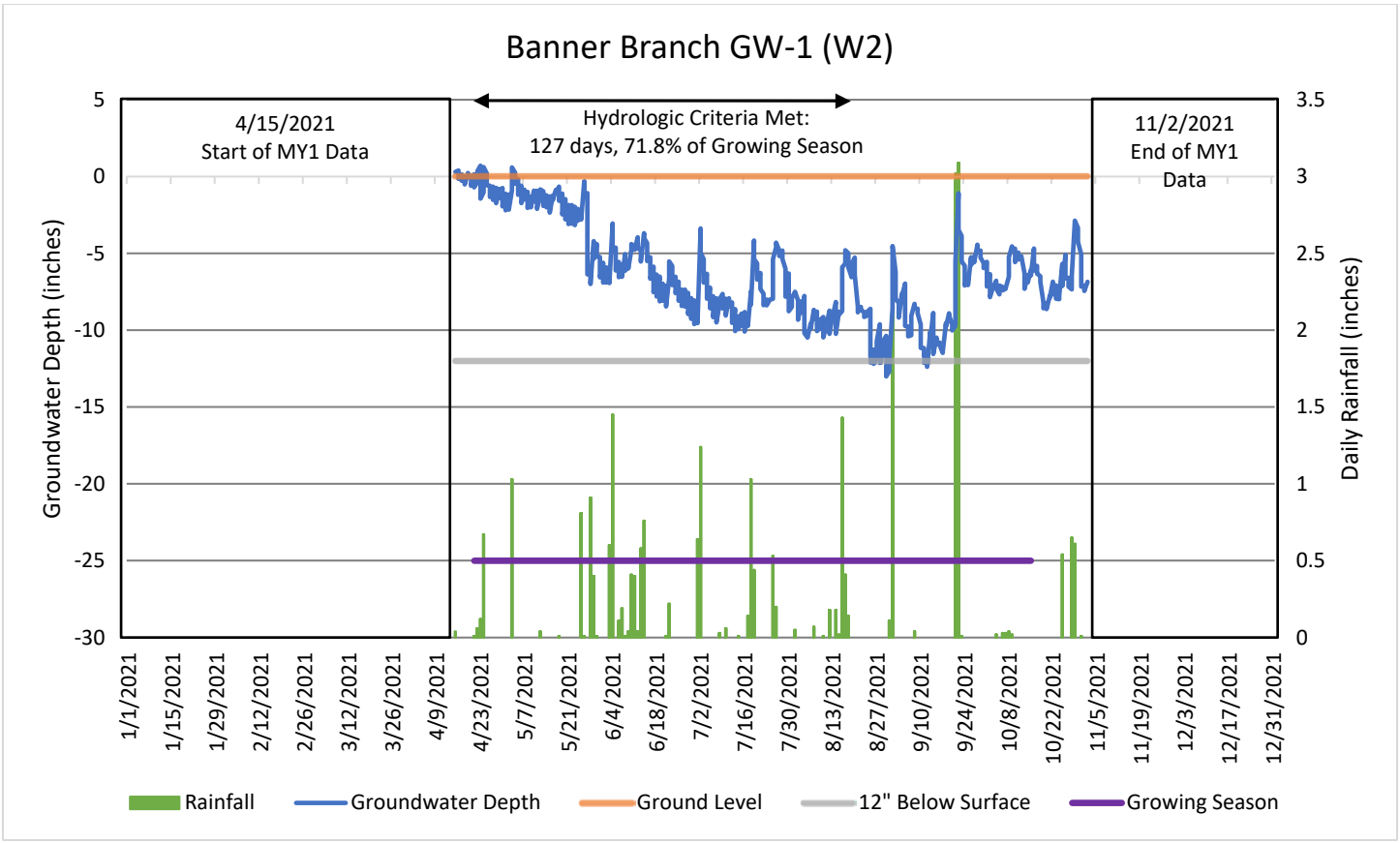

Banner Branch FG-6 (UT4-R1)
4/15/2021
Start of MY1 Data
Maximum Days of Consecutive Flow
202 days - 4/15/2021 - 11/2/2021
11/2/2021
End of MY1
Data
Stream Depth (feet)
Daily Rainfall (inches)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
0
0.5
1
1.5
2
2.5
3
3.5
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
*202 days of cumulative flow
Rainfall
Stream Depth
Downstream Riffle
**0 days of no flow

