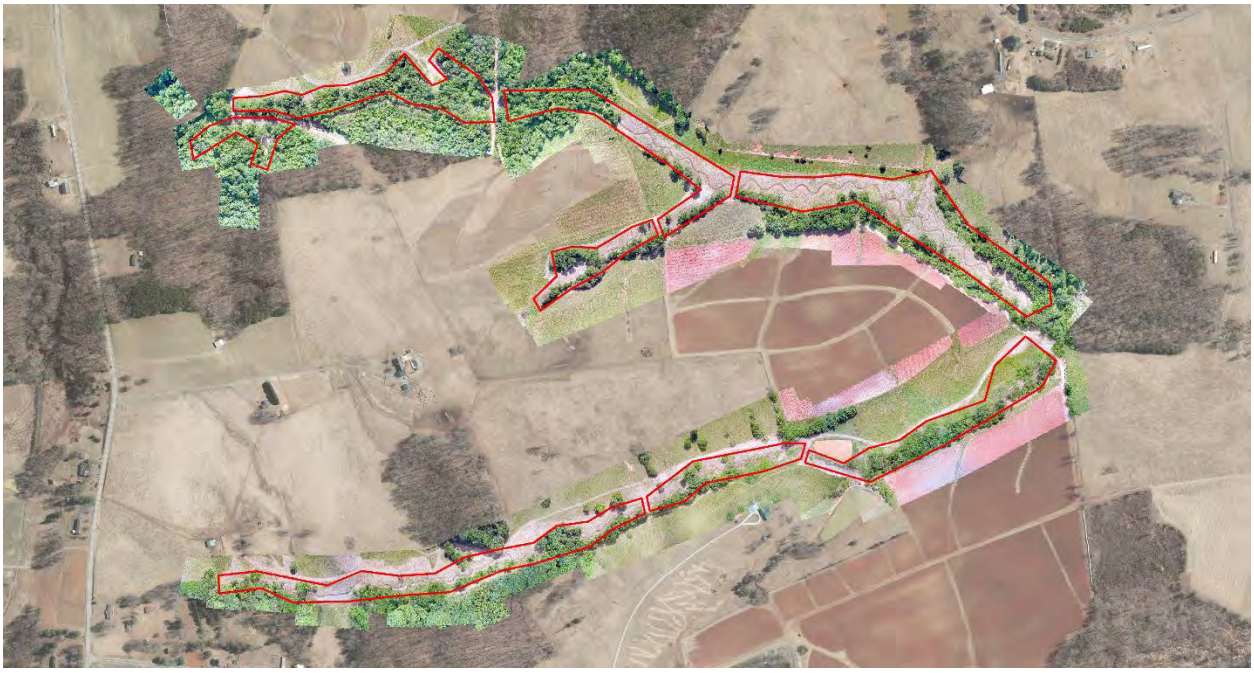
MY3 FINAL MONITORING REPORT
Banner Branch Mitigation Project
Stokes County
Roanoke River Basin
CU 03010103

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: 2023



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 18, 2023

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

RE: WLS Responses to NCDEQ DMS Review Comments for Task 9 Submittal, Draft Monitoring Year 3 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 3 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 3 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 Monitoring Year 3 Report below. Each of the DMS review comments is copied below in **bold** text, followed by the appropriate response from WLS in regular text:

Report

1. **Please note that the 0.107 WMUs associated with Wetland W8A are considered at-risk due to failure to meet the proposed hydroperiod. Please indicate this on Table 1.** WLS Response: WLS notes that 0.107 credits of W8a are at-risk due to failure to meet the proposed hydroperiod for MY1 through MY3. Table 1 has been updated accordingly.

2. **Table 2 incorrectly states in the Measurement column that there were 3 random veg plots. Please change to 2.** WLS Response: Table 2 has been updated to reflect the correct number of 2 random veg plots.

3. **On Figure 1c, recommend adding the SPA-6 label on the part of the map that overlaps with Figure 1b.** WLS Response: Figure 1c has been updated with the labelling of SPA-6.

4. **Veg Plot 18 did not meet success criteria due to herbaceous competition and excessively wet conditions. Does WLS believe that supplemental planting may be necessary, or are volunteer species (as listed in the report) establishing at a density to meet success by year 7?** WLS Response: At this time, WLS does not recommend supplemental planting. WLS expects volunteer species will establish in this area during future monitoring years. WLS will add an additional random transect adjacent to plot 18 in MY5 if the plot continues to not meet success criteria. Veg plot 17, located on the left floodplain of the reach within W3, is meeting success criteria with 769 stems per acre.

5. **5. Appendix C**
    a. **Recommend removing BHR calculations from pool cross sections.** WLS Response: WLS has removed all BHR calculations from pool cross-sections in the Cross-Section Morphology Data Table.

    b. **Is the LTOB cross sectional area correct on XS13? It appears that there should have been a loss in cross sectional area since MY0 based on the plotted graph. Please clarify.** WLS Response: WLS checked the input data and reexported using the DMS Cross-Section Analysis tool. The data is consistent as presented in the report and WLS is confident the data is correct.

6. **Please add a table to Appendix D that summarizes flow data for all monitoring years.** WLS Response: WLS has added a flow data summary table to appendix D and the e-data "App D Tables" excel sheet.

7. **A black corrugated pipe was observed on the left bank of UT4-R2 between stations 59+00 and 60+00. DMS recommends further investigation in MY4 to determine if there is any active drainage through the pipe.** WLS Response: Upon further investigation and review of as-built (MY0) drone videos, the black pipe located on UT4-R2 is likely a piece of trash that has moved down the channel and is now lodged in the bank with sediment. WLS will remove this pipe during MY4.

Digital Files

1. **Please submit digital files with the location of the invasive species indicated in the visual vegetation table and the 2023 treatment areas.** WLS Response: WLS has added the invasive species shapefile in the digital submission.

Please contact me if you have any questions or comments.

Sincerely,

Kyle Obermiller

Water & Land Solutions, LLC
Kyle Obermiller
Water & Land Solutions, LLC
7721 Six Forks Road, Suite 130
Raleigh, NC 27615
Office Phone: (919) 614-5111
Email: kyle@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 the 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, 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 3 (MY3) activities occurred during May and October 2023. This report presents the data for MY3. The Project meets the MY3 success criteria for stream hydrology, stream horizontal and vertical stability, and streambed condition and stability. Seven of the nine groundwater gauges are meeting success criteria for hydrology. Two of the 23 vegetation plots (21 fixed and two random) are not meeting interim success criteria. 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 (at-risk)	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						
	Stream			Riparian	Non-Rip	Coastal
Restoration Level	Warm	Cool	Cold	Wetland	Wetland	Marsh
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 (0.107 at-risk)**

Wetland Mitigation Category

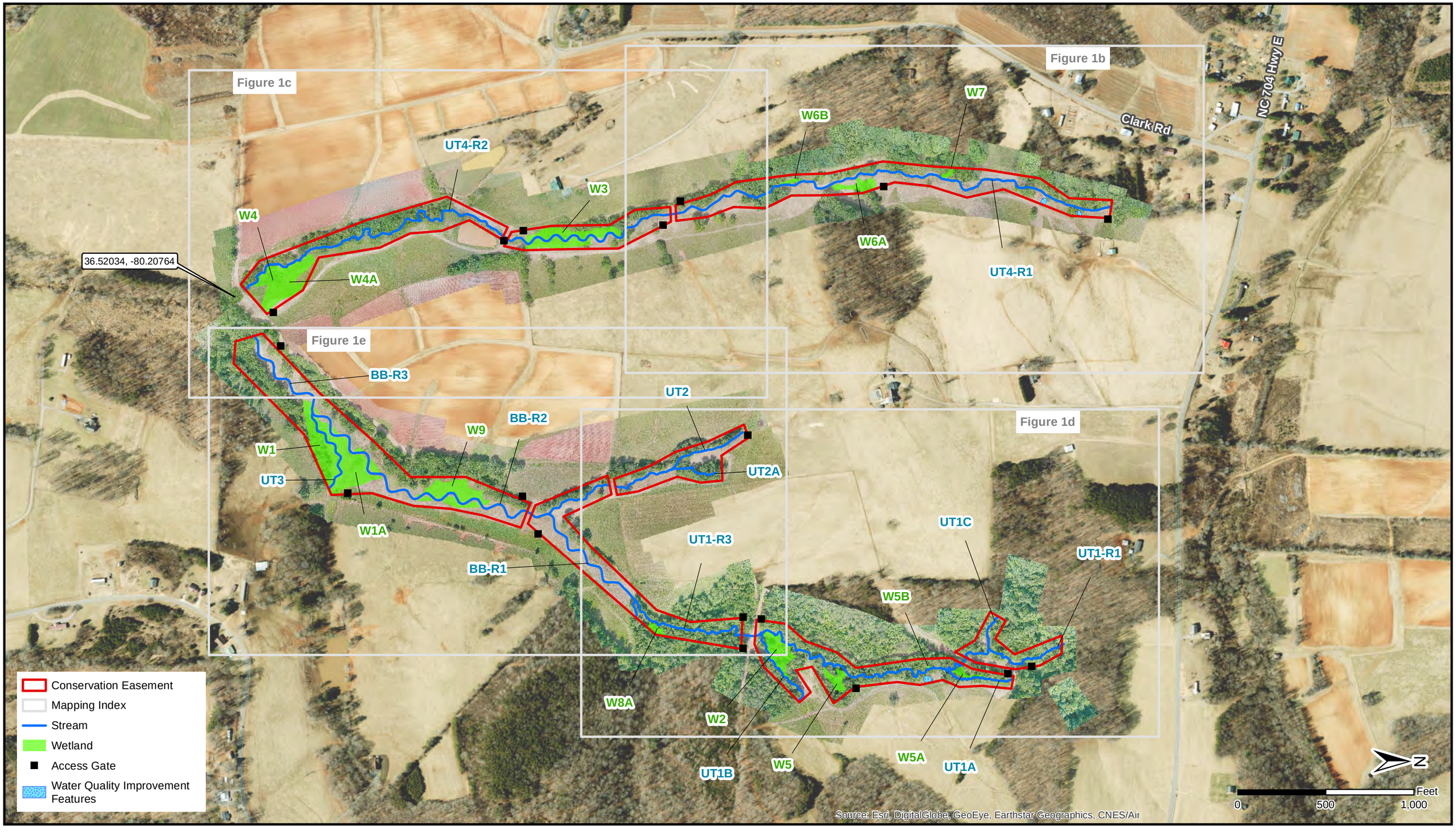
CM	Coastal Marsh
R	Riparian
NR	Non-Riparian

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).



WATER & LAND™ SOLUTIONS

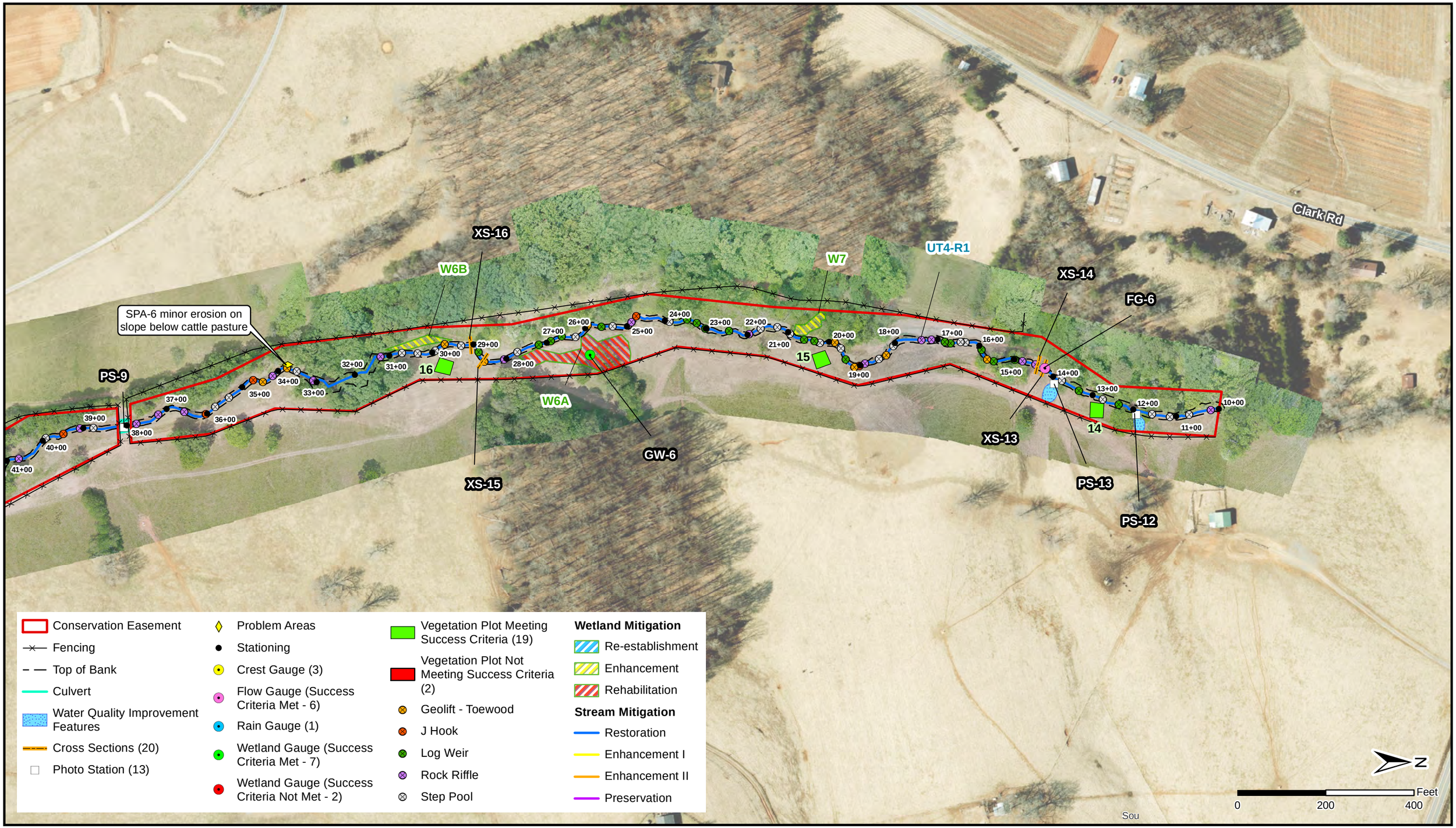
Banner Branch Mitigation Project
Stokes County, North Carolina

USACE Action ID Number:
SAW-2018-01760
October 2023
MY3

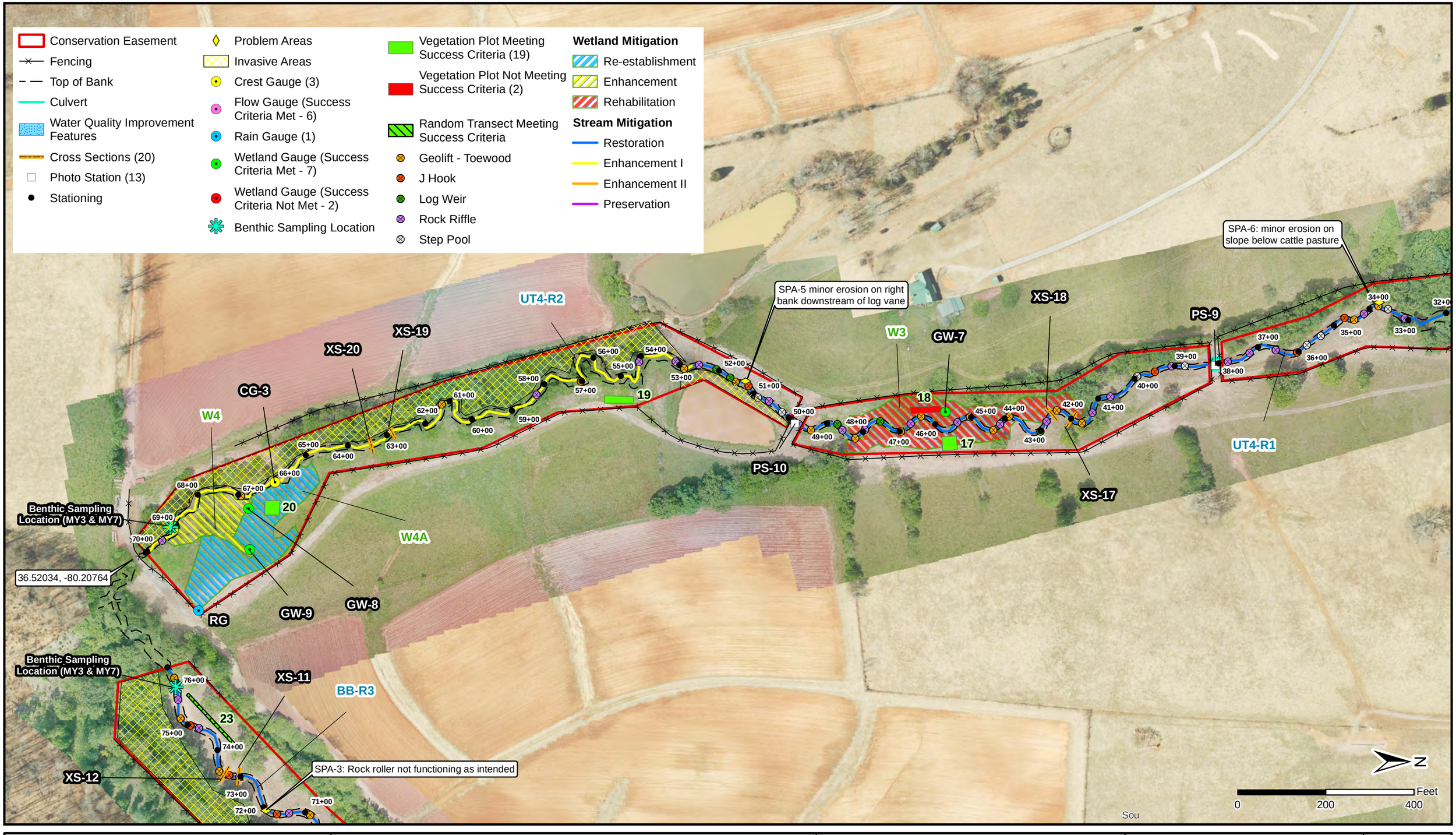
USACE
Current Conditions Plan View
Monitoring Year 3

NAD 1983 2011 State Plane
North Carolina FIPS 3200 FT US

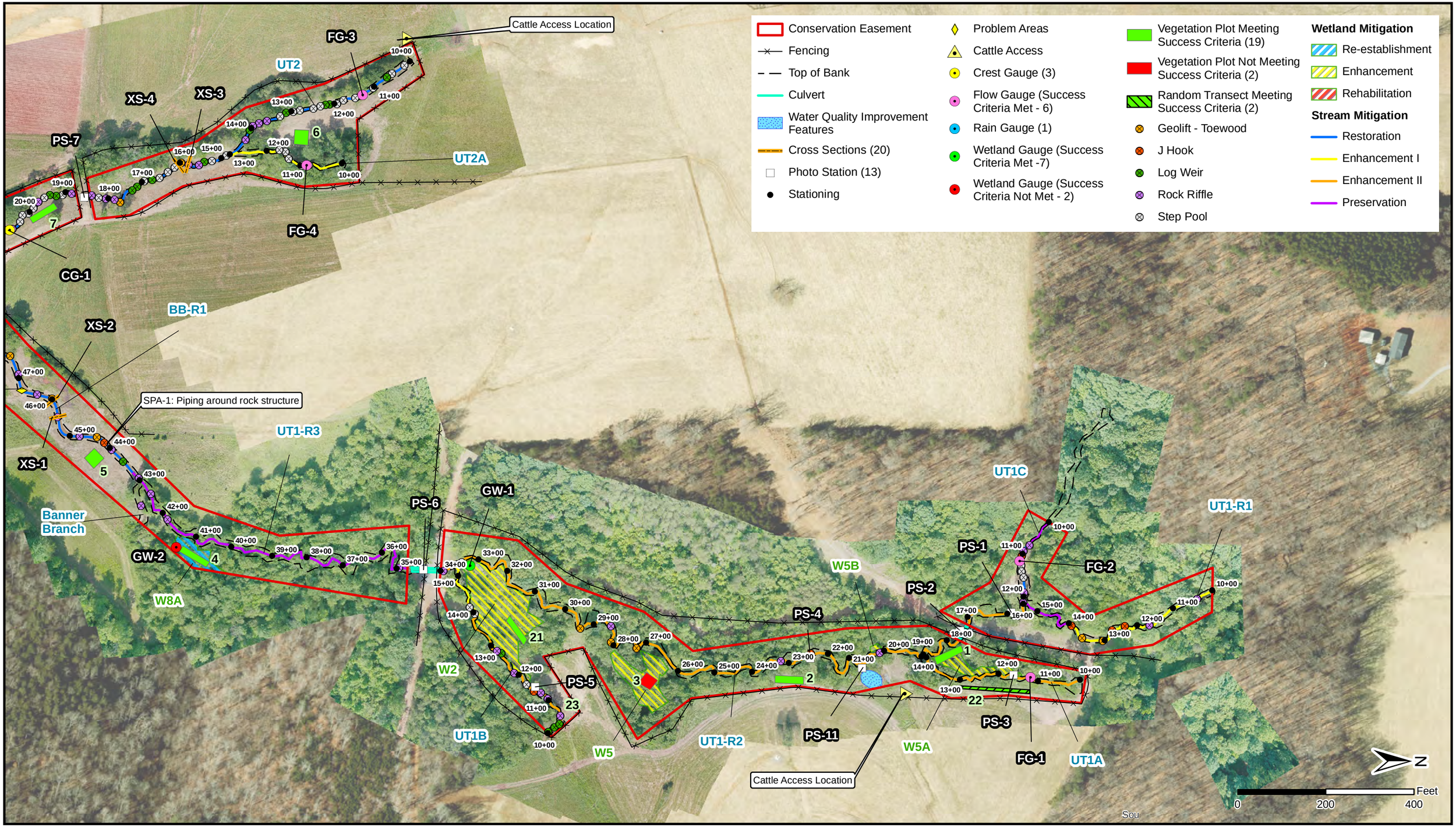
FIGURE
1a



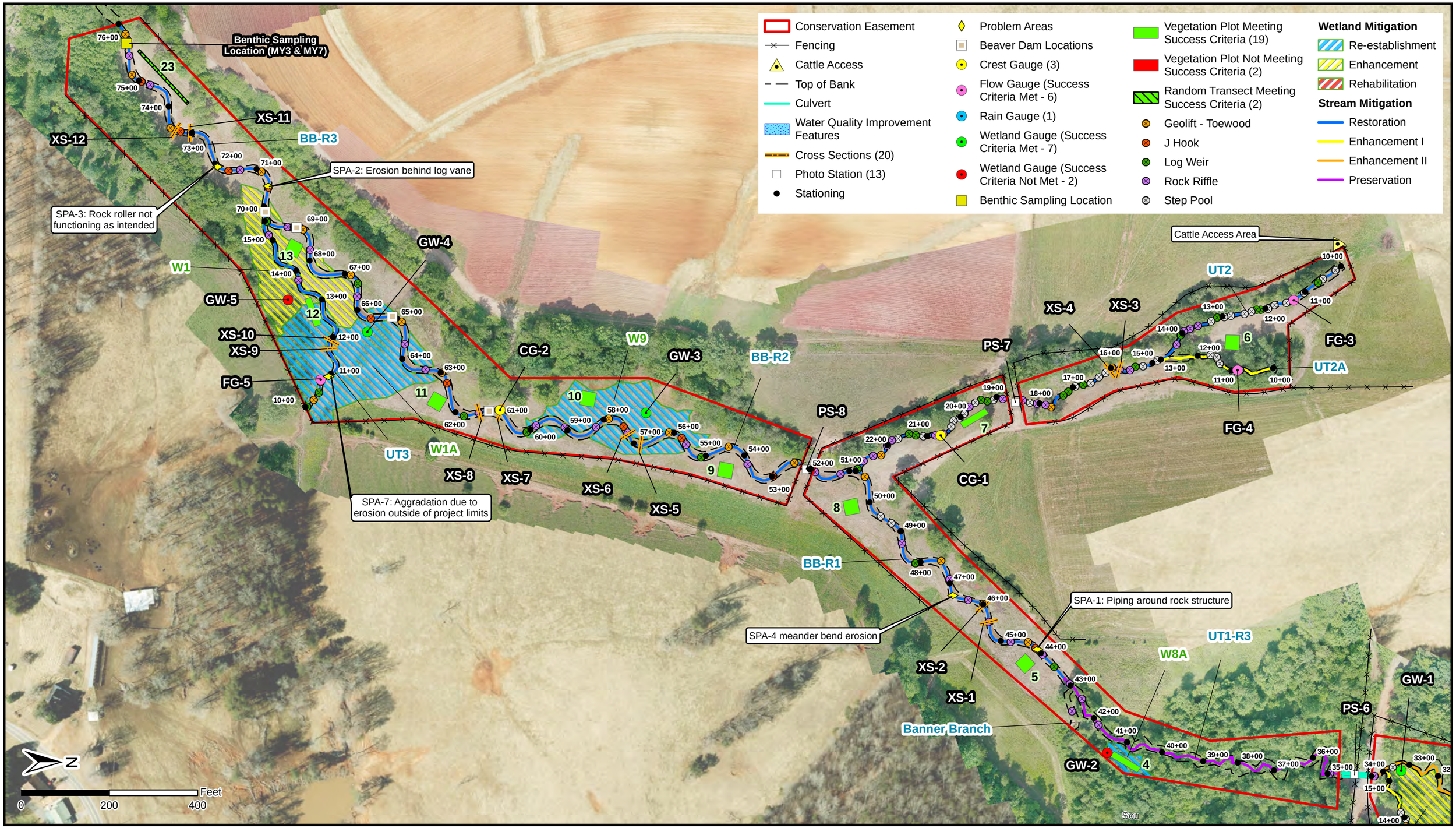
WATER & LAND™ SOLUTIONS	**Banner Branch Mitigation Project** **Stokes County, North Carolina**	USACE Action ID Number: SAW-2018-01760 October 2023 MY3	USACE Current Conditions Plan View Monitoring Year 3 NAD 1983 2011 State Plane North Carolina FIPS 3200 FT US	FIGURE 1b



WATER & LAND™ SOLUTIONS	**Banner Branch Mitigation Project** **Stokes County, North Carolina**	USACE Action ID Number: SAW-2018-01760 October 2023 MY3	USACE Current Conditions Plan View Monitoring Year 3 NAD 1983 2011 State Plane North Carolina FIPS 3200 FT US	FIGURE 1c



WATER & LAND™ SOLUTIONS	**Banner Branch Mitigation Project** **Stokes County, North Carolina**	USACE Action ID Number: SAW-2018-01760 October 2023 MY3	USACE Current Conditions Plan View Monitoring Year 3 NAD 1983 2011 State Plane North Carolina FIPS 3200 FT US	FIGURE 1d



WATER & LAND™ SOLUTIONS	**Banner Branch Mitigation Project** **Stokes County, North Carolina**	USACE Action ID Number: SAW-2018-01760 October 2023 MY3	USACE Current Conditions Plan View Monitoring Year 3 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 with more natural flood processes;
- Improve and protect water quality by reducing streambank erosion and nutrient/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 gauges recorded out of bank events in MY3. 7/9 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), 2 random transects/plots, and visual assessment. Years 1, 2, 3, 5, and 7 for veg plots.	19/21 Fixed Veg Plots met in 2023 and 2/2 Random Veg Plots met in 2023
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	MY3 Biotic index values: BB-R3 increase from "Fair" to "Good-Fair" & UT4-R2 increase from "Poor" to "Good-Fair"

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 years 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 0, 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 two random (2m x 50m or 4m x 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 is 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 3 Assessment and Results

The dates of Year 3 monitoring activities are detailed in Appendix E. All Year 3 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 MY3 was collected in May 2023. 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 MY3 horizontal and vertical stream stability. The visual assessments for each stream reach concluded that the MY3 stream channel pattern and longitudinal profiles, and in-stream structure location/function, still closely match the MY0/baseline conditions (Appendix C). Overall, the MY3 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). During MY3, these problem areas were monitored, and four additional problem areas were documented.

- **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 was functioning as designed during MY3 during the spring and fall site walk visits. WLS will continue to monitor this area in MY4 and will remove from the list if it remains stable for two monitoring seasons.
- **SPA-2:** On BB-R3 near station 70+50, erosion was 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 and additional stakes were added on 5/10/2023. Streambank vegetation has established very well, and the stream feature is stable. WLS will continue to monitor this area in MY4 and will remove from the list if it remains stable for two monitoring seasons.
- **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 not actively eroding. Livestakes were added on 11/3/2021 and 5/10/2023. WLS will continue to monitor this area closely and will remove from the list if it remains stable for two monitoring seasons.
- **SPA-4**: On BB-R1 near station 47+25 a meander bend is experiencing around 20 feet of scour and erosion. This area did not have a structure installed per design. Live stakes were installed on 5/10/2023. Additional live stakes will be installed this winter. Bank pins will also be installed to measure any additional scour during MY4 to determine if any handwork is needed for stabilization.
- **SPA-5**: On UT4-R1 near station 51+80, some minor erosion is occurring due to scour on the right bank downstream of a log vane. Live stakes were added on 5/10/2023 to provide further stability, and this area will continue to be monitored in MY4.

- **SPA-6**: On UT4-R1 near station 34+00 an overland flow path washed rocks into the channel. Larger rocks were removed from the channel, and the riffle remains stable. Minor erosion is occurring on the slope leading down from the existing cattle pasture into the stream. Any remedial action taken during the dormant season will be noted in the MY4 report. WLS will install coir wattles to and live stake the slope to prevent any further erosion.
- **SPA**-7: Cattle access and erosion is occurring upstream of the project on Reach UT3. Sedimentation is present along the reach and was noted in MY2 for aggradation on cross-sections 9 and 10. This reach is being monitored by WLS closely. No remedial action is planned to occur. UT3 was noted as flowing through the restored channel and no side channels or diverging flows were noted in MY3. WLS will continue to watch this stream closely for issues in MY4.

WLS staff noted minor beaver activity occurring on BB-R2 during the fall monitoring site visit. WLS staff removed four small dams on BB-R2. Beaver impacts to the site were negligible and did not negatively affect stream pattern or profile due to the small size of the dams and are marked on the CCPV. The dam construction did not negatively affect any riparian tree plantings as the dam material was primarily live stake cuttings. WLS expects the live stakes to resprout, as the roots were not affected. WLS will continue to monitor these locations and beaver management will be noted in future reports.

4.1.2 Stream Horizontal Dimension

The MY3 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. Cross-sections 9 and 10 on UT3 previously showed significant aggradation during MY1, and MY2 due to erosion outside of the conservation easement, but MY3 cross-section results show sediment is flushing through the system. Cross-section 10 had a bank height ratio of 0.79 in MY2, and that has stabilized closer to design of 0.87 in MY3. Additional photos of this reach can be found in Appendix A. WLS will continue to closely monitor this reach visually during MY4 and include additional photos during MY4. Maximum riffle depths are expected to fluctuate slightly throughout the monitoring period as the channels adjust to the new flow regime. 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). 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. Rainfall was above normal for the year (January – September).

Flow Gauge Data

Flow Gauge Name	Flow Gauge Location	Longest Period of Consecutive Flow	Total Days of Cumulative Flow	Total Days of No Flow	Longest Period of Consecutive No Flow
FG-1	UT1A	284 days 1/1/2023 -10/12/2023	284 days	0 days	0 days
FG-2	UT1C	88 days 1/1/2023 – 3/30/2023	165 days	120 days	25 days
FG-3	UT2	206 days 1/1/2023 – 7/26/2023	278 days	7 days	3 days
FG-4	UT2A	284 days 1/1/2023–10/12/2022	284 days	0 days	0 days
FG-5	UT3	284 days 1/1/2023–10/12/2022	284 days	0 days	0 days
FG-6	UT4-R1	138 days 5/27/2023-10/12/2023	279 days	6 days	1 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 MY3, bankfull events were recorded on all three pressure transducer crest gauges. CG-1 (UT2) recorded 13 events with a maximum event of 0.401 feet above bankfull. CG-2 (BB-R2) recorded 11 events with a maximum event of 1.32 feet above bankfull. CG-3 (UT4-R2) recorded one event with a maximum event of 0.281 feet above bankfull. 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 MY3, seven of the nine wetland groundwater wells are meeting the eight percent wetland hydrology criterion. GW-2 (W8a) had a hydroperiod of 2.8 percent, and GW-5 (W1) had a hydroperiod of 4.5%, which are both not meeting the eight percent criteria. GW-5 is located in W1, a wetland enhancement area. The vegetative profile of W1 indicates that the area is experiencing high hydrologic activity. GW-4, in the adjacent W1a experienced groundwater within 12” of the soil surface for 59.3% of the captured growing season. It is expected that GW-5 will meet criteria in MY4. WLS will replace the wetland gauge in GW-5 to ensure is captured accurately and to remove any sediment buildup within the well.

4.4 Vegetation

Monitoring of the 21 permanent vegetation plots and two random transects was completed during October 2023. Vegetation data photos can be found in Appendix B. The MY3 average density is 519 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. 21 of the 23 vegetation plots are also meeting the interim measure requirements and all plots have 121 – 891 stems per acre including appropriate volunteers. Vegetation plots 3 (in W5) and 18 (in W3) are not meeting success criteria. This is due to vegetation plot 3 being

planted within an existing canopy and groundwater saturation within W5. Numerous mature trees are located within VP3. Vegetation plot 18 not meeting success criteria is due to dense herbaceous cover out competing trees and saturated conditions within W3; GW7 is adjacent to plot 18 in W3 and retained a 74% hydroperiod during MY3. Volunteer tulip poplar (*Liriodendron tulipifera*), spicebush (*Lindera benzoin*), white ash (*Fraxinus americana*), willow oak (*Quercus phellos*), green ash (*Fraxinus pennsylvanica*), hazel alder (*Alnus serrulata*), sycamore (*Platanus occidentalis*), and persimmon (*Diospyros virginiana*) were noted in MY3, 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. In response to MY2 IRT comments, Vegetation Plot 4 will transition from a permanent plot located in W8a to a random vegetation plot in MY5 and MY7 monitoring.

During fall monitoring, two areas of the project had evidence of cattle access within the easement; however, WLS has not seen cattle in the easement. VP6 (near UT2) was grazed by cattle, but the plot trees resprouted and are expected to be successful. WLS staff contacted the landowner to discuss the issue and no further access is expected to occur. Cattle might have accessed through a gate accidently not secured and no fence needs repaired. A second cow access area along UT1a was noted during fall monitoring. A few small cattle likely accessed the easement below the fence through a drainage swale near the BMP located on the left side of the stream. WLS staff contacted the farmer to discuss the issue and he also has never seen cattle in the easement. Random plot 22 was placed in this area during MY3 to document planted stem success. WLS staff met onsite on October 30, 2023, to walk the easement fence perimeter and document any areas needing remedial action. T-posts will be installed inside the fence at the two locations (one along UT1a and another along UT2) where small cows may be accessing the easement by going under the fence. The landowner that encompasses UT2 has also been contacted to spray the fence line and install chains on the fence at all stream crossings to discourage access. WLS will continue to monitor these areas in MY4.

Areas of privet (*Ligustrum sinense*), tree of heaven (*Ailanthus altissima*), and multiflora rose (*Rosa multiflora*) in individual areas are below mapping threshold scattered areas across the project (~4.48 acres). These areas have been spot treated with herbicide, and treatments will continue in future monitoring years. See table below for treatment dates. No other 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.

Invasive Species Treatment Table

Monitoring Year	Date	Species	Treatment
MY3	6/29/2023	Tree of Heaven, Multi-flora rose and Privet	Rodeo backpack foliar spray
	8/30/2023	Tree of Heaven, Multi-flora rose and Privet	Rodeo backpack foliar spray and cut stump

4.5 Macrobenthic Sampling

Two macrobenthic sampling locations were surveyed prior to restoration activities on BB-R3 and UT4-R2. BB-R3 scored “Fair” and had a biotic index value of 5.94, and UT4-R2 scored “Poor” and had a biotic index value of 6.65. Both reaches were re-surveyed in MY3 on June 28, 2023. BB-R3 scored “Good-Fair” and had a biotic index value of 5.19, and UT4-R2 scored “Good-Fair” and had a biotic index value of 4.90. Benthic data is located in Appendix F.

Appendix A:

Visual Assessment Data

Visual Stream Morphology Stability Assessment Table
Vegetation Condition Assessment Table
Cross Section Photos
Stream Photo Stations (Culvert & Ford Crossings, EII Reaches, BMPs)
Potential Problem Area Photos

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		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		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		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			25	98%
	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	25	98%
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)	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		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)	65	66		98%

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	4.48	10.9%
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-03)

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

BB-R1, XS1, Downstream (MY-03)

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

BB-R1, XS1, Left Bank (MY-03)

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

BB-R1, XS1, Right Bank (MY-03)

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

BB-R1, XS2, Upstream (MY-03)

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

BB-R1, XS2, Downstream (MY-03)

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

BB-R1, XS2, Left Bank (MY-03)

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

BB-R1, XS2, Right Bank (MY-03)

UT2, XS3, Upstream (MY-00)

UT2, XS3, Upstream (MY-03)

UT2, XS3, Downstream (MY-00)

UT2, XS3, Downstream (MY-03)

UT2, XS3, Left Bank (MY-00)

UT2, XS3, Left Bank (MY-03)

UT2, XS3, Right Bank (MY-00)

UT2, XS3, Right Bank (MY-03)

UT2, XS4, Upstream (MY-00)

UT2, XS4, Upstream (MY-03)

UT2, XS4, Downstream (MY-00)

UT2, XS4, Downstream (MY-03)

UT2, XS4, Left Bank (MY-00)

UT2, XS4, Left Bank (MY-03)

UT2, XS4, Right Bank (MY-00)

UT2, XS4, Right Bank (MY-03)

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

BB-R2, XS5, Upstream (MY-03)

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

BB-R2, XS5, Downstream (MY-03)

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

BB-R2, XS5, Left Bank (MY-03)

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

BB-R2, XS5, Right Bank (MY-03)

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

BB-R2, XS6, Upstream (MY-03)

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

BB-R2, XS6, Downstream (MY-03)

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

BB-R2, XS6, Left Bank (MY-03)

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

BB-R2, XS6, Right Bank (MY-03)

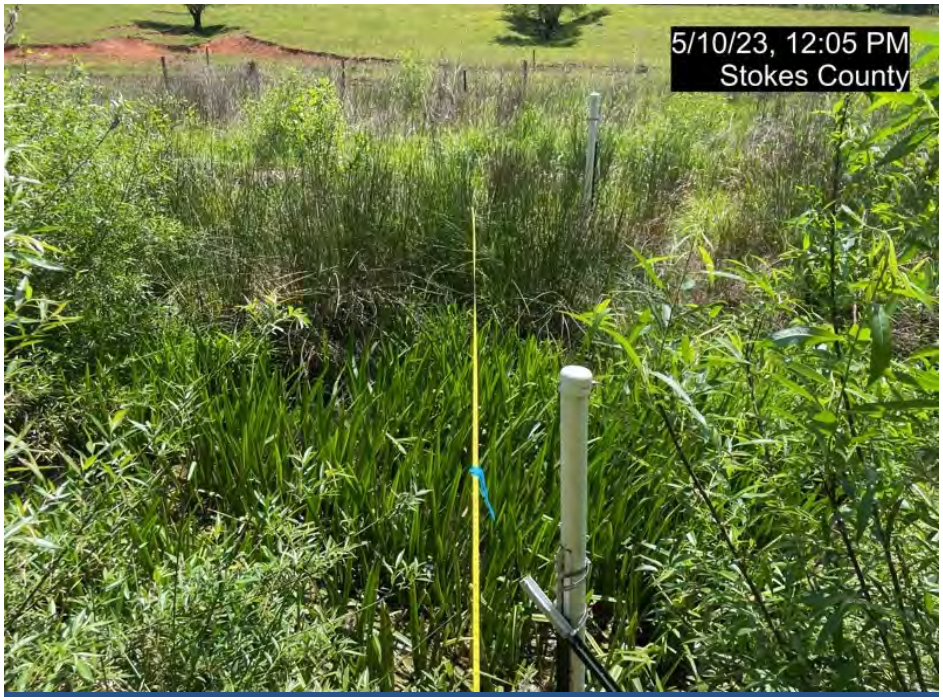
BB-R2, XS7, Upstream (MY-00)

BB-R2, XS7, Upstream (MY-03)

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

BB-R2, XS7, Downstream (MY-03)

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



BB-R2, XS7, Left Bank (MY-03)

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

BB-R2, XS7, Right Bank (MY-03)

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

BB-R2, XS8, Upstream (MY-03)

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

BB-R2, XS8, Downstream (MY-03)

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

BB-R2, XS8, Left Bank (MY-03)