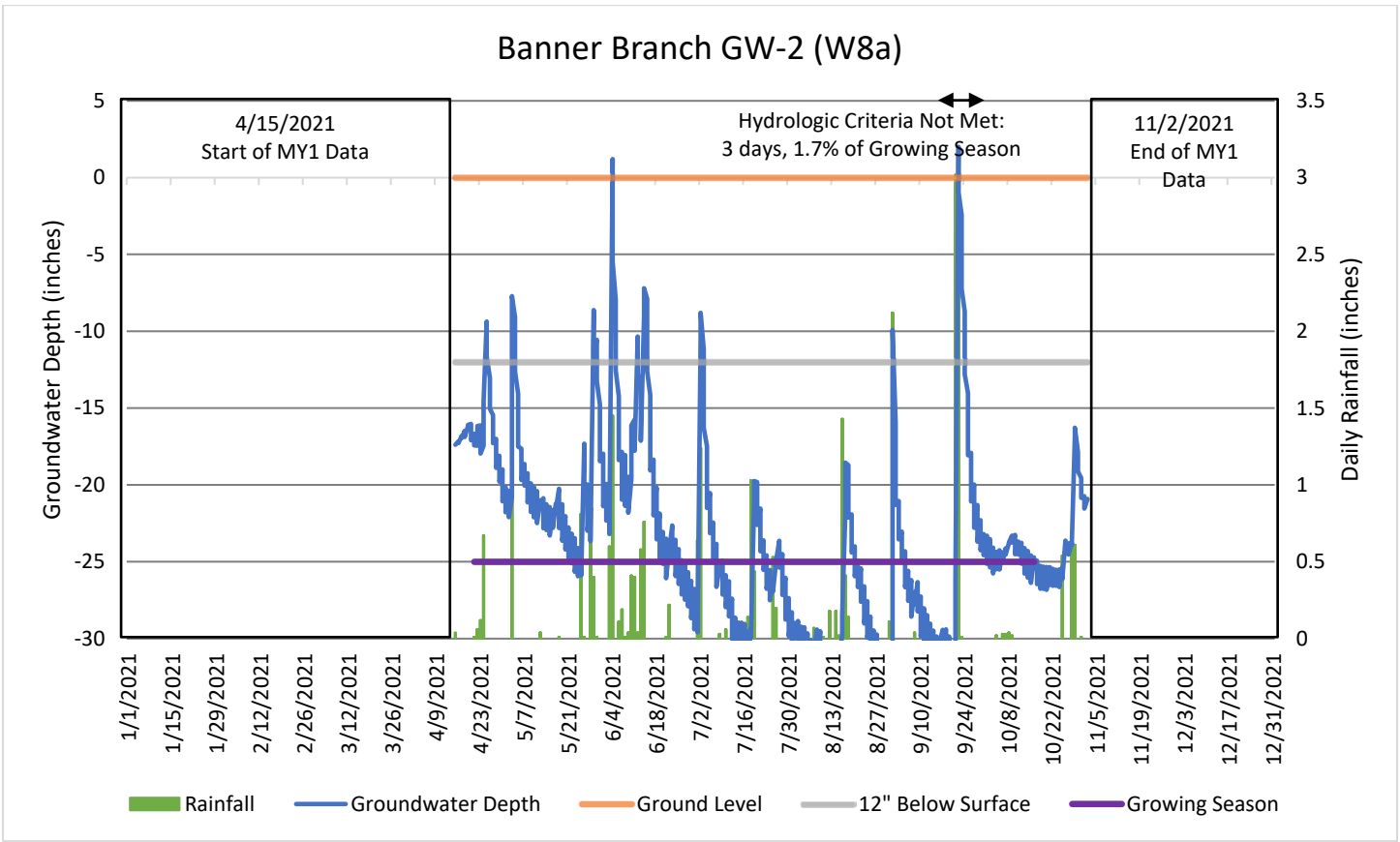

Banner Branch CG-1 (UT2)
4/15/2021
Start of MY1 Data
11/2/2021
End of MY1
Data
Maximum Stream Depth (feet)
Daily Rainfall (inches)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
0
0.5
1
1.5
2
2.5
3
3.5
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
Rainfall
Stream Max Depth
Bankfull Depth

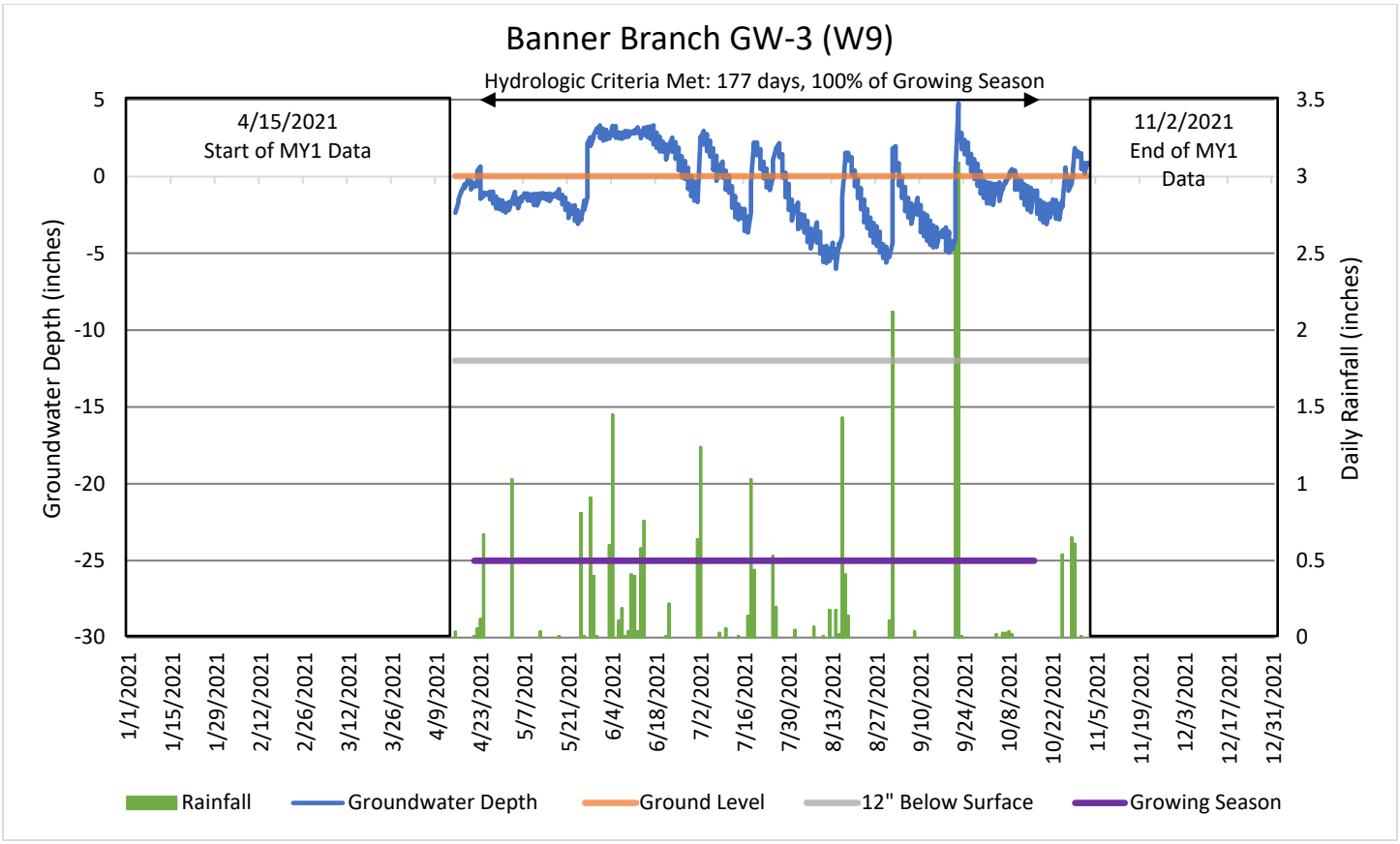

Banner Branch CG-2 (BB-R2)
4/15/2021
Start of MY1 Data
11/2/2021
End of MY1
Data
Maximum Stream Depth (feet)
Daily Rainfall (inches)
0
0.5
1
1.5
2
2.5
3
0
0.5
1
1.5
2
2.5
3
3.5
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
Rainfall
Stream Max Depth
Bankfull Depth

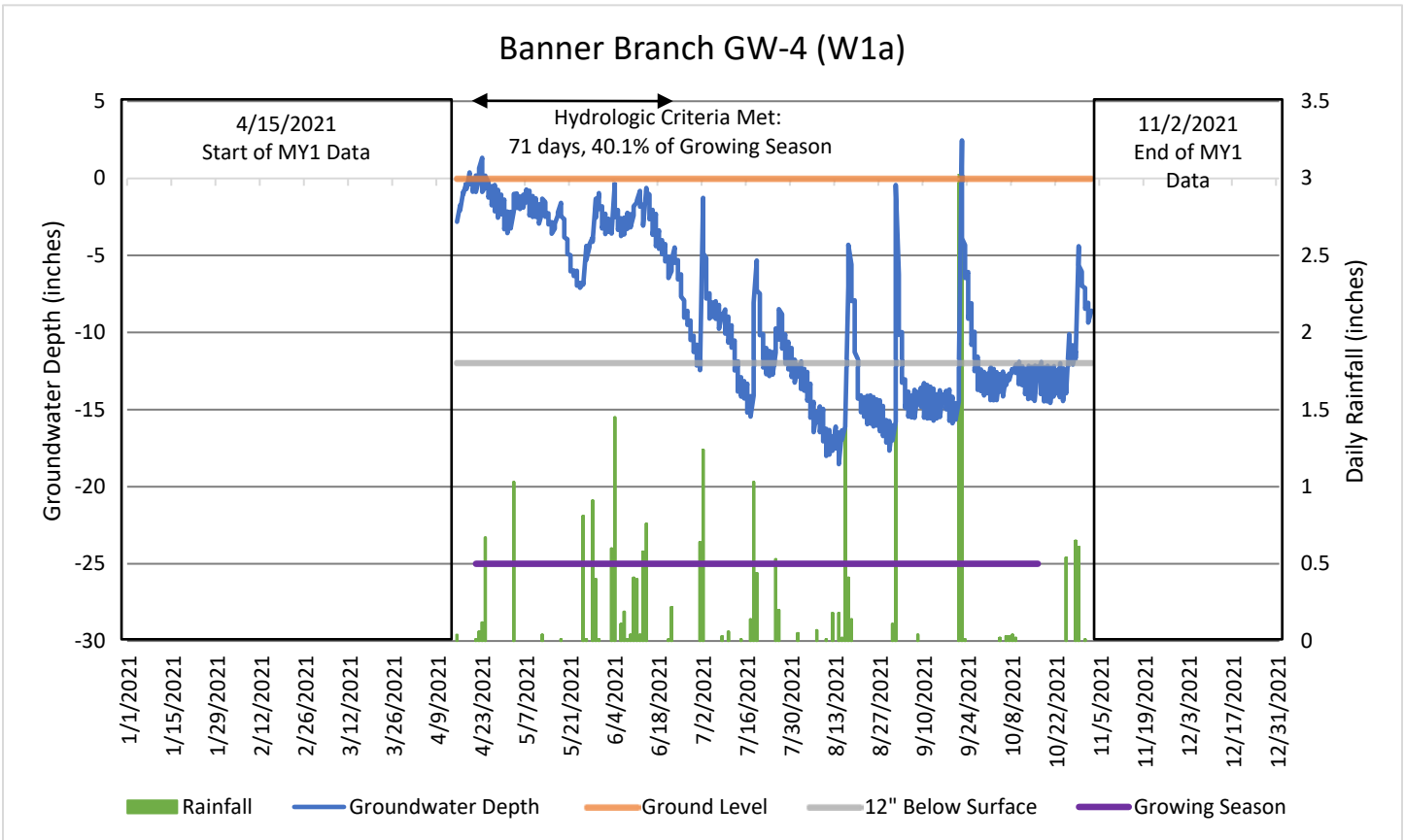

Banner Branch CG-3 (UT4-R2)
4/15/2021
Start of MY1 Data
11/2/2021
End of MY1
Data
Maximum Stream Depth (feet)
Daily Rainfall (inches)
2.5
2
1.5
1
0.5
0
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
Rainfall
Stream Max Depth
Bankfull Depth

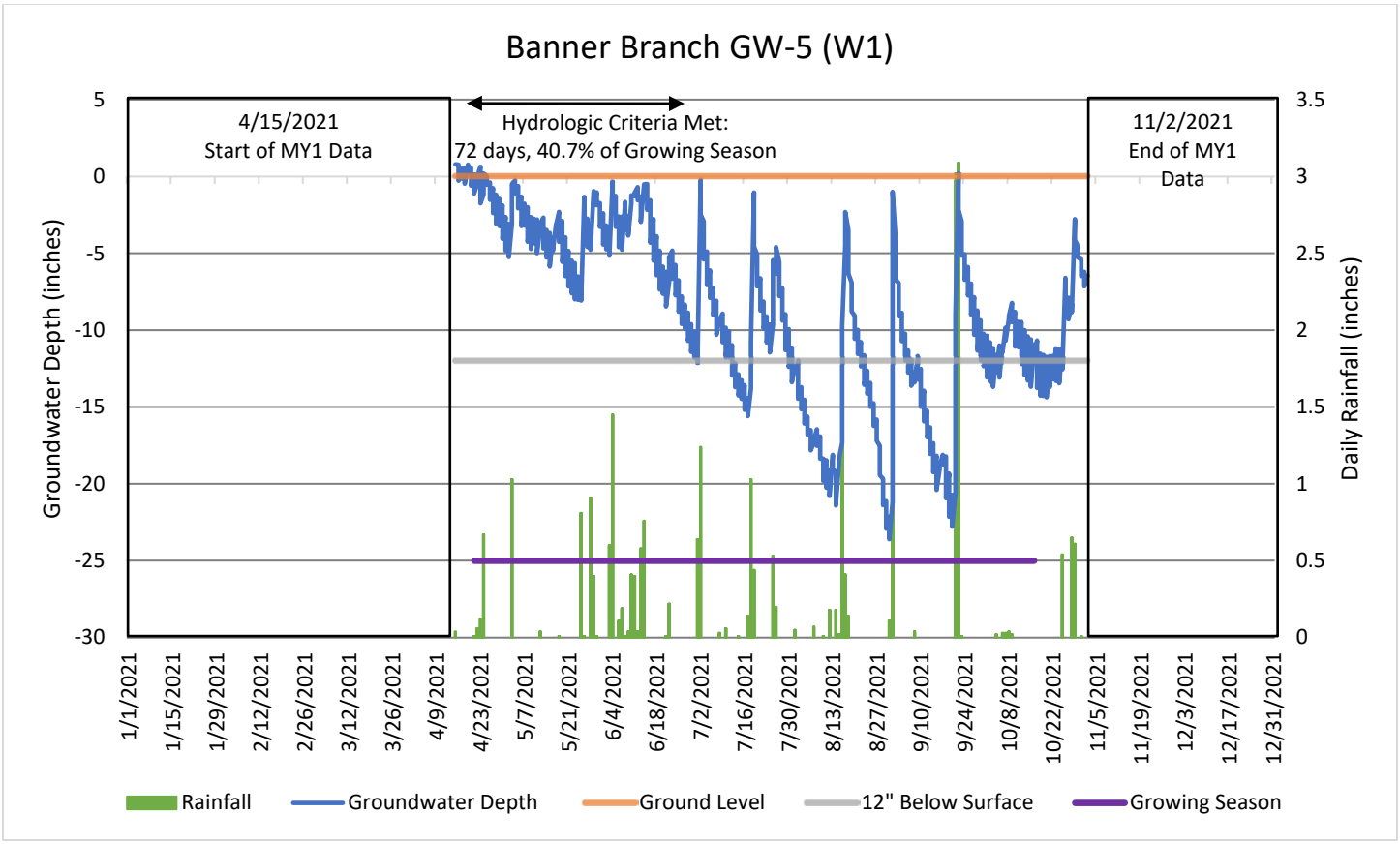
Max Consecutive Hydroperiod Saturation within 12 Inches of Soil Surface (Percent of Growing Season 4/21-10/16) CRONOS Station: Danbury									
Monitoring Gauge Name	MY1 2021	MY2 2022	MY3 2023	MY4 2024	MY4 2025	MY5 2026	MY6 2027	MY7 2028	Mean
Wetland Gauge 1	71.8%								71.8%
Wetland Gauge 2	1.7%								1.7%
Wetland Gauge 3	100.0%								100.0%
Wetland Gauge 4	40.1%								40.1%
Wetland Gauge 5	40.7%								40.7%
Wetland Gauge 6	100.0%								100.0%
Wetland Gauge 7	100.0%								100.0%
Wetland Gauge 8	14.1%								14.1%
Wetland Gauge 9	14.7%								14.7%