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

BB-R2, XS8, Right Bank (MY-03)

UT3, XS9, Upstream (MY-00)

UT3, XS9, Upstream (MY-03)

UT3, XS9, Downstream (MY-00)

UT3, XS9, Downstream (MY-03)

UT3, XS9, Left Bank (MY-00)

UT3, XS9, Left Bank (MY-03)

UT3, XS9, Right Bank (MY-00)

UT3, XS9, Right Bank (MY-03)

UT3, XS10, Upstream (MY-00)

UT3, XS10, Upstream (MY-03)

UT3, XS10, Downstream (MY-00)

UT3, XS10, Downstream (MY-03)

UT3, XS10, Left Bank (MY-00)

UT3, XS10, Left Bank (MY-03)

UT3, XS10, Right Bank (MY-00)

UT3, XS10, Right Bank (MY-03)

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

BB-R3, XS11, Upstream (MY-03)

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

BB-R3, XS11, Downstream (MY-03)

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

BB-R3, XS11, Left Bank (MY-03)

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

BB-R3, XS11, Right Bank (MY-03)

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

BB-R3, XS12, Upstream (MY-03)

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

BB-R3, XS12, Downstream (MY-03)

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

BB-R3, XS12, Left Bank (MY-03)

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

BB-R3, XS12, Right Bank (MY-03)

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

UT4-R1, XS13, Upstream (MY-03)

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

UT4-R1, XS13, Downstream (MY-03)

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

UT4-R1, XS13, Left Bank (MY-03)

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

UT4-R1, XS13, Right Bank (MY-03)

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

UT4-R1, XS14, Upstream (MY-03)

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

UT4-R1, XS14, Downstream (MY-03)

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

UT4-R1, XS14, Left Bank (MY-03)

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

UT4-R1, XS14, Right Bank (MY-03)

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

UT4-R1, XS15, Upstream (MY-03)

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

UT4-R1, XS15, Downstream (MY-03)

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

UT4-R1, XS15, Left Bank (MY-03)

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

UT4-R1, XS15, Right Bank (MY-03)

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

UT4-R1, XS16, Upstream (MY-03)

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

UT4-R1, XS16, Downstream (MY-03)

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

UT4-R1, XS16, Left Bank (MY-03)

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

UT4-R1, XS16, Right Bank (MY-03)

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

UT4-R1, XS17, Upstream (MY-03)

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

UT4-R1, XS17, Downstream (MY-03)

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

UT4-R1, XS17, Left Bank (MY-03)

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

UT4-R1, XS17, Right Bank (MY-03)

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

UT4-R1, XS18, Upstream (MY-03)

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

UT4-R1, XS18, Downstream (MY-03)

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

UT4-R1, XS18, Left Bank (MY-03)

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

UT4-R1, XS18, Right Bank (MY-03)

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

UT4-R2, XS19, Upstream (MY-03)

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

UT4-R2, XS19, Downstream (MY-03)

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

UT4-R2, XS19, Left Bank (MY-03)

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

UT4-R2, XS19, Right Bank (MY-03)

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

UT4-R2, XS20, Upstream (MY-03)

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

UT4-R2, XS20, Downstream (MY-03)

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

UT4-R2, XS20, Left Bank (MY-03)

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

UT4-R2, XS20, Right Bank (MY-03)

PS-1 – UT1-R1, EII, Upstream (MY-00)

PS-1 – UT1-R1, EII, Upstream (MY-03)

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

PS-1 – UT1-R1, EII, Downstream (MY-03)

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

PS-2 – UT1-R1 Culvert Crossing, Upstream (MY-03)

PS-2 – UT1-R1 Culvert Crossing, Upstream Left Bank (MY-03)

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

PS-2 – UT1-R1 Culvert Crossing, Downstream (MY-03)

PS-2 – UT1-R1 Culvert Crossing, Downstream Left Bank (MY-03)

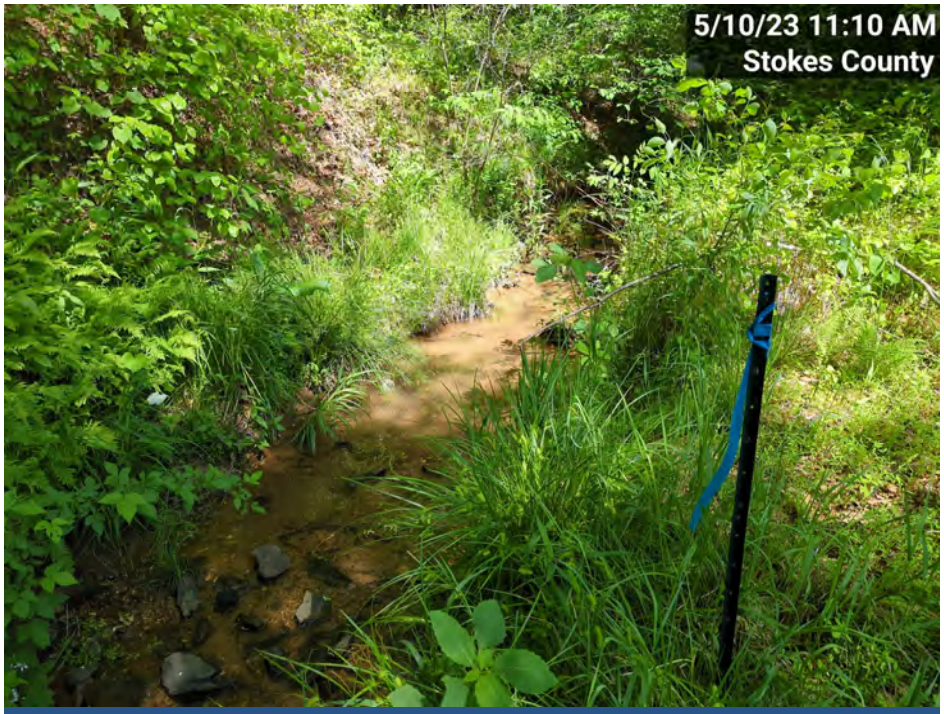
PS-3 – UT1A, EII, Upstream (MY-00)

PS-3 – UT1A, EII, Upstream (MY-03)

PS-3 – UT1A, EII, Downstream (MY-00)

PS-3 – UT1A, EII, Downstream (MY-03)

PS-4 – UT1-R2, EII, Upstream (MY-00)



PS-4 – UT1-R2, EII, Upstream (MY-03)

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

PS-4 – UT1-R2, EII, Downstream (MY-03)

PS-5 – UT1B, EII, Upstream (MY-00)

PS-5 – UT1B, EII, Upstream (MY-03)

PS-5 – UT1B, EII, Downstream (MY-00)

PS-5 – UT1B, EII, Downstream (MY-03)

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

PS-6 – UT1-R2 Culvert Crossing, Upstream (MY-03)

PS-6 – UT1-R2 Culvert Crossing, Upstream Left Bank (MY-03)

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

PS-6 – UT1-R2 Culvert Crossing, Downstream (MY-03)

PS-6 – UT1-R2 Culvert Crossing, Downstream Left Bank (MY-03)

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

PS-7 – UT2 Ford Crossing, Upstream (MY-03)

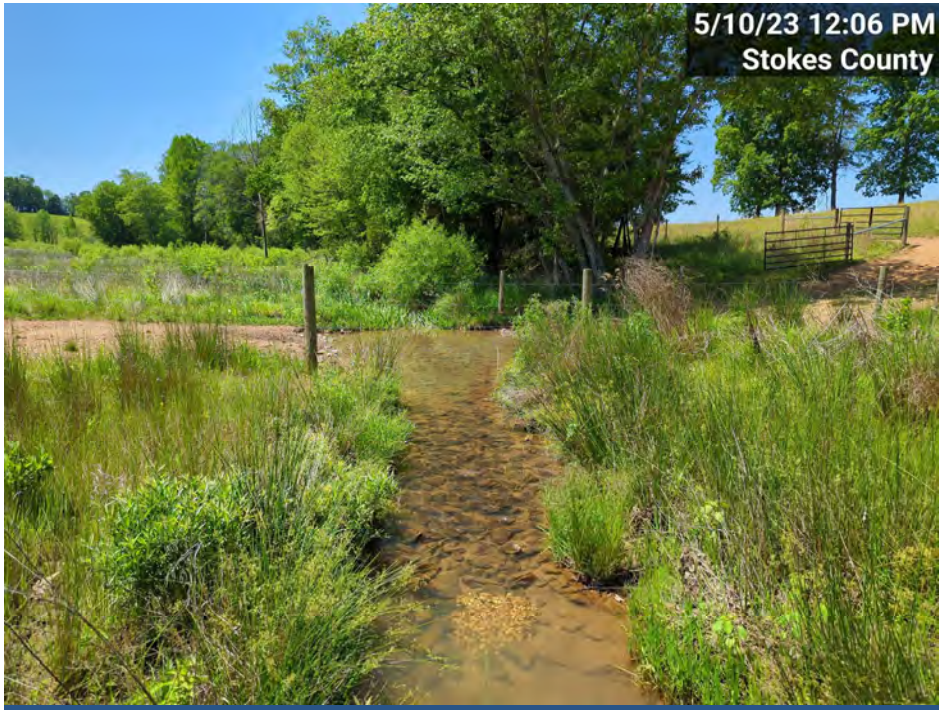
PS-7 – UT2 Ford Crossing, Downstream (MY-00)

PS-7 – UT2 Ford Crossing, Downstream (MY-03)

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

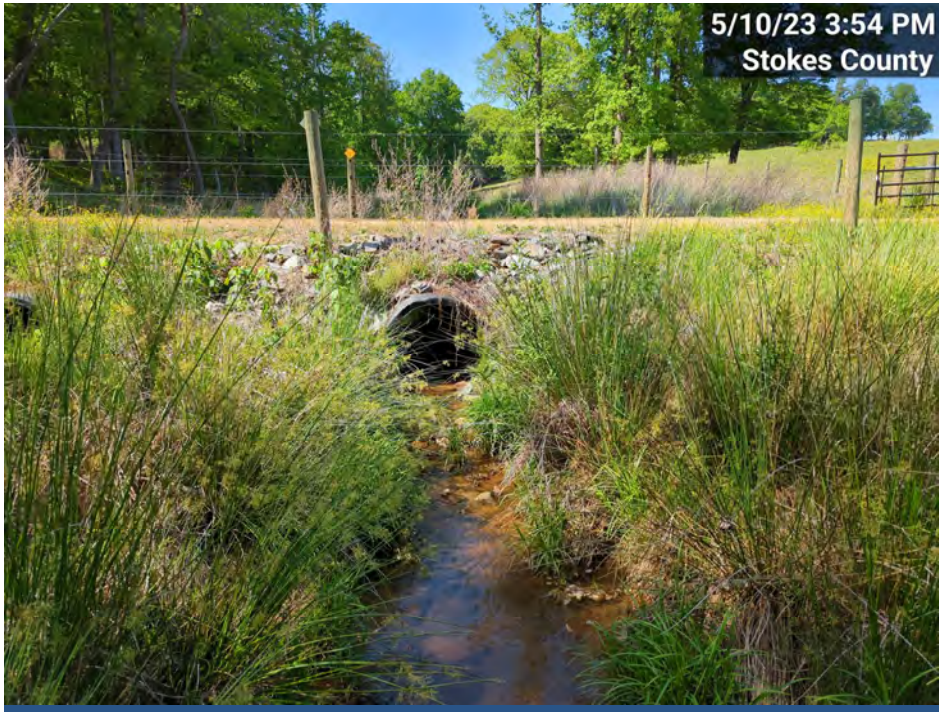
PS-8 – BB-R2 Ford Crossing, Upstream (MY-03)

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



PS-8 – BB-R2 Ford Crossing, Downstream (MY-03)

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



PS-9 – UT4-R1 Culvert Crossing, Upstream (MY-03)

PS-9 – UT4-R1 Culvert Crossing, Upstream Left Bank(MY-03)

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

PS-9 – UT4-R1 Culvert Crossing, Downstream (MY-03)

PS-9 – UT4-R1 Culvert Crossing, Downstream Left Bank (MY-03)

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

PS-10 – UT4-R1 Ford Crossing, Upstream (MY-03)

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

PS-10 – UT4-R1 Ford Crossing, Downstream (MY-03)

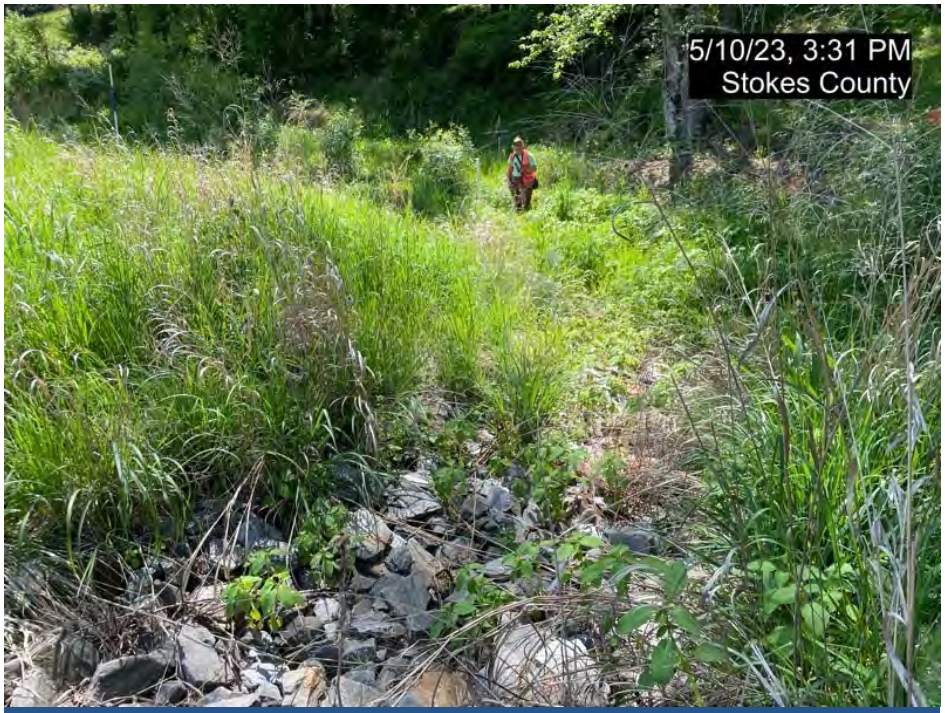
PS-11 – UT1-R1, BMP @ STA 21+00 (MY-01)

PS-11 – UT1-R1, BMP @ STA 21+00 (MY-03)

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

PS-12 – UT4-R1, BMP @ STA 12+00 (MY-03)

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



PS-13 – UT4-R1, BMP @ STA 14+00 (MY-03)

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

SPA-1 – BB-R1, Piping around rock structure @ STA 44+00 (MY-03)

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

SPA-2 – BB-R3, Erosion around log vane @ STA 70+50 (MY-03)

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

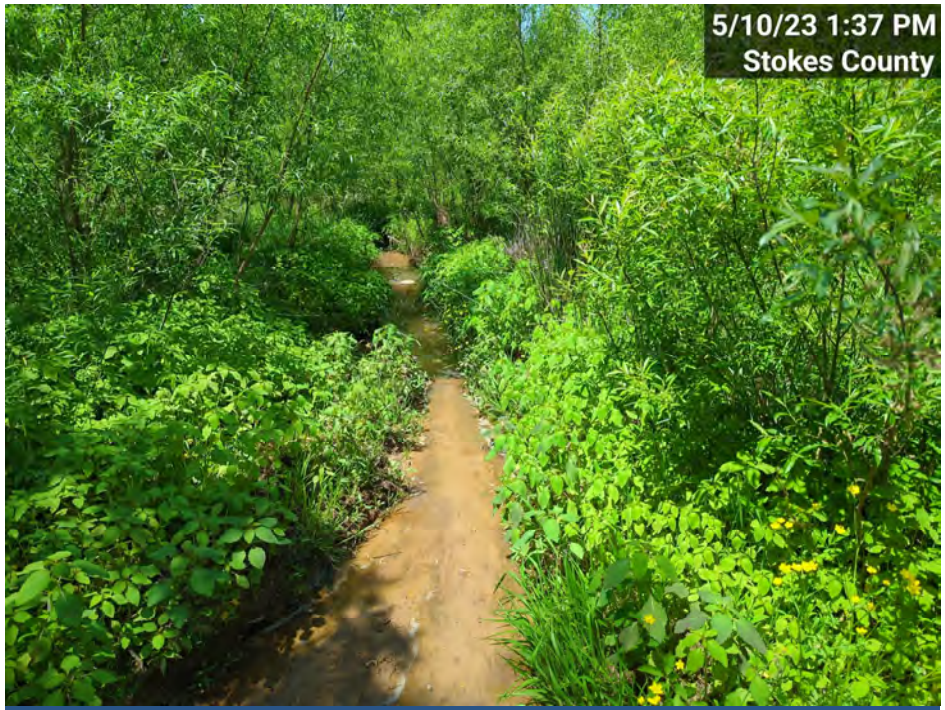
SPA-3 – BB-R3, Rock roller not functioning as intended @ STA 72+00 (MY-03)

SPA-4 – BB-R1, Bank scour & erosion @ STA 47+25 (MY-03)

SPA-4 – BB-R1, Bank scour & erosion @ STA 47+25 (MY-03)

SPA-5 – UT4-R1, Minor erosion downstream of log vane @ STA 51+80 (MY-03)

SPA-6 – UT4-R1, Minor erosion on hillside @ STA 34+00 (MY-03)



SPA-7 - UT3 Additional Photos - Channel at 10+00 (MY-03)

SPA-7 - UT3 Additional photos - Erosion outside easement (MY-03)

SPA-7 - UT3 Additional Photos - Downstream from flow gauge 5 (MY-03)

SPA-7 - UT3 Additional Photos - Upstream from flow gauge 5 (MY-03)

Evidence of cow access inside easement near UT-2 (MY-03)

Cattle access point located on UT1 (MY-03)

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

Vegetation Count and Densities Table	
Planted Acreage	30
Date of Initial Plant	2021-04-07
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2023-10-12
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										1				1								
	Amelanchier arborea	common serviceberry	Tree	FAC															2	2			1	1		
	Amelanchier canadensis	Canadian serviceberry	Tree	FAC											1	1										
	Asimina triloba	pawpaw	Tree	FAC													1	1					1	1		
	Betula nigra	river birch	Tree	FACW			1	1					1	1	3	3			1	1	4	4	4	4	2	2
	Corylus americana	American hazelnut	Shrub	FACU			1	1					1	1											1	1
	Diospyros virginiana	common persimmon	Tree	FAC									1	1				1							1	1
	Fraxinus americana	white ash	Tree	FACU								4														
	Fraxinus pennsylvanica	green ash	Tree	FACW	5	5							1	1					3	3	2	2			1	1
	Hamamelis virginiana	American witchhazel	Tree	FACU			2	2					1	1	1	1	1	1								
	Lindera benzoin	northern spicebush	Tree	FAC		6	1	1				2			2	2				1						
	Liriodendron tulipifera	tuliptree	Tree	FACU		2						5														
	Nyssa sylvatica	blackgum	Tree	FAC			1	1					1	1					1	1			2	2	1	1
	Platanus occidentalis	American sycamore	Tree	FACW	4	4			4	4			2	2	1	2	3	3			2	2	1	1	2	2
	Quercus alba	white oak	Tree	FACU									1	1	1	1							2	2	1	1
	Quercus falcata	southern red oak	Tree	FACU													1	1								
	Quercus michauxii	swamp chestnut oak	Tree	FACW			1	1					1	1	1	1			1	1	1	1				
	Quercus phellos	willow oak	Tree	FAC			3	3	1	1	4	4	1	1	1	1	1	1					2	2	2	3
	Tilia americana	American basswood	Tree	FACU																						
Sum	Performance Standard				9	17	10	10	5	5	4	15	11	12	11	12	7	9	8	9	9	9	13	13	11	12
Post Mitigation Plan Species	Magnolia tripetala	umbrella-tree	Tree	FACU															1	1	2	2				
	Salix nigra	*black willow*	*Tree*	*OBL*																						*4*
Sum	Proposed Standard				9	17	10	10	5	5	4	15	11	12	11	12	7	9	9	10	11	11	13	13	11	12
Mitigation Plan Performance Standard	Current Year Stem Count					17		10		5		15		12		12		9		9		9		13		12
	Stems/Acre					688		405		121		607		486		486		364		364		364		526		486
	Species Count					4		7		2		4		11		8		7		6		4		7		8
	Dominant Species Composition (%)					35		30		80		33		17		25		33		30		36		31		25
	Average Plot Height (ft.)					5		3		2		16		3		2		4		2		5		4		3
	% Invasives					0		0		0		0		0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					17		10		5		15		12		12		9		10		11		13		12
	Stems/Acre					688		405		121		607		486		486		364		405		445		526		486
	Species Count					4		7		2		4		11		8		7		7		5		7		8
	Dominant Species Composition (%)					35		30		80		33		17		25		33		30		36		31		25
	Average Plot Height (ft.)					5		3		2		16		3		2		4		2		4		4		3
	% 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.