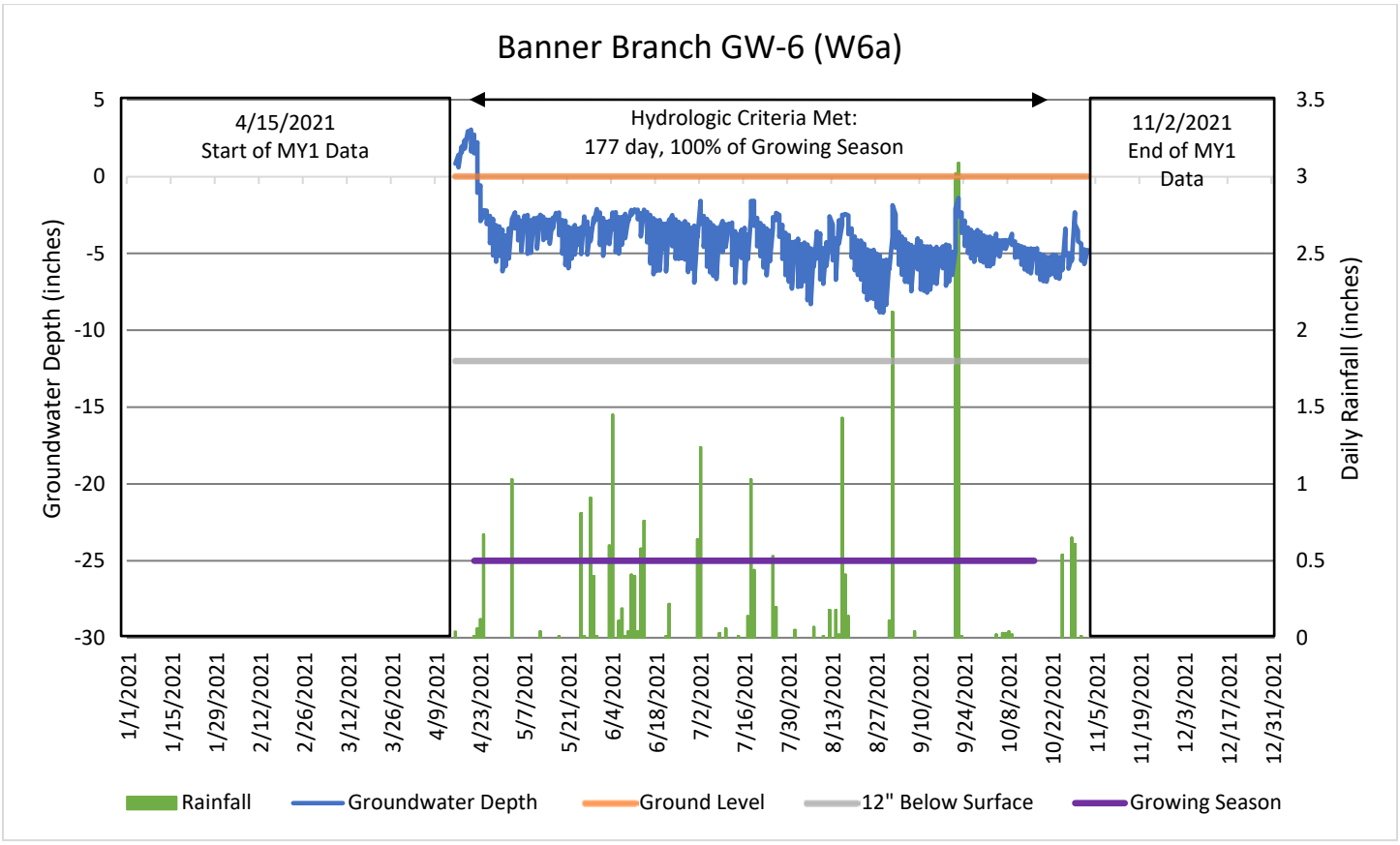

Banner Branch GW-1 (W2)
4/15/2021
Start of MY1 Data
Hydrologic Criteria Met:
127 days, 71.8% of Growing Season
11/2/2021
End of MY1
Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season