Vegetation Count and Densities Table	
Planted Acreage	30
Date of Initial Plant	2021-04-07
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2023-10-12
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
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total	Total
Species Included in Approved Mitigation Plan	Alnus serrulata	hazel alder	Tree	OBL	1	1							1	4	2	4	1	1			1	1				2
	Amelanchier arborea	common serviceberry	Tree	FAC			3	3							1	1							1	1		
	Amelanchier canadensis	Canadian serviceberry	Tree	FAC																						
	Asimina triloba	pawpaw	Tree	FAC			1	1			2	2			2	2										
	Betula nigra	river birch	Tree	FACW					1	1	4	4			1	1			1	1					1	2
	Corylus americana	American hazelnut	Shrub	FACU	2	2	1	1			1	1	1	1	1	1			1	1						
	Diospyros virginiana	common persimmon	Tree	FAC					1	4	1	1	2	2					2	2	1	1			1	
	Fraxinus americana	white ash	Tree	FACU																						
	Fraxinus pennsylvanica	green ash	Tree	FACW	3	3	3	3					2	2	1	1			2	3	1	1	2	2		1
	Hamamelis virginiana	American witchhazel	Tree	FACU	1	1			3	3	1	1	1	1					1	1					2	
	Lindera benzoin	northern spicebush	Tree	FAC									1	1					1	1	1	1	1	1	1	
	Liriodendron tulipifera	tuliptree	Tree	FACU																						
	Nyssa sylvatica	blackgum	Tree	FAC			1	1	2	2			1	1			1	1								
	Platanus occidentalis	American sycamore	Tree	FACW	2	2	1	2			2	3		4	1	1			2	2	4	4	4	4	6	1
	Quercus alba	white oak	Tree	FACU	1	1			3	3	2	2			3	3					1	1				1
	Quercus falcata	southern red oak	Tree	FACU	1	1	2	2	2	2			1	1							1	1	3	3		5
	Quercus michauxii	swamp chestnut oak	Tree	FACW							1	1	1	1	1	1										2
	Quercus phellos	willow oak	Tree	FAC	1	1	1	1			2	2	1	1	2	2	2	2	3	3	1	1				2
	Tilia americana	American basswood	Tree	FACU			1	1					3	3	2	2					1	1	1	1		
Sum	Performance Standard				12	12	14	15	12	15	16	17	15	22	17	19	4	4	13	14	12	12	12	12	11	16
Post Mitigation Plan Species	Magnolia tripetala	umbrella-tree	Tree	FACU			1	1	1	1													1	1		
	Salix nigra	*black willow*	*Tree*	*OBL*																						
Sum	Proposed Standard				12	12	15	16	13	16	16	17	15	22	17	19	4	4	13	14	12	12	13	13	11	16
Mitigation Plan Performance Standard	Current Year Stem Count					12		15		15		17		22		19		4		14		12		12	11	16
	Stems/Acre					486		607		607		688		891		769		162		567		486		486	405	648
	Species Count					8		9		6		9		12		11		3		8		9		6	5	8
	Dominant Species Composition (%)					25		19		25		24		18		21		50		21		33		31	55	31
	Average Plot Height (ft.)					4		3		4		4		4		3		3		5		4		3	8	4
	% Invasives					0		0		0		0		0		0		0		0		0		0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count					12		16		16		17		22		19		4		14		12		13	11	16
	Stems/Acre					486		648		648		688		891		769		162		567		486		526	405	648
	Species Count					8		10		7		9		12		11		3		8		9		7	5	8
	Dominant Species Composition (%)					25		19		25		24		18		21		50		21		33		31	55	31
	Average Plot Height (ft.)					4		3		3		4		4		3		3		5		4		3	8	4
	% Invasives					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	688	5	4	0	405	3	7	0	121	2	2	0
Monitoring Year 2	1012	4	4	0	445	2	8	0	405	2	5	0
Monitoring Year 1	648	1	5	0	648	1	11	0	607	1	5	0
Monitoring Year 0	769	2	6	0	810	2	12	0	729	1	6	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	607	16	4	0	486	3	11	0	486	2	8	0
Monitoring Year 2	162	1	2	0	607	2	11	0	729	2	10	0
Monitoring Year 1	486	1	4	0	850	2	12	0	891	2	13	0
Monitoring Year 0	729	1	5	0	850	2	12	0	1012	2	13	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	364	4	7	0	364	2	6	0	364	5	4	0
Monitoring Year 2	486	2	7	0	324	2	5	0	405	3	5	0
Monitoring Year 1	486	2	7	0	607	2	9	0	445	2	5	0
Monitoring Year 0	810	2	10	0	607	2	9	0	567	2	8	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	526	4	7	0	486	3	8	0	486	4	8	0
Monitoring Year 2	648	2	9	0	486	2	9	0	526	2	9	0
Monitoring Year 1	688	2	9	0	810	2	13	0	769	2	10	0
Monitoring Year 0	729	2	10	0	810	2	13	0	931	2	12	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	607	3	9	0	607	4	6	0	688	4	9	0
Monitoring Year 2	648	2	11	0	648	2	6	0	607	3	9	0
Monitoring Year 1	769	2	12	0	729	2	8	0	688	2	9	0
Monitoring Year 0	891	2	14	0	850	2	11	0	972	2	12	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	891	4	12	0	769	3	11	0	162	3	3	0
Monitoring Year 2	688	2	12	0	769	2	13	0	324	2	4	0
Monitoring Year 1	850	2	15	0	931	2	13	0	729	2	9	0
Monitoring Year 0	1093	2	15	0	1093	2	14	0	891	2	10	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	567	5	8	0	486	4	9	0	486	3	6	0
Monitoring Year 2	526	3	8	0	607	3	12	0	607	2	7	0
Monitoring Year 1	688	2	9	0	729	2	12	0	567	2	7	0
Monitoring Year 0	850	2	10	0	810	2	13	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	405	8	5	0	648	4	8	0				
Monitoring Year 2	526	2	8	0	486	3	6	0				
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-03)

Fixed Veg Plot 2 (MY-00)

Fixed Veg Plot 2 (MY-03)

Fixed Veg Plot 3 (MY-00)

Fixed Veg Plot 3 (MY-03)

Fixed Veg Plot 4 (MY-00)

Fixed Veg Plot 4 (MY-03)

Fixed Veg Plot 5 (MY-00)

Fixed Veg Plot 5 (MY-03)

Fixed Veg Plot 6 (MY-00)

Fixed Veg Plot 6 (MY-03)

Fixed Veg Plot 7 (MY-00)

Fixed Veg Plot 7 (MY-03)

Fixed Veg Plot 8 (MY-00)

Fixed Veg Plot 8 (MY-03)

Fixed Veg Plot 9 (MY-00)

Fixed Veg Plot 9 (MY-03)

Fixed Veg Plot 10 (MY-00)

Fixed Veg Plot 10 (MY-03)

Fixed Veg Plot 11 (MY-00)

Fixed Veg Plot 11 (MY-03)

Fixed Veg Plot 12 (MY-00)

Fixed Veg Plot 12 (MY-03)

Fixed Veg Plot 13 (MY-00)

Fixed Veg Plot 13 (MY-03)

Fixed Veg Plot 14 (MY-00)

Fixed Veg Plot 14 (MY-03)

Fixed Veg Plot 15 (MY-00)

Fixed Veg Plot 15 (MY-03)

Fixed Veg Plot 16 (MY-00)

Fixed Veg Plot 16 (MY-03)

Fixed Veg Plot 17 (MY-00)

Fixed Veg Plot 17 (MY-03)

Fixed Veg Plot 18 (MY-00)

Fixed Veg Plot 18 (MY-03)

Fixed Veg Plot 19 (MY-00)

Fixed Veg Plot 19 (MY-03)

Fixed Veg Plot 20 (MY-00)

Fixed Veg Plot 20 (MY-03)

Fixed Veg Plot 21 (MY-01)

Fixed Veg Plot 21 (MY-03)

Random Veg Plot 22 (View Northeast) (MY-03)

Random Veg Plot 22 (View Southwest) (MY-03)

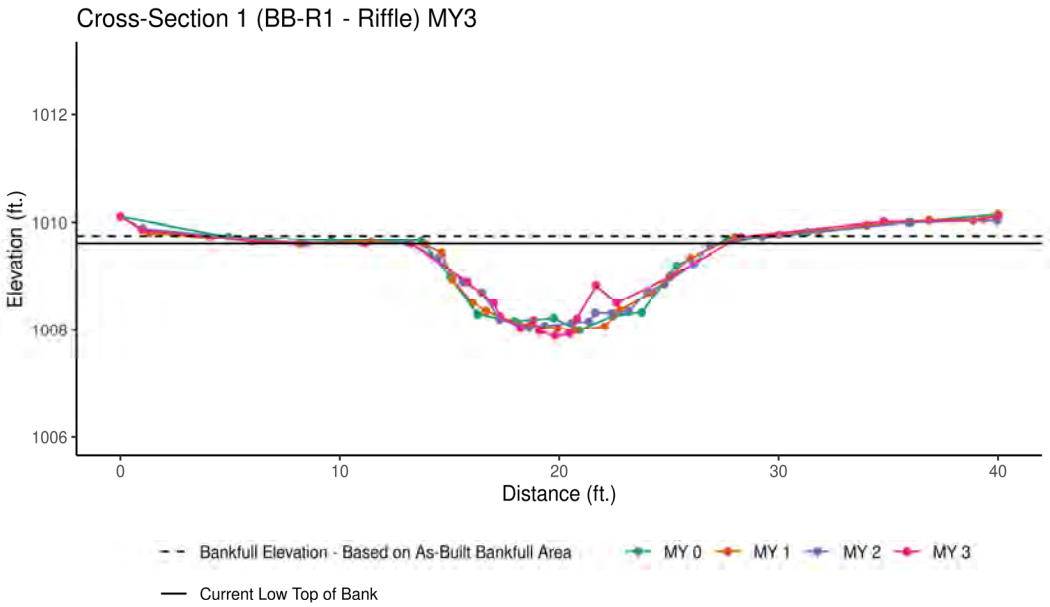
Random Veg Plot 23 (View North) (MY-03)

Random Veg Plot 23 (View South) (MY-03)

Appendix C:

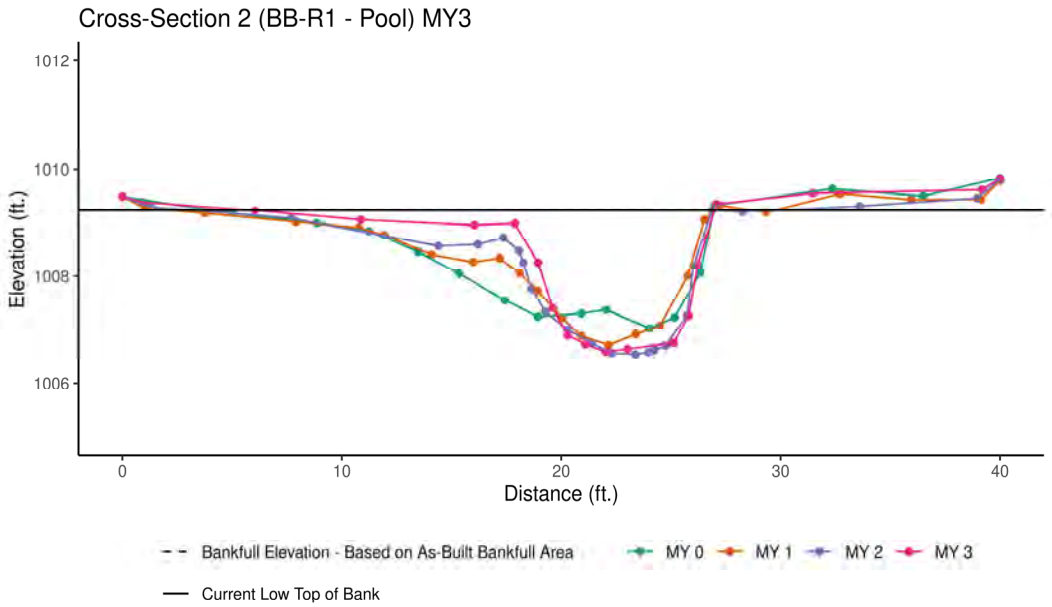
Stream Geomorphology Data

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



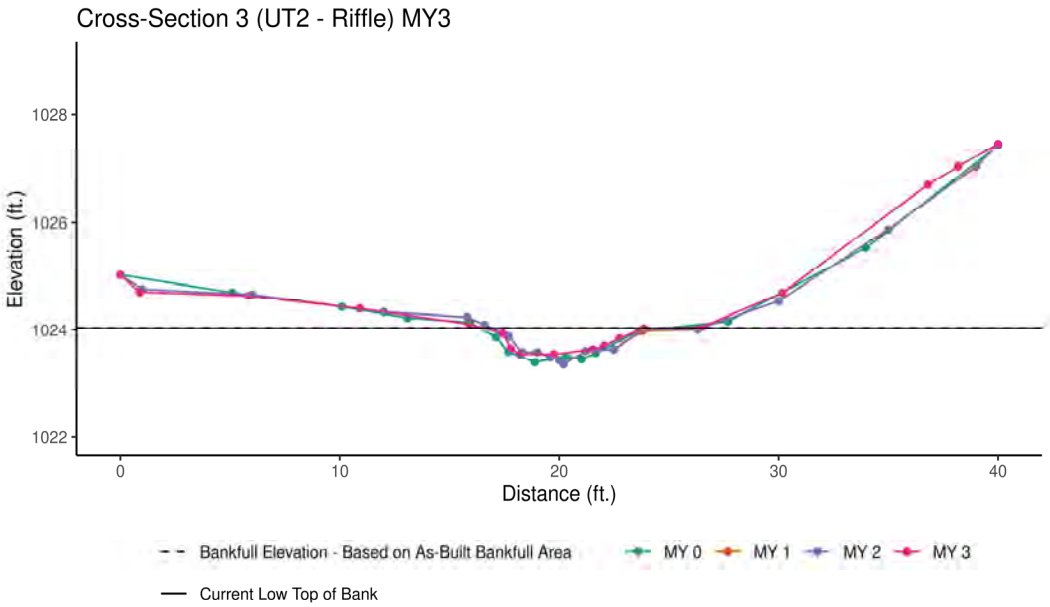
Distance	Elevation	Features
0	1010.108	TLP
0.98499239	1009.873	
5.966939	1009.645	
11.0975317	1009.608	
13.241	1009.606	TLB
15.8044445	1008.892	
17.0152652	1008.496	
17.3127628	1008.244	
18.2479025	1008.036	
18.8097373	1008.183	
19.1114862	1007.982	
19.8277527	1007.886	THW
20.4265049	1007.933	
20.8093768	1008.211	
21.6839242	1008.829	
22.6159767	1008.503	
25.0410052	1008.983	
28.2790702	1009.739	TRB
34.7903173	1010.02	
38.8562753	1010.04	
40	1010.106	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1009.67	1009.68	1009.72	1009.76				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.94	0.91	0.92				
Thalweg Elevation	1008.00	1008.00	1008.05	1007.89				
LTOB Elevation	1009.67	1009.59	1009.56	1009.61				
LTOB Max Depth	1.675	1.594	1.512	1.72				
LTOB Cross Sectional Area	14.77	13.52	12.66	12.61				



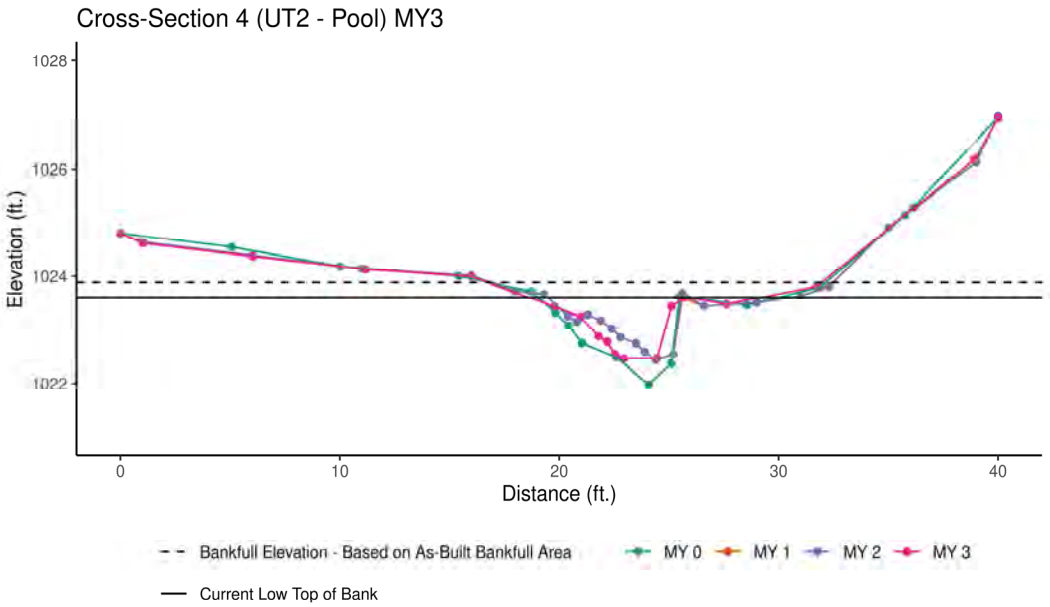
Distance	Elevation	Features
0	1009.489	TLP
0.93154978	1009.385	
6.04668256	1009.229	TLB, BKF
10.8716281	1009.053	
16.0393742	1008.955	
17.8759548	1008.986	
18.9412741	1008.256	
19.6199434	1007.407	
20.3004062	1006.892	
21.1103687	1006.737	
22.0282003	1006.595	THW
23.0170018	1006.649	
25.1291912	1006.762	
25.8035855	1007.263	
26.2324252	1008.232	
26.5955622	1008.71	
27.0718562	1009.349	TRB
31.4891941	1009.55	
39.1814493	1009.614	
40	1009.824	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1008.99	1009.12	1009.06	1009.23				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.91	1.01	1.00				
Thalweg Elevation	1007.03	1006.72	1006.55	1006.60				
LTOB Elevation	1008.99	1008.91	1009.08	1009.23				
LTOB Max Depth	1.961	2.192	2.534	2.634				
LTOB Cross Sectional Area	19.90	16.61	20.41	19.78				



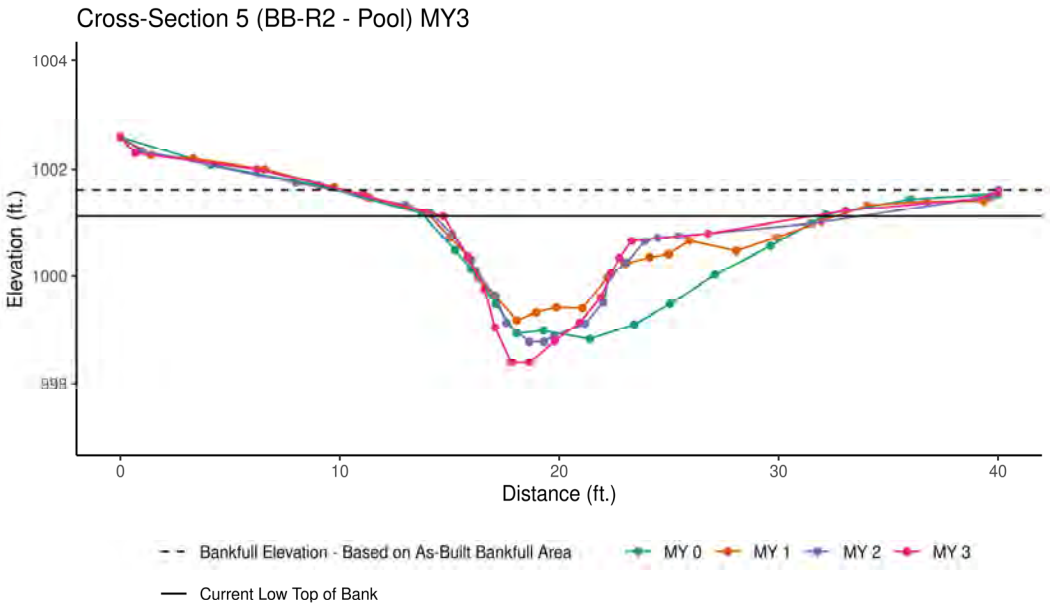
Distance	Elevation	Features
0	1025.028	tlp
0.87604224	1024.707	
5.84454361	1024.632	
10.9084654	1024.401	
15.9059888	1024.109	TLB, BKF
17.4358311	1023.93	
17.7986891	1023.649	
18.2216866	1023.547	THW
19.75	1023.548	
21.54	1023.639	
22.05	1023.698	
22.75	1023.843	
23.85	1024.028	TRB
26.4786648	1024.051	
30.1703709	1024.691	
36.8048686	1026.708	
38.183824	1027.051	
40	1027.459	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1023.98	1024.00	1024.00	1024.04				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.96	1.01	0.98				
Thalweg Elevation	1023.45	1023.36	1023.36	1023.55				
LTOB Elevation	1023.98	1023.98	1024.01	1024.03				
LTOB Max Depth	0.527	0.62	0.65	0.481				
LTOB Cross Sectional Area	2.35	2.21	2.39	2.29				