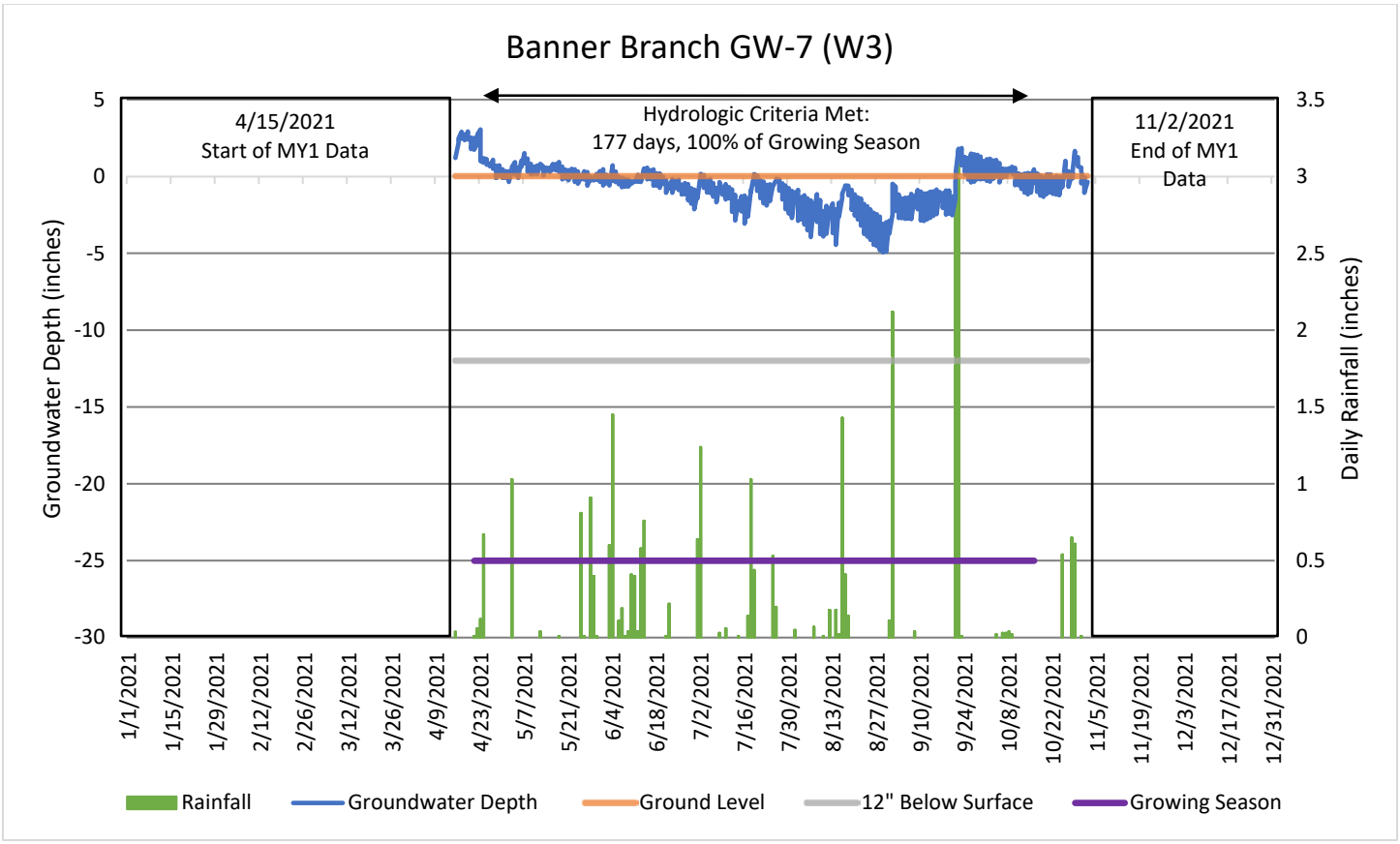

Banner Branch GW-2 (W8a)
4/15/2021
Start of MY1 Data
Hydrologic Criteria Not Met:
3 days, 1.7% of Growing Season
11/2/2021
End of MY1
Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season

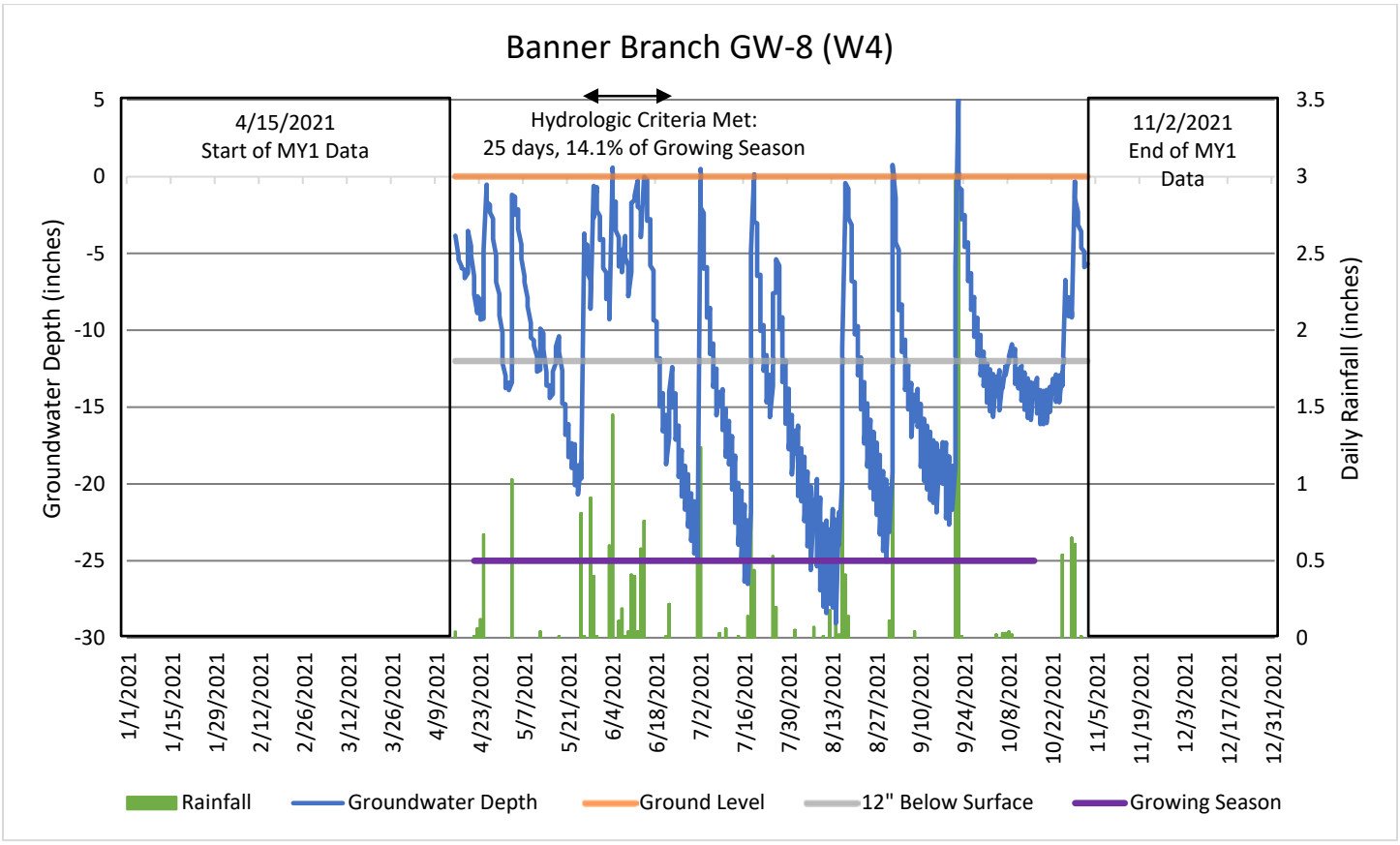

Banner Branch GW-3 (W9)
Hydrologic Criteria Met: 177 days, 100% of Growing Season
4/15/2021
Start of MY1 Data
11/2/2021
End of MY1
Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season