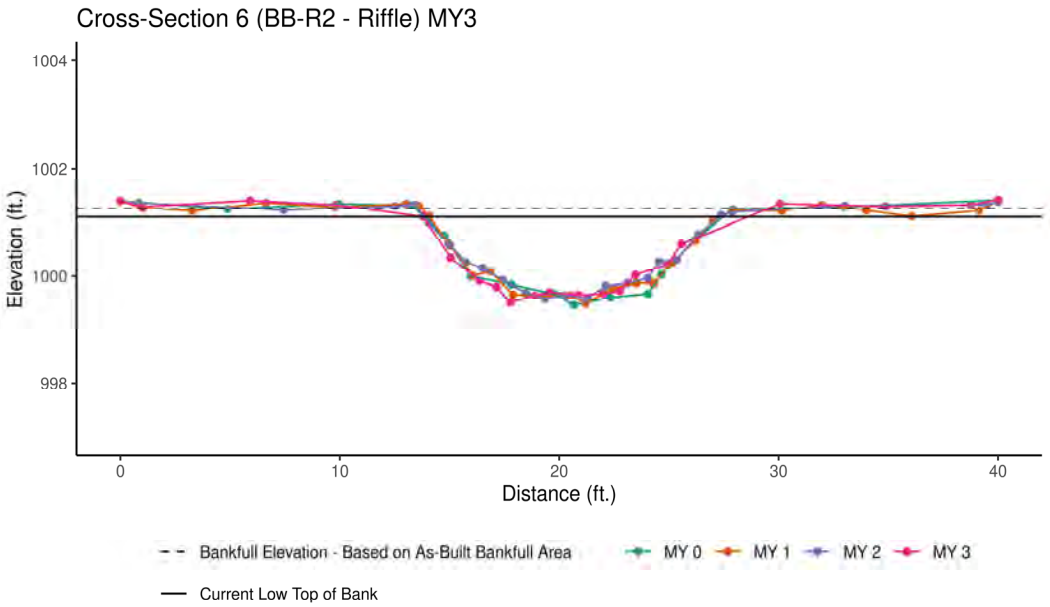
Distance	Elevation	Features
0	1024.802	TLP
1.03259382	1024.617	
6.02495851	1024.372	
11.1887547	1024.131	
15.9799953	1023.996	TLB
19.7802826	1023.434	
20.9904887	1023.238	
21.7922842	1022.879	
22.1863645	1022.782	
22.5374796	1022.55	
22.9557983	1022.469	THW
24.4598325	1022.478	
25.1170578	1023.438	
25.7210258	1023.61	TRB, BKF
27.6184259	1023.478	
31.7522642	1023.814	
36.1669464	1025.275	
38.9205416	1026.179	
40	1026.943	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1023.62	1023.98	1023.97	1023.88				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.75	0.80	0.81				
Thalweg Elevation	1021.98	1022.44	1022.44	1022.47				
LTOB Elevation	1023.62	1023.60	1023.67	1023.61				
LTOB Max Depth	1.635	1.16	1.23	1.141				
LTOB Cross Sectional Area	6.12	3.82	4.24	4.17				



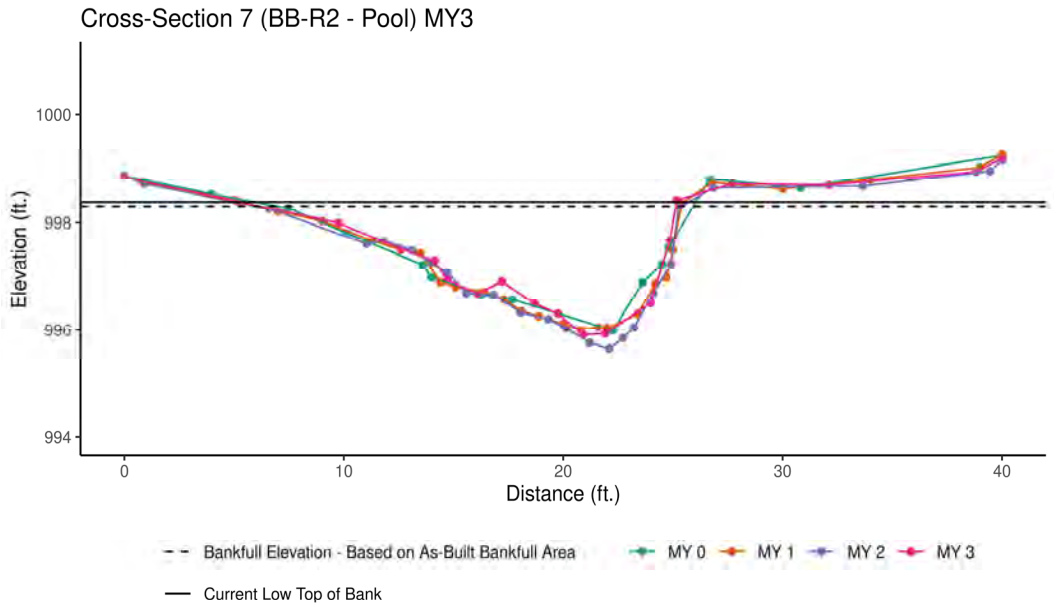
Distance	Elevation	Features
0	1002.598	TLP
0.67633793	1002.294	
6.22696796	1002.003	
11.0771856	1001.517	
14.7271081	1001.119	TLB, BKF
15.8243869	1000.367	
16.6043438	999.755	
17.0740713	999.044	
17.8326019	998.386	THW
18.6496759	998.392	
19.8017378	998.799	
20.9349291	999.136	
21.9074002	999.614	
22.3644411	1000.05	
22.7446405	1000.344	
23.3068193	1000.664	
26.7901163	1000.797	
33.0429276	1001.223	TRB
39.0573735	1001.447	
40	1001.568	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1001.15	1001.56	1001.54	1001.60				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.84	0.86	0.85				
Thalweg Elevation	998.94	999.18	998.78	998.39				
LTOB Elevation	1001.15	1001.18	1001.17	1001.12				
LTOB Max Depth	2.217	2.005	2.388	2.733				
LTOB Cross Sectional Area	24.67	17.50	17.12	16.54				



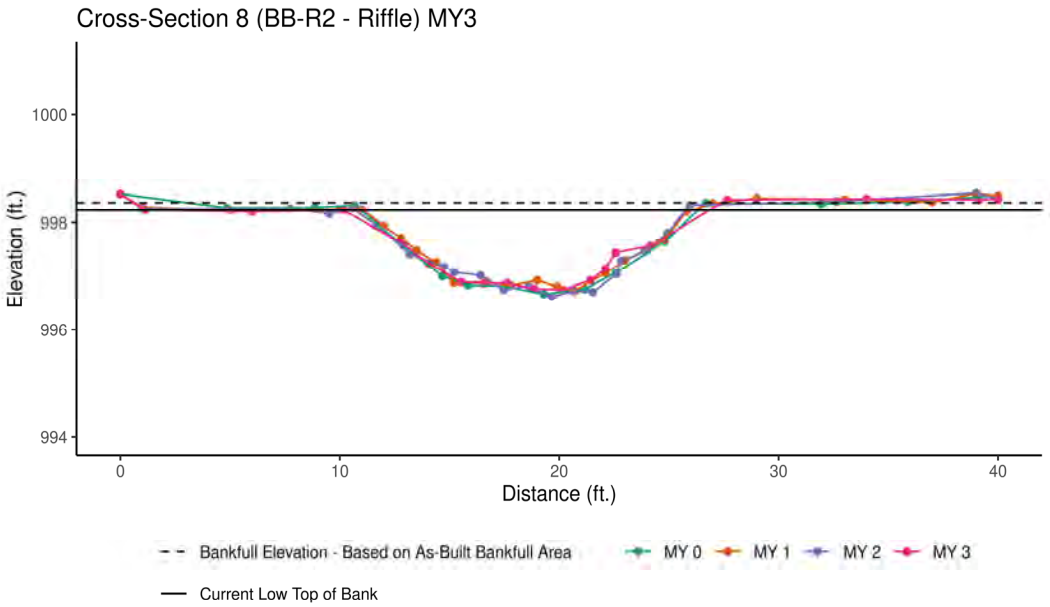
Distance	Elevation	Features
0	1001.408	TLP
0.93433399	1001.298	
5.91043865	1001.415	
9.82317428	1001.333	
13.7887984	1001.11	TLB, BKF
15.0581221	1000.348	
16.3656367	999.918	
17.1446358	999.801	
17.7759227	999.513	THW
18.8899542	999.641	
19.5464845	999.702	
20.8692659	999.657	
22.0050376	999.672	
22.7629544	999.726	
23.47436	1000.029	
24.9218772	1000.213	
25.57125	1000.597	
30.0766009	1001.358	TRB
34.8650081	1001.303	
38.7710781	1001.337	
40	1001.431	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1001.25	1001.29	1001.34	1001.26				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.96	0.92	0.92				
Thalweg Elevation	999.46	999.49	999.59	999.51				
LTOB Elevation	1001.25	1001.22	1001.20	1001.11				
LTOB Max Depth	1.792	1.729	1.612	1.597				
LTOB Cross Sectional Area	16.62	15.67	14.61	14.45				



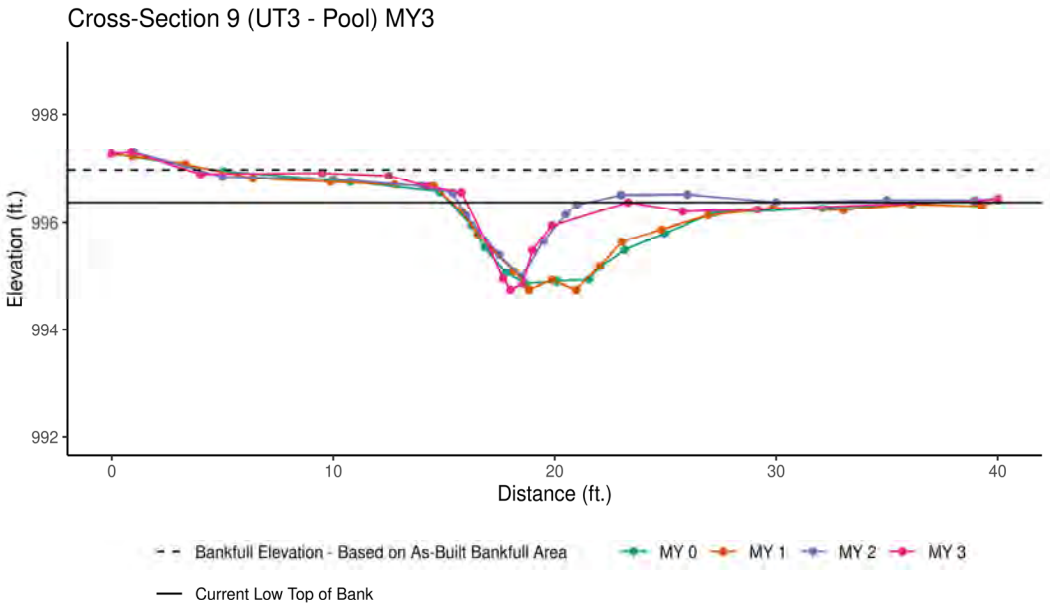
Distance	Elevation	Features
0	998.871	TLP
0.82492424	998.766	
5.23101615	998.39	TLB, BKF
9.74667723	997.995	
12.5987812	997.513	
14.1380161	997.295	
14.7147715	996.929	
16.0985652	996.678	
17.2067787	996.902	
18.6963585	996.489	
19.7565192	996.307	
20.9107682	995.91	THW
21.9187309	995.931	
23.9815678	996.5	
24.866249	997.67	
25.1815213	998.425	TRB
27.7166459	998.726	
32.1203783	998.703	
38.8067917	998.95	
40	999.195	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	998.28	998.23	998.21	998.31				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.06	1.02	1.03				
Thalweg Elevation	995.99	996.00	996.03	995.91				
LTOB Elevation	998.28	998.36	998.26	998.39				
LTOB Max Depth	2.283	2.36	2.232	2.48				
LTOB Cross Sectional Area	22.81	25.30	23.82	24.43				



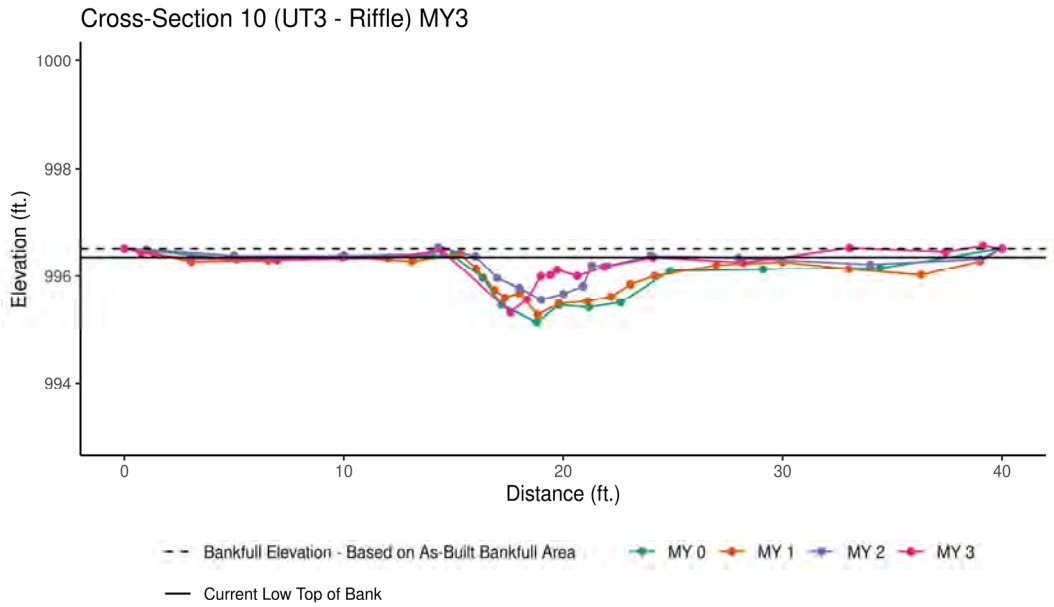
Distance	Elevation	Features
0	998.535	TLP
1.11834923	998.232	
5.99560906	998.203	
10.1776457	998.229	TLB, BKF
12.8380691	997.619	
14.0701571	997.239	
15.5243784	996.893	
16.5938701	996.869	
17.612886	996.87	
18.8796195	996.766	
20.1778023	996.752	THW
21.4326256	996.927	
22.0876015	997.134	
22.5654173	997.439	
24.1571459	997.566	
27.651	998.428	TRB
34.0283495	998.446	
39.1435181	998.431	
40	998.442	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	998.33	998.42	998.37	998.38				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.90	0.94	0.91				
Thalweg Elevation	996.67	996.74	996.62	996.75				
LTOB Elevation	998.33	998.26	998.26	998.23				
LTOB Max Depth	1.659	1.52	1.647	1.477				
LTOB Cross Sectional Area	17.48	14.98	15.79	15.04				



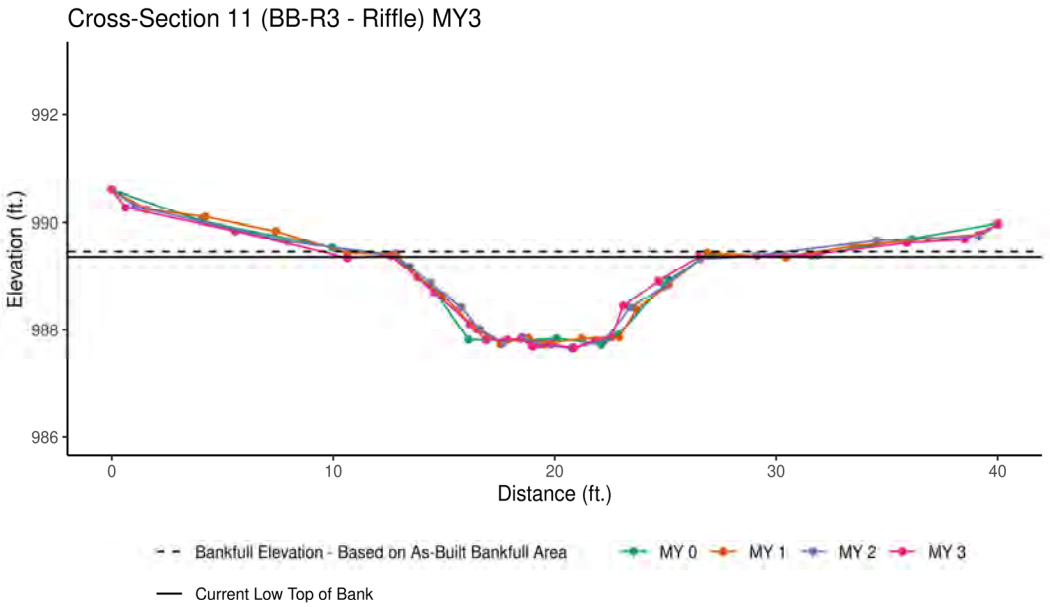
Distance	Elevation	Features
0	997.283	TLP
0.883	997.313	
4.012	996.906	
9.509	996.924	
12.509	996.876	
14.262	996.675	TLB
15.792	996.56	
17.128	995.463	
17.667	994.956	
18	994.757	THW
18.567	994.869	
18.987	995.49	
19.876	995.943	
23.314	996.378	TRB, BKF
25.791	996.209	
29.135	996.247	
38.938	996.402	
40	996.443	TRB

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	996.19	996.23	997.07	996.99				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.03	0.73	0.73				
Thalweg Elevation	994.86	994.75	994.99	994.76				
LTOB Elevation	996.19	996.27	996.51	996.38				
LTOB Max Depth	1.323	1.52	1.52	1.621				
LTOB Cross Sectional Area	8.82	9.44	4.64	4.37				



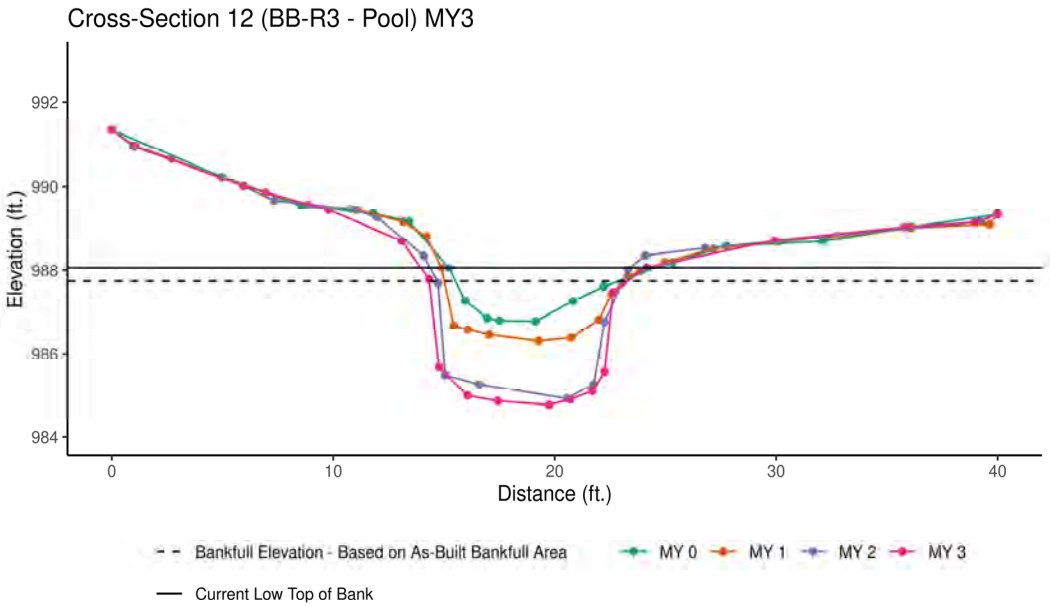
Distance	Elevation	Features
0	996.512	TLP
0.764	996.439	
3.001	996.334	
6.957	996.308	
12.02	996.344	
14.481	996.477	TLB
17.6	995.333	THW
18.341	995.569	
18.987	995.999	
19.418	996.022	
19.717	996.124	
20.638	996.005	
21.865	996.177	
24.102	996.356	TRB, BKF
28.227	996.258	
33.061	996.522	
37.421	996.449	
39.125	996.563	
40	996.508	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	996.10	996.21	996.59	996.51				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.99	0.79	0.87				
Thalweg Elevation	995.15	995.29	995.56	995.33				
LTOB Elevation	996.10	996.21	996.37	996.36				
LTOB Max Depth	0.955	0.922	0.81	1.023				
LTOB Cross Sectional Area	4.91	4.85	3.17	3.49				