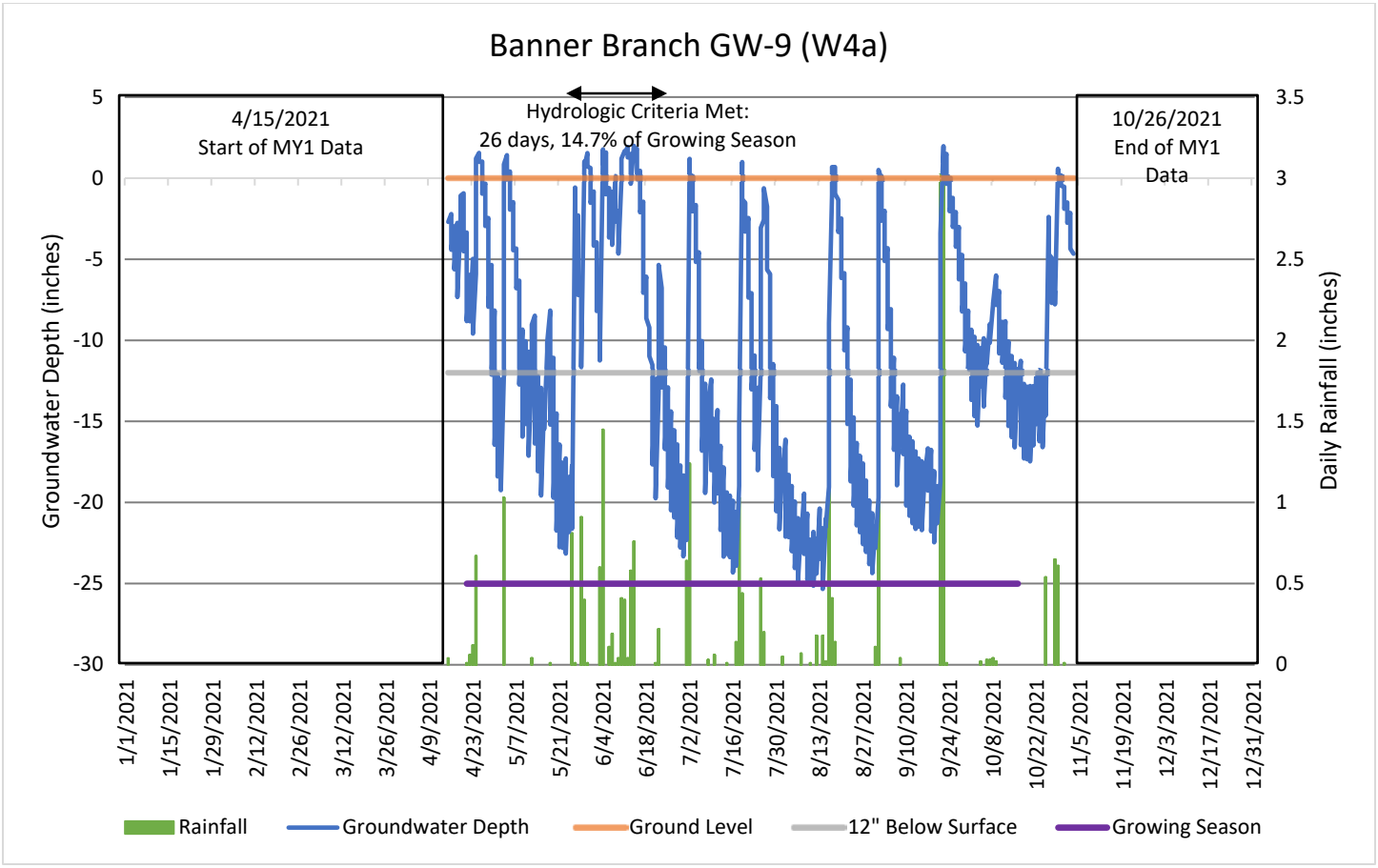

Banner Branch GW-4 (W1a)
4/15/2021
Start of MY1 Data
Hydrologic Criteria Met:
71 days, 40.1% of Growing Season
11/2/2021
End of MY1
Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season