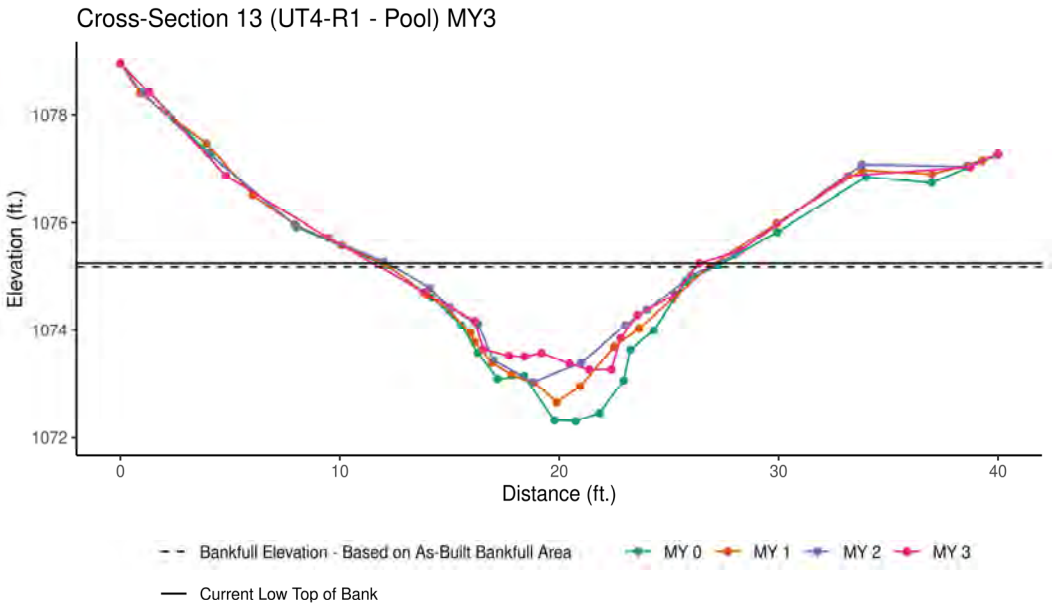
Distance	Elevation	Features
0	990.615	TLP
0.62681736	990.282	
5.58260029	989.843	
10.6282932	989.345	
12.6039248	989.387	TLB
14.5779162	988.695	
16.1714015	988.111	
16.8803832	987.814	
17.8450657	987.815	
18.4722843	987.832	
18.9782448	987.701	
19.0131024	987.698	
19.8501726	987.738	
20.8616153	987.67	THW
21.8163012	987.8	
22.5500734	987.865	
23.0961805	988.448	
24.6780042	988.91	
26.513299	989.365	TRB, BKF
31.5959814	989.399	
35.8998078	989.622	
38.5211101	989.688	
40	989.971	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	989.39	989.43	989.44	989.46				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.99	0.96	0.95				
Thalweg Elevation	987.74	987.74	987.67	987.67				
LTOB Elevation	989.39	989.41	989.37	989.37				
LTOB Max Depth	1.654	1.674	1.702	1.695				
LTOB Cross Sectional Area	15.65	15.44	14.46	14.40				



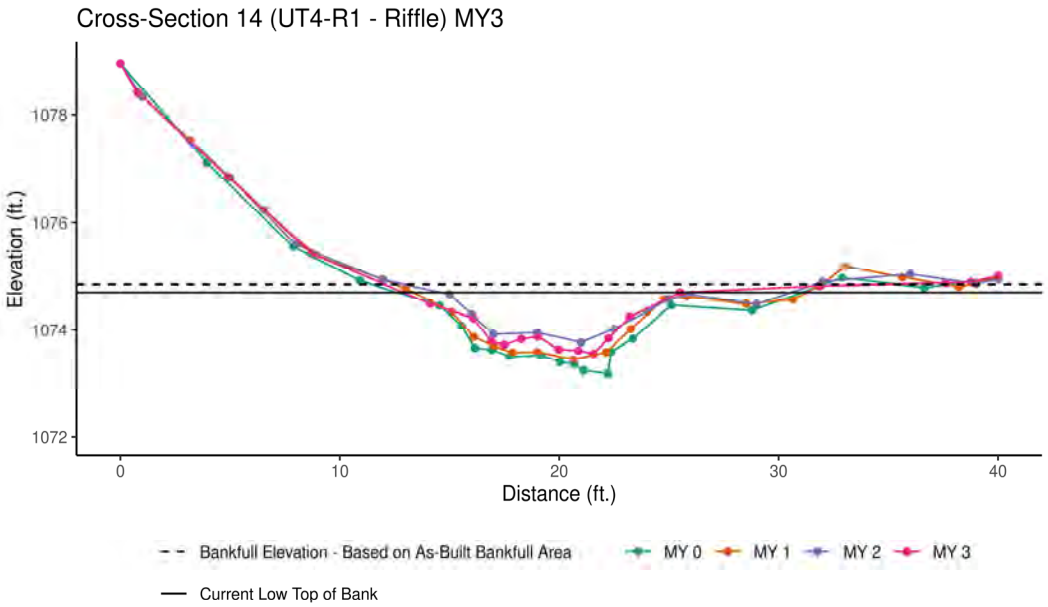
Distance	Elevation	Features
0	991.368	TLP
1.05726534	990.981	
5.95402066	990.016	
9.7884273	989.452	
13.0858107	988.71	TLB
14.3273975	987.781	
14.7739839	985.678	
16.0590512	984.996	
17.4200714	984.87	
19.7410023	984.778	THW
20.7076594	984.909	
21.6960952	985.105	
22.2506626	985.563	
22.6397581	987.478	
24.1539784	988.069	TRB, BKF
29.9336945	988.718	
35.8148593	989.041	
38.9703804	989.155	
40	989.339	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	989.04	988.82	988.04	987.74				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.00	1.10	1.11				
Thalweg Elevation	986.79	986.31	984.93	984.78				
LTOB Elevation	989.04	988.81	988.36	988.07				
LTOB Max Depth	2.249	2.508	3.434	3.291				
LTOB Cross Sectional Area	21.50	21.45	24.55	24.68				



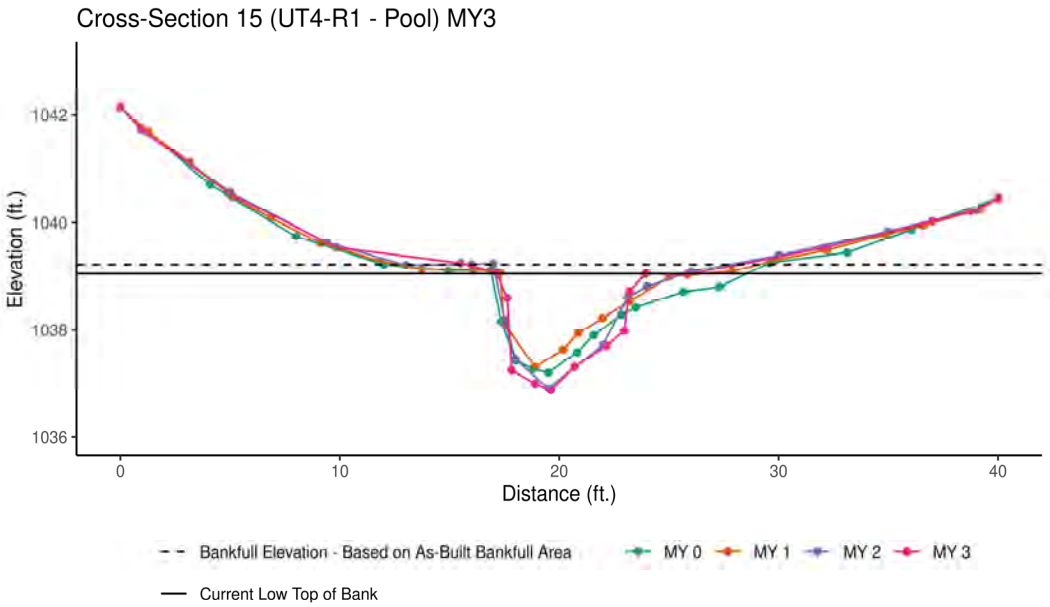
Distance	Elevation	Features
0	1078.95	TLP
1.31955485	1078.407	
4.80789569	1076.875	
9.48089289	1075.718	TLB
13.8391007	1074.702	
16.1527951	1074.163	
16.532948	1073.645	
17.7116913	1073.517	
18.440415	1073.503	
19.1910152	1073.572	THW
20.4675738	1073.366	
21.3666276	1073.257	
22.3824781	1073.257	
22.7950116	1073.844	
23.565611	1074.27	
25.2823171	1074.663	
26.3914	1075.252	TRB, BKF
28.2621365	1075.482	
33.157687	1076.873	
38.7322716	1077.041	
40	1077.283	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1074.60	1074.91	1075.10	1075.18				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.85	0.95	1.04				
Thalweg Elevation	1072.31	1072.65	1073.03	1073.57				
LTOB Elevation	1074.60	1074.58	1075.00	1075.25				
LTOB Max Depth	2.289	1.926	1.97	1.68				
LTOB Cross Sectional Area	14.60	10.98	13.34	15.58				



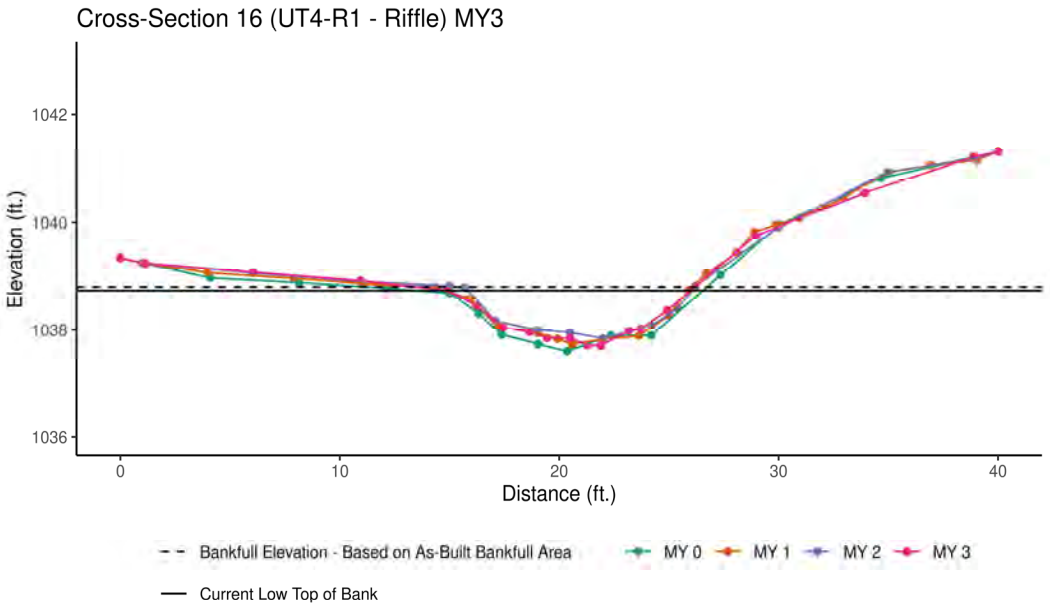
Distance	Elevation	Features
0	1078.94	TLP
0.80152667	1078.4	
4.8977942	1076.856	
8.69601161	1075.43	TLB
14.1220859	1074.488	
16.0859435	1074.218	
16.9130441	1073.782	
17.5034655	1073.723	
18.268974	1073.83	
19.0257254	1073.877	THW
19.9738493	1073.636	
20.8704185	1073.615	
21.5576889	1073.555	
22.2550707	1073.844	
23.2112482	1074.241	
25.5054224	1074.701	TRB, BKF
31.8511474	1074.822	
37.622487	1074.875	
38.765125	1074.894	
40	1075.007	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1074.45	1074.59	1074.84	1074.85				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.99	0.83	0.85				
Thalweg Elevation	1073.24	1073.58	1073.77	1073.88				
LTOB Elevation	1074.45	1074.58	1074.66	1074.70				
LTOB Max Depth	1.211	1.001	0.89	0.824				
LTOB Cross Sectional Area	7.83	7.67	5.89	5.95				



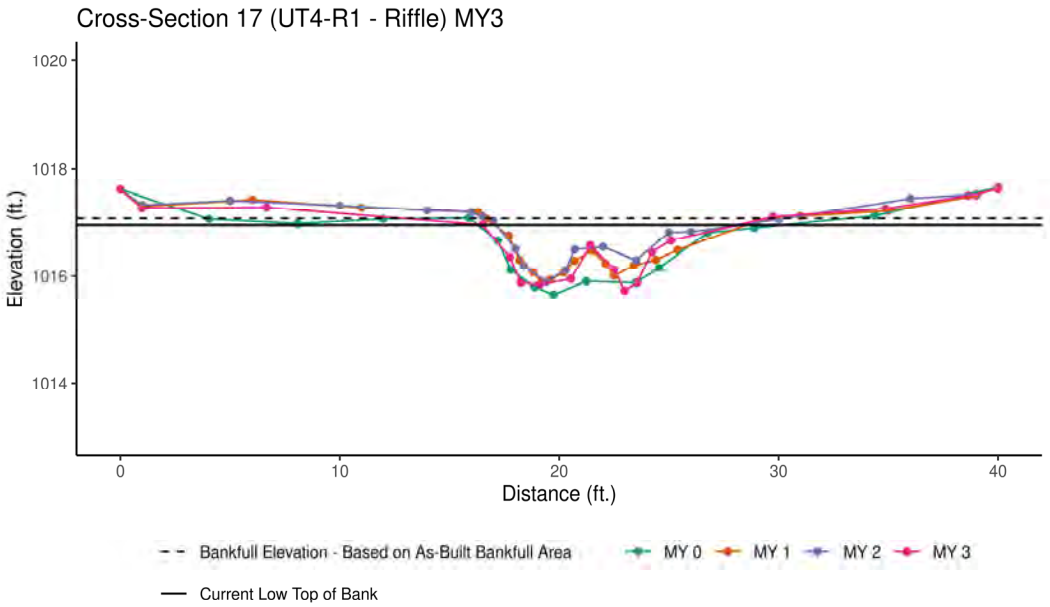
Distance	Elevation	Features
0	1042.14	TLP
0.94540203	1041.756	
4.91115475	1040.558	
9.84944552	1039.538	
15.5056885	1039.248	
17.1118814	1039.079	TLB, BKF
17.6338371	1038.596	
17.8320338	1037.246	
18.90628	1037	
19.6200666	1036.875	THW
20.6963479	1037.31	
22.1492989	1037.703	
22.9616178	1037.984	
23.2086996	1038.722	
23.9319622	1039.049	TRB
25.8613565	1039.033	
32.0068619	1039.524	
37.0000557	1040.024	
38.7426588	1040.215	
40	1040.446	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1039.11	1039.39	1039.20	1039.22				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.85	0.95	0.93				
Thalweg Elevation	1037.27	1037.31	1036.91	1036.88				
LTOB Elevation	1039.11	1039.07	1039.09	1039.05				
LTOB Max Depth	1.84	1.764	2.18	2.174				
LTOB Cross Sectional Area	10.71	7.53	9.76	9.53				



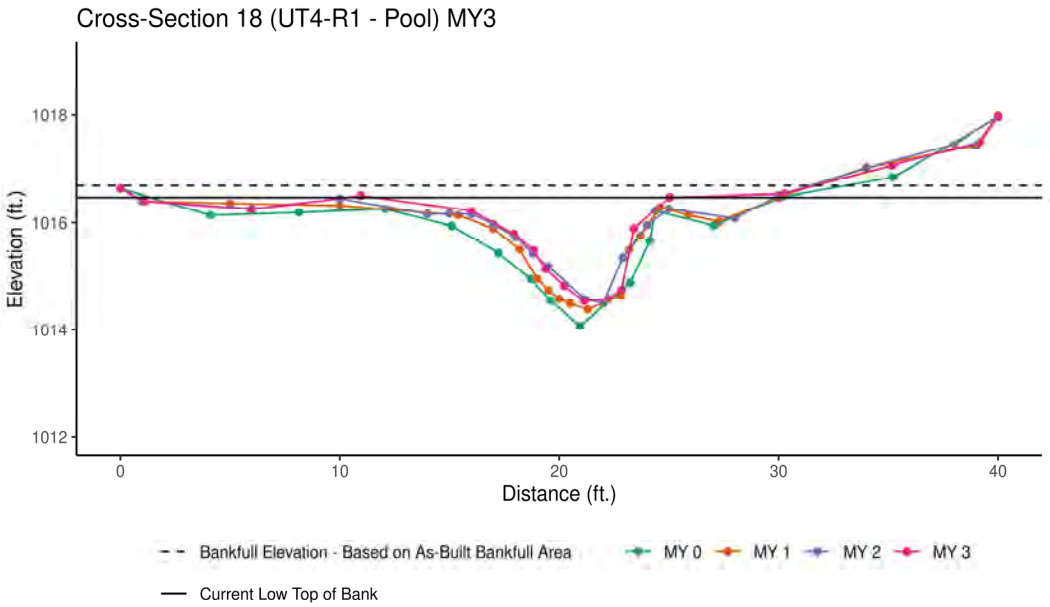
Distance	Elevation	Features
0	1039.34	TLP
1.10325745	1039.249	
6.07440277	1039.074	
10.9459262	1038.916	
14.8968837	1038.737	TLB, BKF
16.2435041	1038.443	
17.4519827	1038.048	
18.626985	1037.962	
19.4496256	1037.846	
20.5037632	1037.841	
21.2831107	1037.719	
21.9108066	1037.711	THW
23.1774592	1037.984	
23.7005379	1038.023	
24.917225	1038.361	
28.9633395	1039.759	TRB
33.9266964	1040.557	
38.8682152	1041.226	
40	1041.321	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1038.68	1038.79	1038.87	1038.80				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.01	0.92	0.94				
Thalweg Elevation	1037.61	1037.73	1037.84	1037.71				
LTOB Elevation	1038.68	1038.79	1038.79	1038.74				
LTOB Max Depth	1.074	1.062	0.95	1.026				
LTOB Cross Sectional Area	7.80	7.89	6.97	7.04				



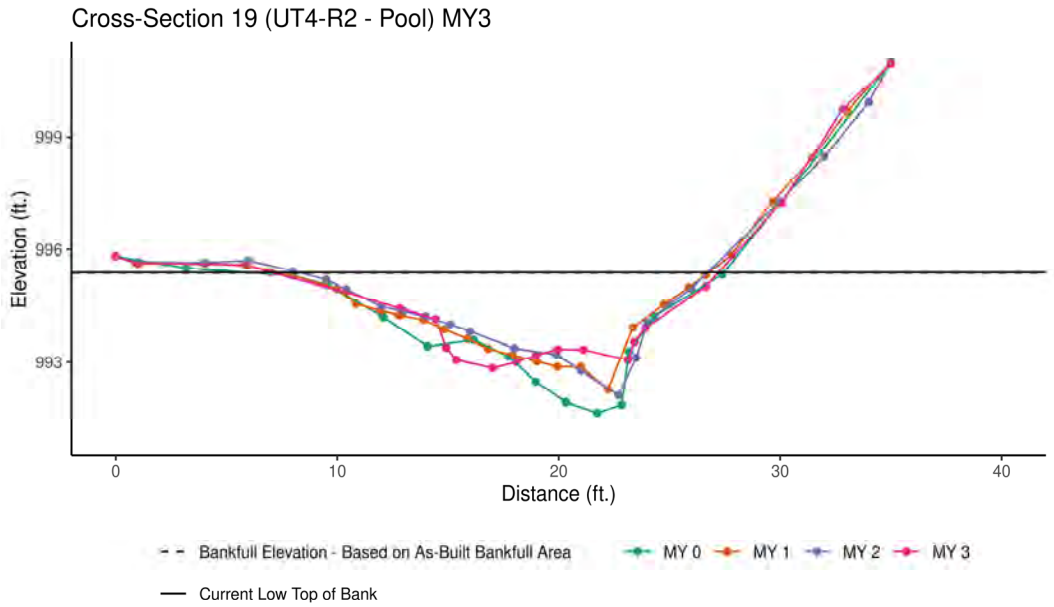
Distance	Elevation	Features
0	1017.62	TLP
0.98336006	1017.271	
6.65511908	1017.284	
16.514	1016.958	TLB, BKF
17.7497611	1016.356	
18.2513304	1015.885	
19.092423	1015.841	
20.5347643	1015.954	
21.4188093	1016.576	
22.5022013	1016.132	
22.9777466	1015.736	THW
23.568712	1015.893	
24.227763	1016.457	
25.0880916	1016.669	
29.7356188	1017.108	TRB
34.8633438	1017.262	
38.6340601	1017.504	
40	1017.625	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1016.91	1017.12	1017.24	1017.08				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.93	0.86	0.91				
Thalweg Elevation	1015.66	1015.90	1015.90	1015.74				
LTOB Elevation	1016.91	1017.03	1017.06	1016.96				
LTOB Max Depth	1.245	1.13	1.16	1.222				
LTOB Cross Sectional Area	8.36	7.26	5.93	6.97				



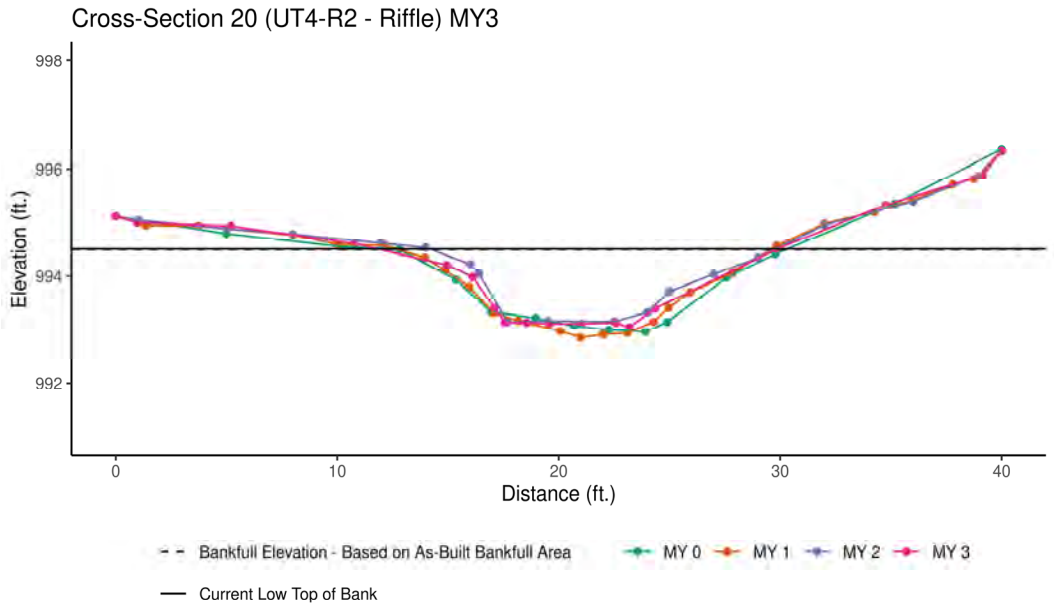
Distance	Elevation	Features
0	1016.64	TLP
1.10884895	1016.403	
5.95321174	1016.243	
10.9643518	1016.505	TLB
15.9946209	1016.222	
17.9200321	1015.797	
18.8299901	1015.49	
19.3764245	1015.139	
20.218603	1014.822	
21.1443243	1014.541	THW
22.2233453	1014.575	
22.8422332	1014.748	
23.406212	1015.893	
25.0360923	1016.472	TRB, BKF
30.2768562	1016.539	
35.1823481	1017.072	
39.1798987	1017.503	
40	1017.966	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	1016.26	1016.51	1016.62	1016.69				
Bank Height Ratio - Based on As-Built Bankfull Area	0.96	0.90	0.83	0.90				
Thalweg Elevation	1014.07	1014.38	1014.50	1014.54				
LTOB Elevation	1016.22	1016.29	1016.26	1016.47				
LTOB Max Depth	2.147	1.91	1.76	1.931				
LTOB Cross Sectional Area	11.80	9.98	8.09	10.05				



Distance	Elevation	Features
0	995.816	TLP
0.93354914	995.642	
5.86219959	995.593	
6.975	995.39	TLB, BKF
10.3822962	994.866	
12.8292451	994.43	
14.4389288	994.15	
14.9200353	993.384	
15.3760175	993.058	
17.0358714	992.84	THW
18.0820637	993.001	
18.9733587	993.174	
19.942266	993.342	
21.1060473	993.33	
23.1270302	993.059	
23.4216516	993.535	
23.9127632	993.91	
26.6419676	995.013	
30.0765514	997.26	TRB
32.8381316	999.729	
35	1000.908	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	995.05	995.40	995.44	995.38				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.97	1.08	1.01				
Thalweg Elevation	991.65	992.28	992.12	992.84				
LTOB Elevation	995.05	995.31	995.71	995.39				
LTOB Max Depth	3.406	3.031	3.59	2.55				
LTOB Cross Sectional Area	27.60	25.94	32.87	27.92				



Distance	Elevation	Features
0	995.117	TLP
0.97243252	995.001	
5.1967868	994.936	
10.7765631	994.611	TLB
14.9606423	994.21	
16.1200966	993.987	
17.1049001	993.403	
17.5790936	993.139	
18.5493231	993.137	
19.5822586	993.111	
21.0137901	993.116	
22.5807735	993.131	
23.1819151	993.048	THW
24.3542053	993.398	
29.864983	994.509	TRB, BKF
34.7537173	995.331	
39.1566148	995.883	
40	996.342	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	994.42	994.41	994.65	994.50				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.10	0.98	1.01				
Thalweg Elevation	993.07	992.86	993.16	993.05				
LTOB Elevation	994.42	994.58	994.62	994.51				
LTOB Max Depth	1.342	1.718	1.46	1.461				
LTOB Cross Sectional Area	14.51	17.20	13.90	14.68				

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	1009.72	1009.76				1008.99	1009.12	1009.06	1009.23				1023.98	1024.00	1024.00	1024.04				1023.62	1023.98	1023.97	1023.88			
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	0.94	0.91	0.92				N/A	N/A	N/A	N/A				1.00	0.96	1.01	0.98				N/A	N/A	N/A	N/A			
Thalweg Elevation	1008.00	1008.00	1008.05	1007.89				1007.03	1006.72	1006.55	1006.60				1023.45	1023.36	1023.36	1023.55				1021.98	1022.44	1022.44	1022.47			
LTOB[2] Elevation	1009.67	1009.59	1009.56	1009.61				1008.99	1008.91	1009.08	1009.23				1023.98	1023.98	1024.01	1024.03				1023.62	1023.60	1023.67	1023.61			
LTOB[2] Max Depth (ft)	1.68	1.59	1.51	1.72				1.96	2.19	2.53	2.63				0.53	0.62	0.65	0.48				1.63	1.16	1.23	1.14			
LTOB[2] Cross Sectional Area (ft^2)	14.77	13.52	12.66	12.61				19.91	16.61	20.41	19.78				2.36	2.21	2.39	2.29				6.12	3.82	4.24	4.17			
	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	1001.54	1001.60				1001.25	1001.29	1001.34	1001.26				998.28	998.23	998.21	998.31				998.33	998.42	998.37	998.38			
Bank Height Ratio_Based on AB Bankfull[1] Area	N/A	N/A	N/A	N/A				1.00	0.96	0.92	0.92				N/A	N/A	N/A	N/A				1.00	0.90	0.94	0.91			
Thalweg Elevation	998.94	999.18	998.78	998.39				999.46	999.49	999.59	999.51				995.99	996.00	996.03	995.91				996.67	996.74	996.62	996.75			
LTOB[2] Elevation	1001.15	1001.18	1001.17	1001.12				1001.25	1001.22	1001.20	1001.11				998.28	998.36	998.26	998.39				998.33	998.26	998.26	998.23			
LTOB[2] Max Depth (ft)	2.22	2.01	2.39	2.73				1.79	1.73	1.61	1.60				2.28	2.36	2.23	2.48				1.66	1.52	1.65	1.48			
LTOB[2] Cross Sectional Area (ft^2)	24.67	17.50	17.12	16.54				16.63	15.67	14.61	14.45				22.81	25.31	23.82	24.43				17.48	14.98	15.79	15.04			
	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	997.07	996.99				996.10	996.21	996.59	996.51				989.39	989.43	989.44	989.46				989.04	988.82	988.04	987.74			
Bank Height Ratio_Based on AB Bankfull[1] Area	N/A	N/A	N/A	N/A				1.00	0.99	0.79	0.87				1.00	0.99	0.96	0.95				N/A	N/A	N/A	N/A			
Thalweg Elevation	994.86	994.75	994.99	994.76				995.15	995.29	995.56	995.33				987.74	987.74	987.67	987.67				986.79	986.31	984.93	984.78			
LTOB[2] Elevation	996.19	996.27	996.51	996.38				996.10	996.21	996.37	996.36				989.39	989.41	989.37	989.37				989.04	988.81	988.36	988.07			
LTOB[2] Max Depth (ft)	1.32	1.52	1.52	1.62				0.96	0.92	0.81	1.02				1.65	1.67	1.70	1.69				2.25	2.51	3.43	3.29			
LTOB[2] Cross Sectional Area (ft^2)	8.82	9.44	4.64	4.37				4.91	4.85	3.17	3.49				15.65	15.44	14.46	14.40				21.50	21.45	24.55	24.68			
	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	1075.10	1075.18				1074.45	1074.59	1074.84	1074.85				1039.11	1039.39	1039.20	1039.22				1038.68	1038.79	1038.87	1038.80			
Bank Height Ratio_Based on AB Bankfull[1] Area	N/A	N/A	N/A	N/A				1.00	0.99	0.83	0.85				N/A	N/A	N/A	N/A				1.00	1.01	0.92	0.94			
Thalweg Elevation	1072.31	1072.65	1073.03	1073.57				1073.24	1073.58	1073.77	1073.88				1037.27	1037.31	1036.91	1036.88				1037.61	1037.73	1037.84	1037.71			
LTOB[2] Elevation	1074.60	1074.58	1075.00	1075.25				1074.45	1074.58	1074.66	1074.70				1039.11	1039.07	1039.09	1039.05				1038.68	1038.79	1038.79	1038.74			
LTOB[2] Max Depth (ft)	2.29	1.93	1.97	1.68				1.21	1.00	0.89	0.82				1.84	1.76	2.18	2.17				1.07	1.06	0.95	1.03			
LTOB[2] Cross Sectional Area (ft^2)	14.60	10.98	13.34	15.58				7.83	7.67	5.89	5.95				10.71	7.54	9.76	9.53				7.80	7.89	6.97	7.04			
	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	1017.24	1017.08				1016.26	1016.51	1016.62	1016.69				995.05	995.40	995.44	995.38				994.42	994.41	994.65	994.50			
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	0.93	0.86	0.91				N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A				1.00	1.10	0.98	1.01			
Thalweg Elevation	1015.66	1015.90	1015.90	1015.74				1014.07	1014.38	1014.50	1014.54				991.65	992.28	992.12	992.84				993.07	992.86	993.16	993.05			
LTOB[2] Elevation	1016.91	1017.03	1017.01	1016.96				1016.22	1016.29	1016.26	1016.47				995.05	995.31	995.71	995.39				994.42	994.58	994.62	994.51			
LTOB[2] Max Depth (ft)	1.25	1.13	1.16	1.22				2.15	1.91	1.76	1.93				3.41	3.03	3.59	2.55				1.34	1.72	1.46	1.46			
LTOB[2] Cross Sectional Area (ft^2)	8.36	7.26	5.93	6.97				11.81	9.98	8.09	10.05				27.60	25.94	32.87	27.92				14.51	17.20	13.90	14.68			

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
Cumulative Flow Gauge Data Chart
Wetland Hydrology Criteria and Hydrographs
Rainfall Data Table

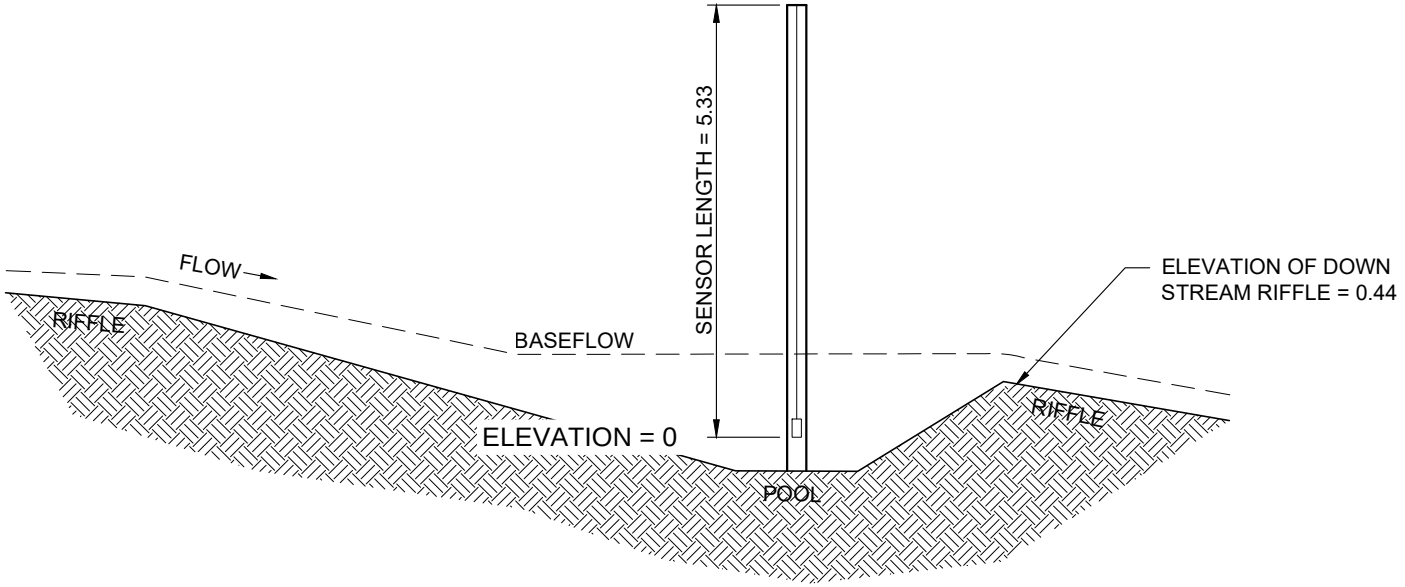
Verification of Bankfull Events: CG-1 (UT2) Banner Branch Mitigation Project					
	Date of Collection	Date of Occurrence	Method	Photos/Notes	Measurement above bankfull (feet)
MY1	11/2/2021	9/22/2021	Pressure Transducer	Recorded bankfull flow	0.23
MY2	9/21/2022	5/23/2022	Pressure Transducer	Recorded bankfull flow	0.137
	9/21/2022	5/27/2022	Pressure Transducer	Recorded bankfull flow	0.354
	9/21/2022	8/21/2022	Pressure Transducer	Recorded bankfull flow	0.278
	9/21/2022	8/30/2022	Pressure Transducer	Recorded bankfull flow	0.322
	9/21/2022	9/4/2022	Pressure Transducer	Recorded bankfull flow	0.333
MY3	5/12/2023	1/4/2023	Pressure Transducer	Recorded bankfull flow	0.055
	5/12/2023	1/12/2023	Pressure Transducer	Recorded bankfull flow	0.018
	5/12/2023	1/25/2023	Pressure Transducer	Recorded bankfull flow	0.142
	5/12/2023	2/12/2023	Pressure Transducer	Recorded bankfull flow	0.214
	5/12/2023	2/17/2023	Pressure Transducer	Recorded bankfull flow	0.053
	5/12/2023	3/3/2023	Pressure Transducer	Recorded bankfull flow	0.2
	5/12/2023	4/28/2023	Pressure Transducer	Recorded bankfull flow	0.224
	10/12/2023	5/29/2023	Pressure Transducer	Recorded bankfull flow	0.399
	10/12/2023	6/19/2023	Pressure Transducer	Recorded bankfull flow	0.289
	10/12/2023	6/22/2023	Pressure Transducer	Recorded bankfull flow	0.21
	10/12/2023	7/16/2023	Pressure Transducer	Recorded bankfull flow	0.081
	10/12/2023	8/6/2023	Pressure Transducer	Recorded bankfull flow	0.197
	10/12/2023	8/28/2023	Pressure Transducer	Recorded bankfull flow	0.401

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
MY2	9/21/2022	5/24/2022	Pressure Transducer	Recorded bankfull flow	0.346
	9/21/2022	5/27/2022	Pressure Transducer	Recorded bankfull flow	0.923
	9/21/2022	6/16/2022	Pressure Transducer	Recorded bankfull flow	0.117
	9/21/2022	8/5/2022	Pressure Transducer	Recorded bankfull flow	0.811
	9/21/2022	8/21/2022	Pressure Transducer	Recorded bankfull flow	0.889
	9/21/2022	8/30/2022	Pressure Transducer	Recorded bankfull flow	0.729
	9/21/2022	9/4/2022	Pressure Transducer	Recorded bankfull flow	0.693
MY3	5/12/2023	1/25/2023	Pressure Transducer	Recorded bankfull flow	0.126
	5/12/2023	2/12/2023	Pressure Transducer	Recorded bankfull flow	0.267
	5/12/2023	3/3/2023	Pressure Transducer	Recorded bankfull flow	0.001
	5/12/2023	4/28/2023	Pressure Transducer	Recorded bankfull flow	0.816
	10/12/2023	5/29/2023	Pressure Transducer	Recorded bankfull flow	1.026
	10/12/2023	6/19/2023	Pressure Transducer	Recorded bankfull flow	0.825
	10/12/2023	6/22/2023	Pressure Transducer	Recorded bankfull flow	0.471
	10/12/2023	7/16/2023	Pressure Transducer	Recorded bankfull flow	0.299
	10/12/2023	8/6/2023	Pressure Transducer	Recorded bankfull flow	0.499
	10/12/2023	8/28/2023	Pressure Transducer	Recorded bankfull flow	1.32
	10/12/2023	10/8/2023	Pressure Transducer	Recorded bankfull flow	0.007

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
MY2	9/21/2022	5/27/2022	Pressure Transducer	Recorded bankfull flow	0.429
	9/21/2022	8/30/2022	Pressure Transducer	Recorded bankfull flow	0.025
MY3	8/29/2023	Unknown	Pressure Transducer	Wrack lines and matted vegatation	NA
	10/12/2023	8/28/2023	Pressure Transducer	Recorded bankfull flow	0.281