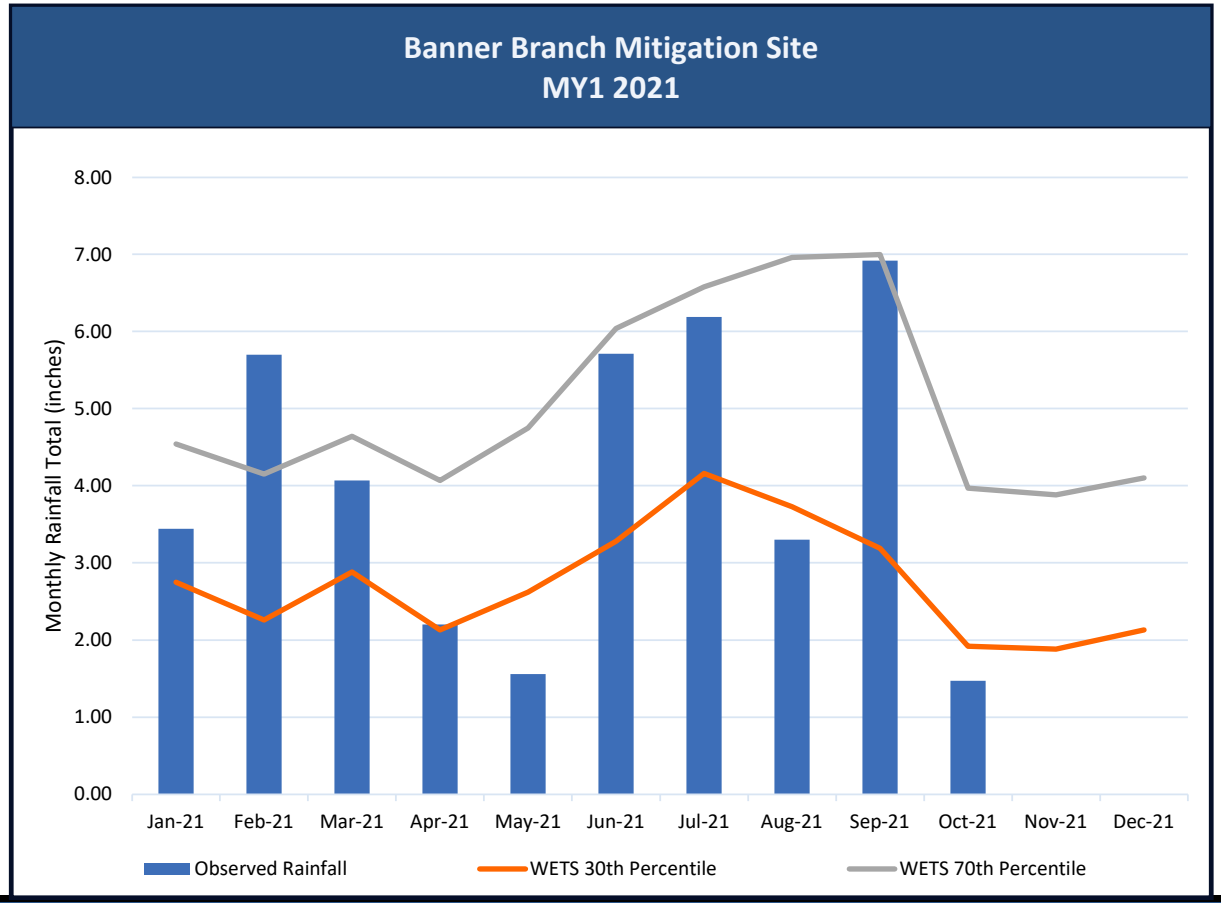

Banner Branch GW-5 (W1)
4/15/2021
Start of MY1 Data
Hydrologic Criteria Met:
72 days, 40.7% of Growing Season
11/2/2021
End of MY1
Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Banner Branch GW-6 (W6a)
4/15/2021
Start of MY1 Data
Hydrologic Criteria Met:
177 day, 100% of Growing Season
11/2/2021
End of MY1
Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Banner Branch GW-7 (W3)
4/15/2021
Start of MY1 Data
Hydrologic Criteria Met:
177 days, 100% of Growing Season
11/2/2021
End of MY1
Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Banner Branch GW-8 (W4)
4/15/2021
Start of MY1 Data
Hydrologic Criteria Met:
25 days, 14.1% of Growing Season
11/2/2021
End of MY1
Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Banner Branch GW-9 (W4a)
4/15/2021
Start of MY1 Data
Hydrologic Criteria Met:
26 days, 14.7% of Growing Season
10/26/2021
End of MY1
Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2021
1/15/2021
1/29/2021
2/12/2021
2/26/2021
3/12/2021
3/26/2021
4/9/2021
4/23/2021
5/7/2021
5/21/2021
6/4/2021
6/18/2021
7/2/2021
7/16/2021
7/30/2021
8/13/2021
8/27/2021
9/10/2021
9/24/2021
10/8/2021
10/22/2021
11/5/2021
11/19/2021
12/3/2021
12/17/2021
12/31/2021
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season



Banner Branch Mitigation Project Monthly Rainfall Summary												
	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21
Observed Rainfall	3.44	5.70	4.07	2.20	1.56	5.71	6.19	3.30	6.92	1.47	**	**
WETS 30th Percentile	2.46	2.09	2.96	2.42	3.10	2.52	3.13	2.76	2.42	2.36	1.94	2.46
WETS 70th Percentile	4.33	3.84	5.14	4.71	5.53	4.84	5.26	4.92	5.84	4.66	3.97	4.51
Low/Normal/High	N	H	N	L	L	H	H	N	H	L	**	**

*30th and 70th Percentile data collected from data from WETS Station: Stokes County

Groundwater Gauge Soil Conditions at Installation (MY0)						
Groundwater Gauge Installation Soil Notes						
	Depth (inches)	**Matrix Color**	**%**	**Redox Color**	**%**	**Texture**
GW-1	0-30	10 YR 2/1	100			Silty Clay
	3-36	10 YR 5/1	100			Sandy Clay
GW-2	0-10	10 YR 4/4	100			Clay Loam
	10-18	10 YR 4/1	100			Sandy Clay
	18-30	10 YR 3/1	100			Sandy Loam
	30-36	10 YR 3/1	100			Sand
GW-3	0-6	10 YR 4/3	100			Clay Loam
	6-20	10 YR 5/2	85	10 YR 5/6	15	Clay
	20-36	10 YR 3/2	100			Sand
GW-4	0-4	10 YR 3/3	100			Clay Loam
	4-30	10 YR 3/2	95	10 YR 4/1	5	Clay
	30-36	10 YR 3/1	100			Clay
GW-5	0-12	10 YR 4/1	100			Loamy Clay
	12-18	10 YR 4/1	80	5 YR 4/6	20	Loam Clay
	18-26	10 YR 4/2	100			Sand
	26-36	10 YR 5/2	85	10 YR 6/3	15	Sand
GW-6	0-12	10 YR 3/1	90	10 YR 3/6	10	Sandy Loam
	12-24	10 YR 2/1	100			Sandy Clay
	24-30	5 YR 5/8	100			Sand
GW-7	0-10	10 YR 2/1	100			Sandy Loam
	10-32	10 YR 3/1	100			Sandy Loam
	32-36	10 YR 2/2	100			Sandy Loam
GW-8	0-16	10 YR 2/1	90	10 YR 3/6	10	Clay Loam
	16-20	10 YR 6/1	60	10 YR 5/8	40	Clay
	20-30	10 YR 5/1	85	10 YR 5/8	15	Sandy Clay
	30-36	10 YR 3/1	100			Clay
GW-9	0-8	10 YR 3/1	100			Loam
	8-26	10 YR 5/1	80	10 YR 6/8	20	Sandy Clay
	26-32	10 YR 3/1	100			Clay
	32-36	10 YR 6/1	80	10 YR 5/6	20	Sandy Clay

Appendix E:

Project Timeline and Contact Info

Project Timeline and Contacts		
Activity or Deliverable	**Data Collection Complete**	**Task Completion or Deliverable Submission**
Project Instituted	NA	6/14/2018
Mitigation Plan Approved	NA	6/23/2020
Construction (Grading) Completed	NA	4/21/2021
Planting Completed	NA	4/22/2021
As-built Survey Completed	NA	6/21/2021
MY-0 Baseline Report	4/22/2021	6/25/2021
MY1 Monitoring Report	11/3/2021	12/29/2021
Remediation Items (e.g. beaver removal, supplements, repairs etc.)		
Encroachment		

Banner Branch Mitigation Project/DMS: 100080	
Provider	7721 Six Forks Road, Suite 130
Water & Land Solutions, LLC	Raleigh, NC 27615
Mitigation Provider POC: Emily Dunnigan	(269) 908-6306
Designer	7721 Six Forks Road, Suite 130
Water & Land Solutions, LLC	Raleigh, NC 27615
Primary project design POC: Christopher Tomsic	(828) 493-3287
Construction Contractor	5616 Coble Church Road
KBS Earthworks Inc.	Julian, NC 27283
Primary contractor POC: Stephen Shore	(336) 380-2505

Appendix F: Correspondence

MY0 IRT Comments Memo

WLS Memo

Banner Branch Mitigation Site, DMS Project #100080

USACE Action ID#: SAW-2018-01760

DWR Project #18-1154

Subject: Banner Branch As-Built Baseline IRT Comments

Date Prepared: December 1st, 2021

This memo addresses the North Carolina Interagency Review Team (NCIRT) comments on the Banner Branch As-Built/MY0 report. These comments were provided via email by Kimberly Browning on September 13th, 2021. DMS directed WLS to address these comments in the MY1 report. WLS is providing our written responses to the NCIRT's review comments below. Each of the NCIRT review comments is copied below in bold text, followed by the appropriate response from WLS in regular text:

USACE Comments (Kim Browning)

1. **Table 1: Wetlands W2, W6A, W4, W1A list planting as part of the functional uplift, yet none of these areas are captured in vegetation plot data. Please ensure these areas are captured in future monitoring by either permanent veg plots or random transects.** Response: The approved mitigation plan did not have any vegetation plots in these wetland areas nor any comments to add them. W1A is re-establishment and does have a vegetation plot (VP12) in the wetland. W6A is rehabilitation (0.251 acres), most of the uplift is provided from the hydrology, and this wetland has a monitoring gauge. WLS proposes to not add a vegetation plot/transect in W6A. W4 was not planted per the mitigation plan due to remaining canopy coverage after construction, but the stream restoration activities improve the hydrology of this wetland. We were able to do a random transect on the boundary of the W4/W4A wetland for the MY1 report, but that is the only location. WLS proposes to not continue collecting this transect as it does not represent W4, but we did want to provide in the MY1 report. In the MY1 report and going forward WLS will provide vegetation data from a fixed vegetation plot for W2.

2. **In future monitoring reports, please show the location of the benthic macroinvertebrate sampling on the CCPV.** Response: The benthic macroinvertebrate sampling will be conducted in monitoring years 3 and 7. This has been added to the CCPV with a note that it is for MY3 and MY7.

3. **American basswood and umbrella tree are both FACU species and were noted as being planted in numerous veg plots located in wetlands. I question the appropriateness of these species in wetland areas, especially once hydrology increases.** Response: WLS will monitor the survival of these tree species in the wetland areas. American basswood was in the approved planting list and no planting zones were proposed. Umbrella tree was an addition due to availability but was only

planted at 3% across the entire site.

4. **Please label UT3 on the CCPV.** Response: UT3 has been labeled on CCPV.

5. **UT4-RS, XS 19 appears to have a debris jam or beaver dam. Please confirm that this was removed.** Response: There is no debris jam or beaver dam on UT4-R2. This was just debris and a poor camera angle. There is currently no debris jam in this area.

6. **It was noted that flow gauge 3 on UT2 was shifted down stream. In the video footage it appears that the upper portion of this channel is dry. Please supplement the flow data with additional photos documenting flow in future monitoring reports.** Response: The flow gauge was installed more upstream than proposed in the mitigation plan and is well above the upper one-third of the reach. This is an intermittent reach and the gauge data will provide evidence of flow. WLS will provide photo documentation of flow on UT2 during the twice a year visual assessment.

DWR Comments (Erin Davis)

1. **Photo UT4-R1 XS13 Left Bank appears to show a riprap swale from the stream to the easement boundary where a Water Quality Improvement Feature was proposed. Was this feature constructed as per the Sheet 5 Detail in the approved design plan (e.g. with planted pool area)? DWR would like a photo of at least one of the three Water Quality Improvement Features constructed.** Response: The water quality improvement feature was constructed per the details in the approved design plan. This photo of the XS does not show the BMP area, but only shows the swale that is preventing erosion/runoff due to steep side slopes. WLS will provide a photo of each water quality improvement feature in the annual monitoring reports.

2. **Photo UT4-R2 XS19 Upstream shows an in-stream drop. Do you know if it's a debris jam or beaver dam?** Response: Please see response to USACE #5. This is a poor photo angle and there is not an in-stream drop, debris jam or beaver dam on UT4-R2. This was just debris and a poor camera angle. There is currently no debris jam in this area.

3. **DWR appreciated all of the crossing photos and gauge diagrams included.** Response: Thank you.

4. **I couldn't tell by the photos, was woody debris habitat placed in the wetland and floodplain areas as discussed in the mitigation plan comments?** Response: Yes, woody debris habitat was placed in the wetland and floodplain areas, but not large debris.

5. **Were soil borings collected near the installed wetland gauges (as per the 2016 IRT Guidance)? Please submit this data with the MY1 report.** Response: Soil borings were collected near the installed wetland gauges in MY0, this information is being provided in Appendix D in the MY1 report.

6. **Sheet 6 UT4-R1 Sta. 32+10 - 33+60 shows a 2+ foot deviation in as-built vs. design thalweg and bankfull. Was there a field condition reason for this design change? Is this area stable?** Response: An existing bedrock outcrop resulted in a field change in stream stationing of approximately 50 feet. This area is stable.

7. **Gate locations were not indicated on the redline drawings. Please confirm that the site has adequate safe access points for regulatory and stewardship staff.** Response: There is adequate safe access points for regulatory and stewardship staff. There are 18 access gates on the project site. WLS has provided the gate locations on the CCPV Figure 1a.

8. **In future monitoring reports please add a callout for UT3 on Figure 1e.** Response: UT3 has been labeled on CCPV.

9. **For future MY0 reports, please note any monitoring station location changes more than just a minor field shift (e.g. WG-7 moved to opposite side of stream). DWR understands that minor field shifts are expected, but we review and comment on the number and location of wetland gauges, flow gauges and veg plots based on what's presented on the mitigation plan monitoring figure.** Response: WLS understands and will note any major monitoring station location changes in future MY0 reports. WLS did install monitoring equipment based on the approved mitigation plan (general locations, number of devices, etc.).

10. **DWR appreciated the inclusion of drone footage. It was great to see all the wood added to the system! Just a few follow-ups: Have the areas of sparse veg cover greened up or is re-seeding/planting planned? Have the areas of excess sediment within the stream reaches started to flush through the system? Has the corrugated plastic pipe on the UT4-R2 right bank (video 5:19) been removed?** Response: The few areas of sparse vegetation coverage have greened up and WLS will continue to monitor the steep side slopes for vegetation cover. No reseeding/planting is proposed at this time. Yes, the excess sediment has started to flush through the systems. Also, the corrugated plastic pipe on UT4-R2 was just a piece of pipe left over and has been removed.