UT4-R2 Evidence of Bankful Event

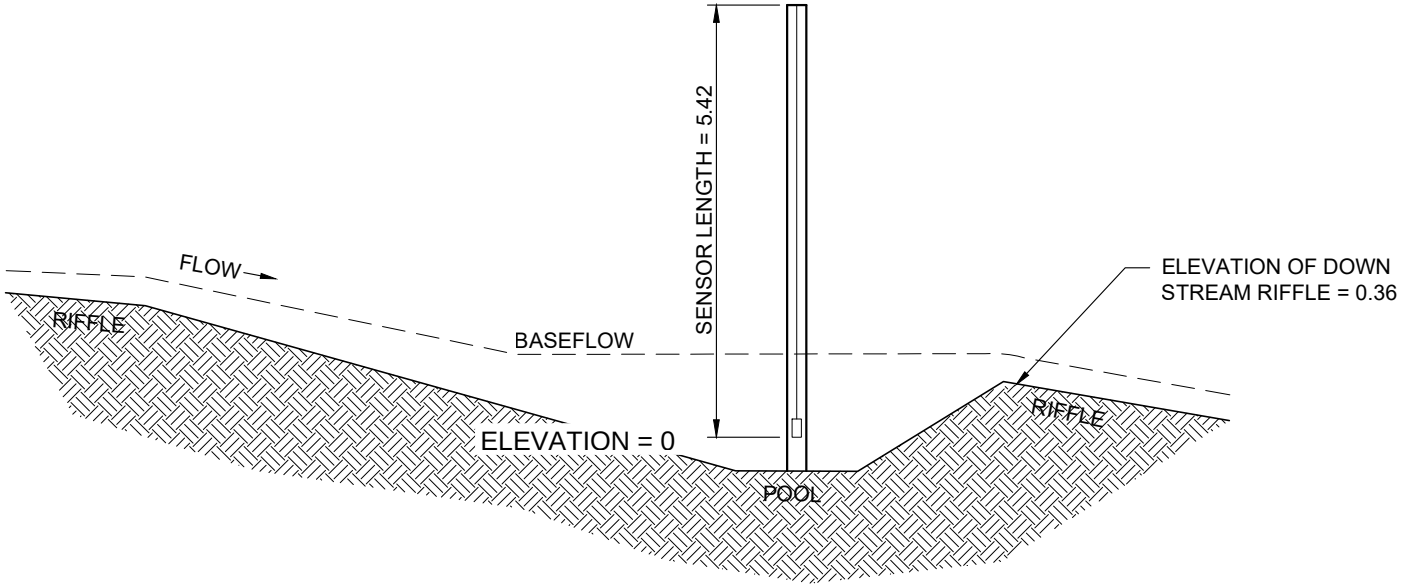
UT4-R2 Evidence of Bankful Event



FLOW GAUGE FG-1 (UT1A)

Flow Depth = 0.44 feet

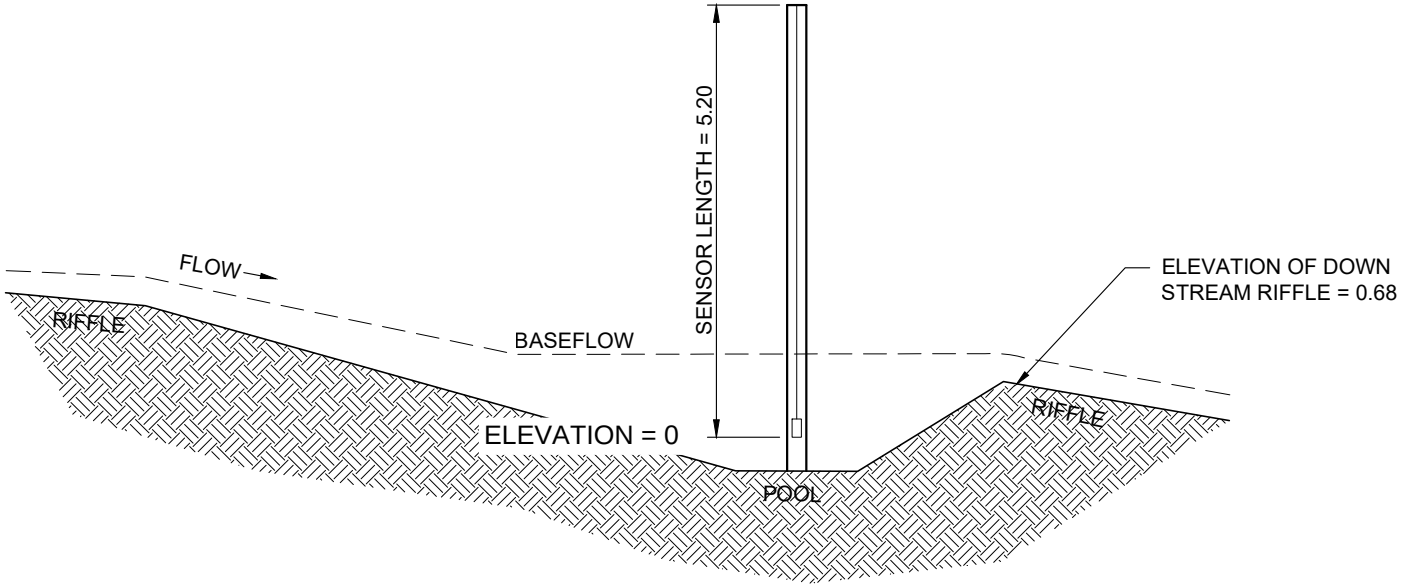
*All elevations relative to sensor depth



FLOW GAUGE FG-2 (UT1C)

Flow Depth = 0.36 feet

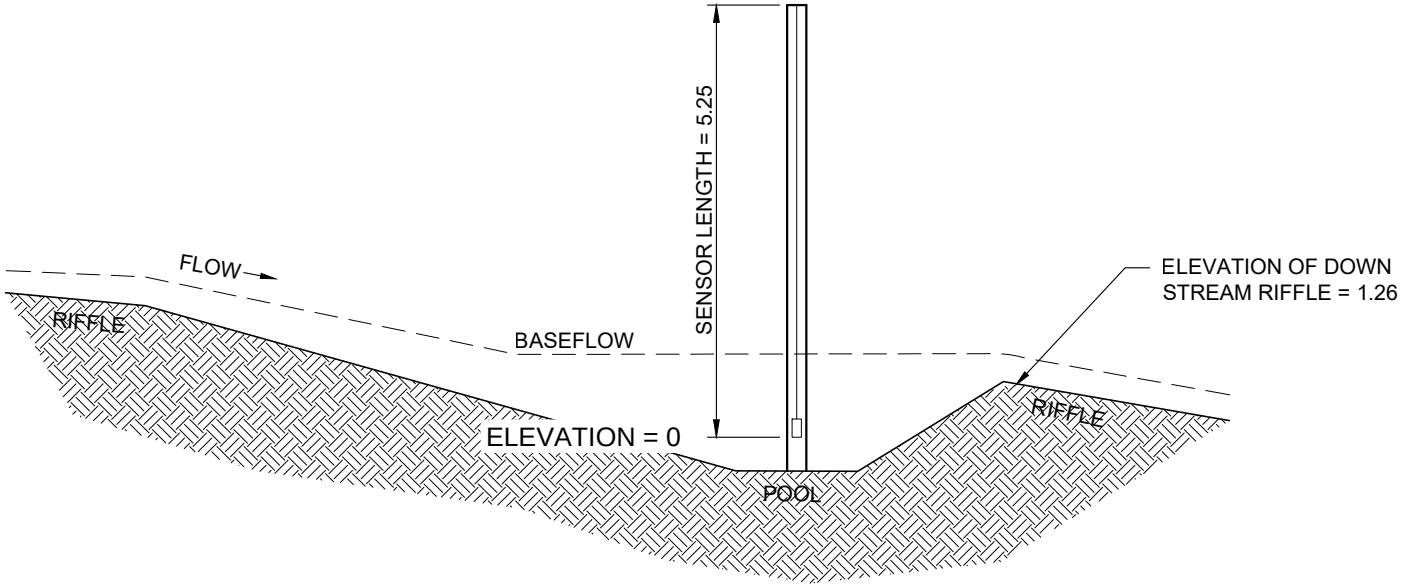
*All elevations relative to sensor depth



FLOW GAUGE FG-3 (UT2)

Flow Depth = 0.68 feet

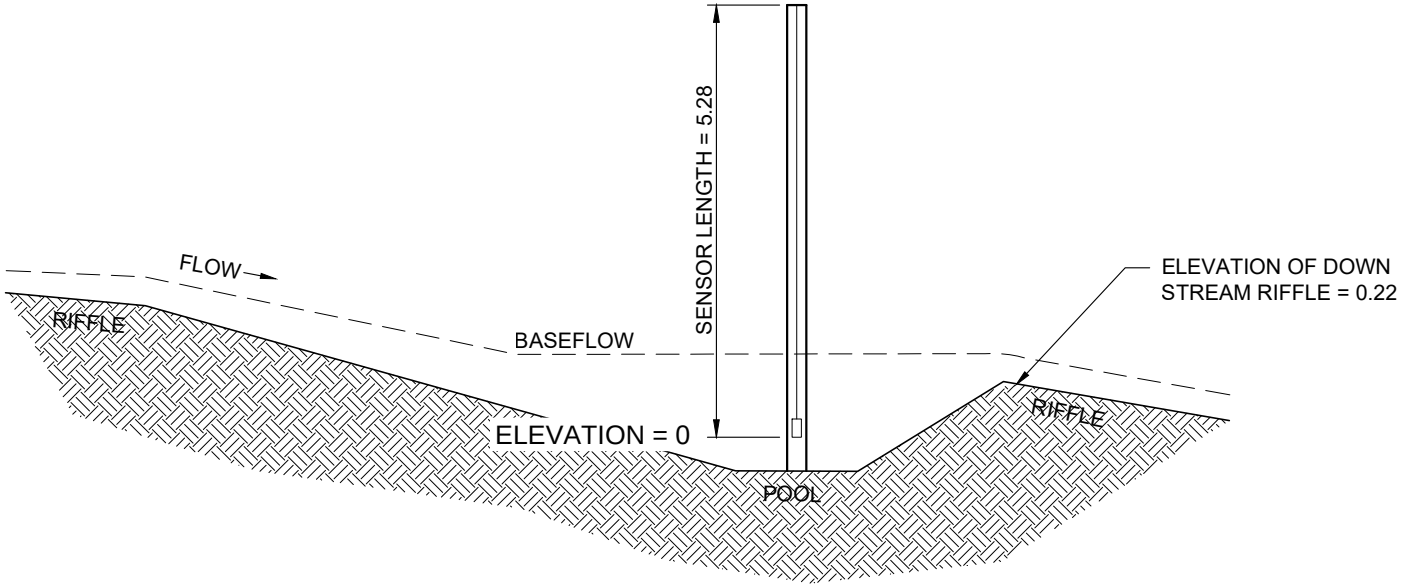
*All elevations relative to sensor depth



FLOW GAUGE FG-4 (UT2A)

Flow Depth = 1.26 feet

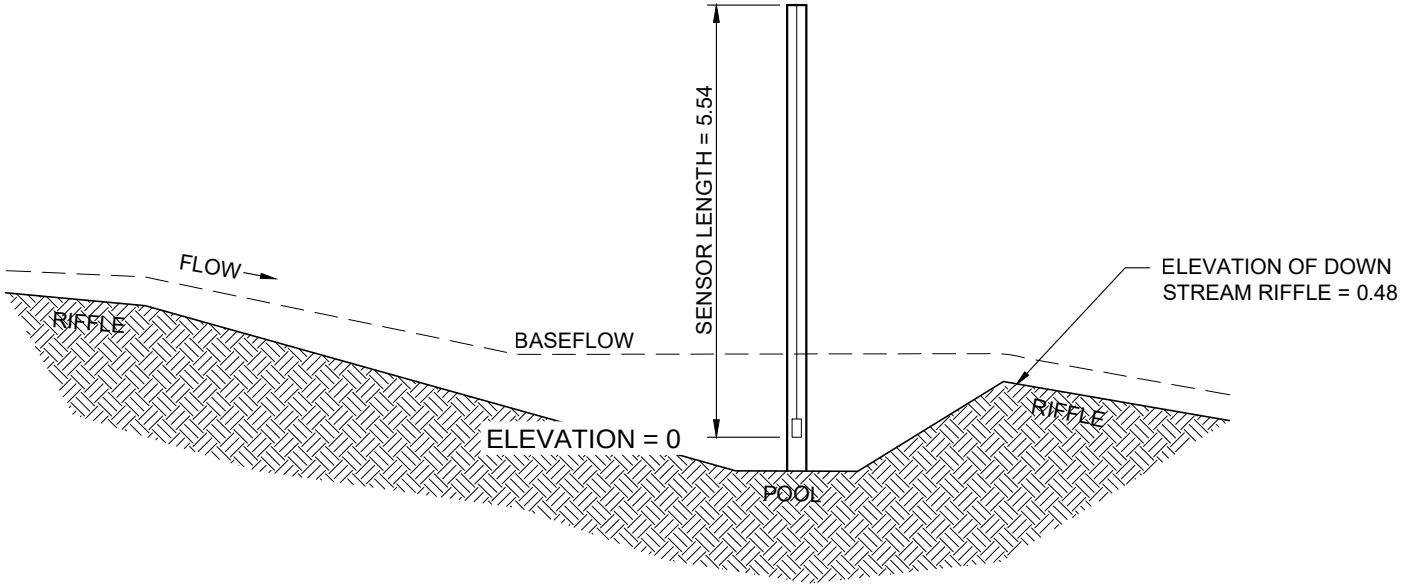
*All elevations relative to sensor depth



FLOW GAUGE FG-5 (UT3)

Flow Depth = 0.22 feet

*All elevations relative to sensor depth

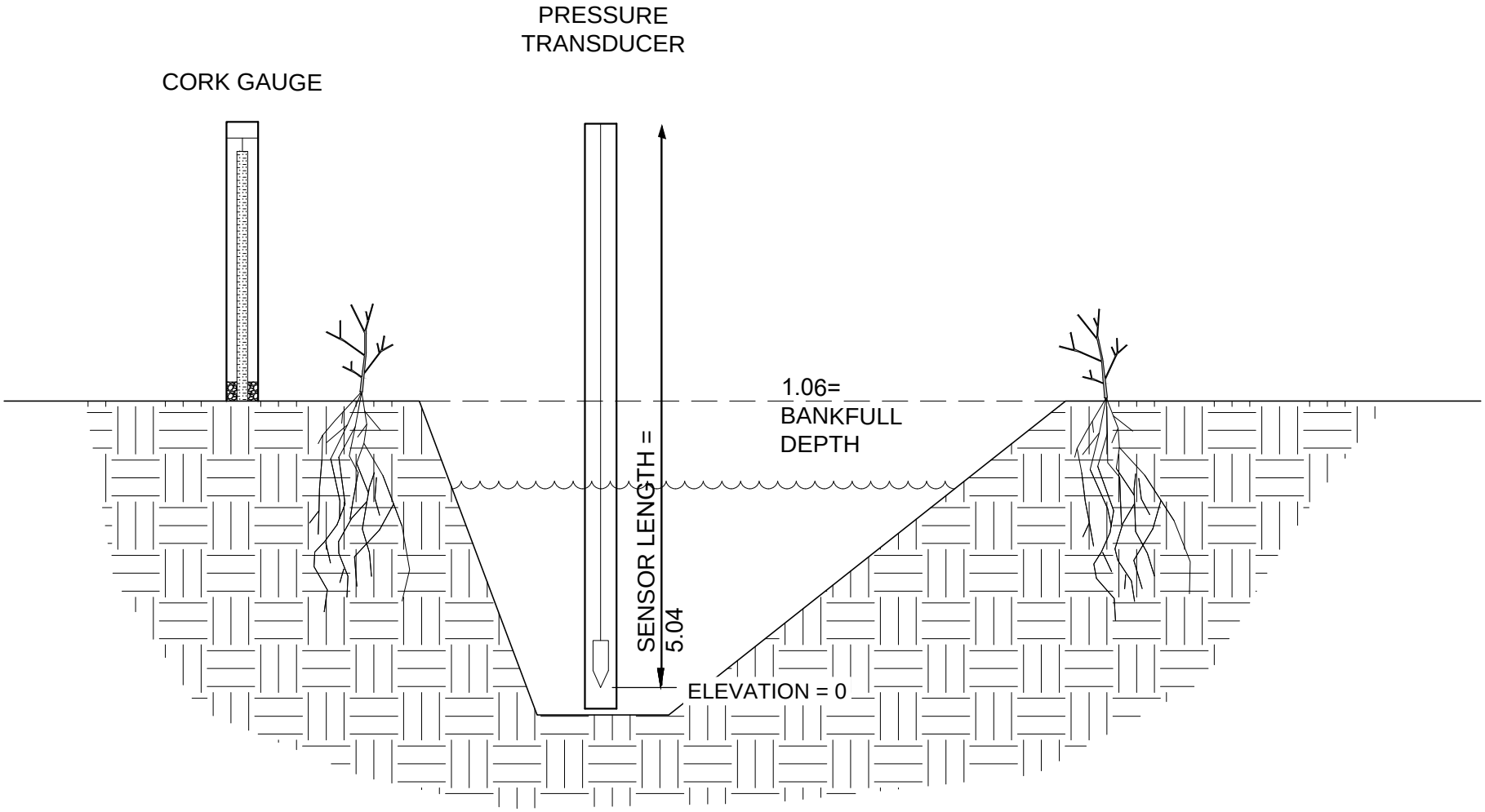


FLOW GAUGE FG-6 (UT4-R1)

Flow Depth = 0.48 feet

*All elevations relative to sensor depth

CROSS SECTIONAL VIEW OF STREAM

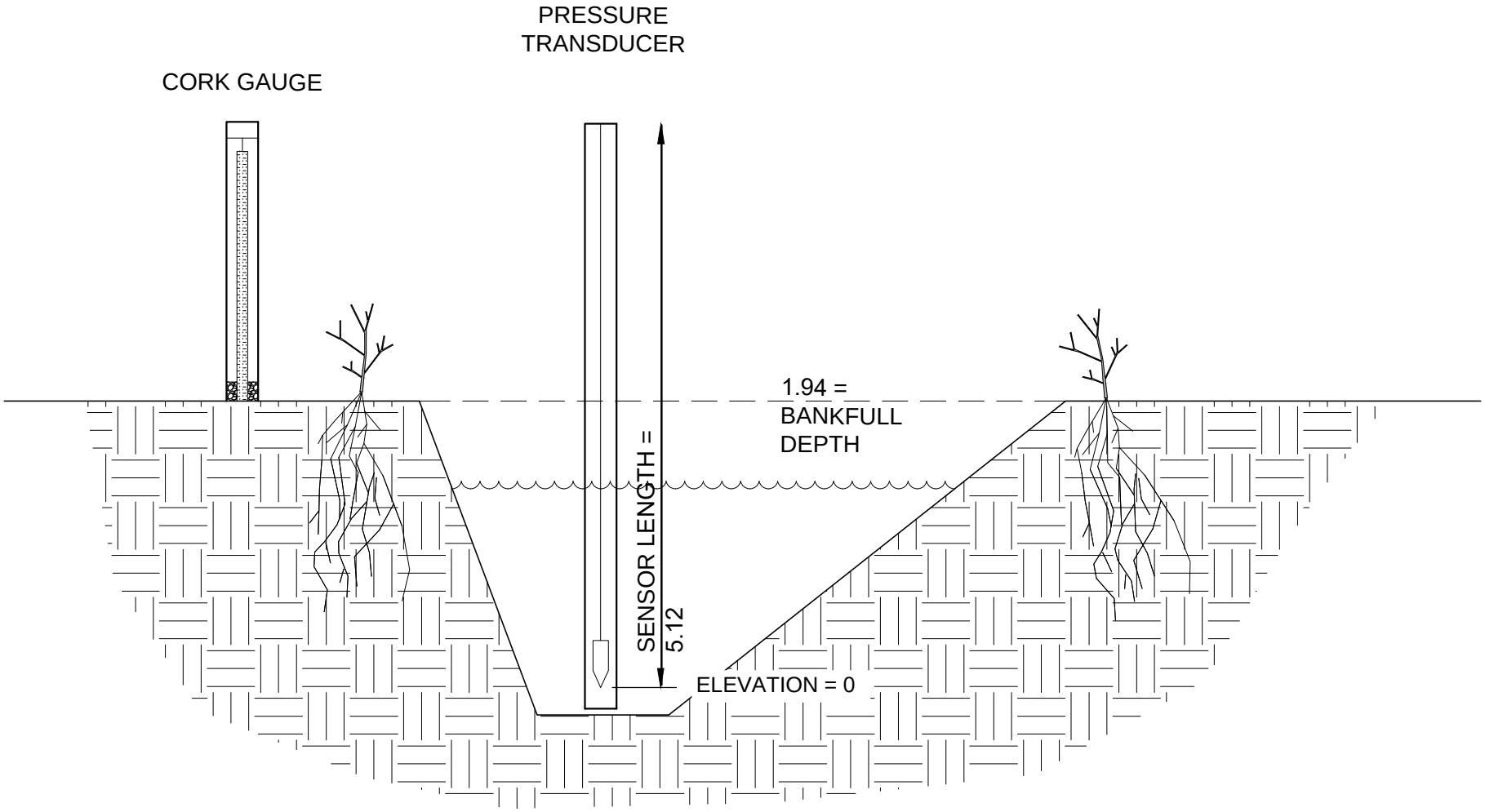


Crest Gauge CG-1 (UT2)

Bankfull Event Depth = 1.06

*All elevations relative to sensor depth

CROSS SECTIONAL VIEW OF STREAM

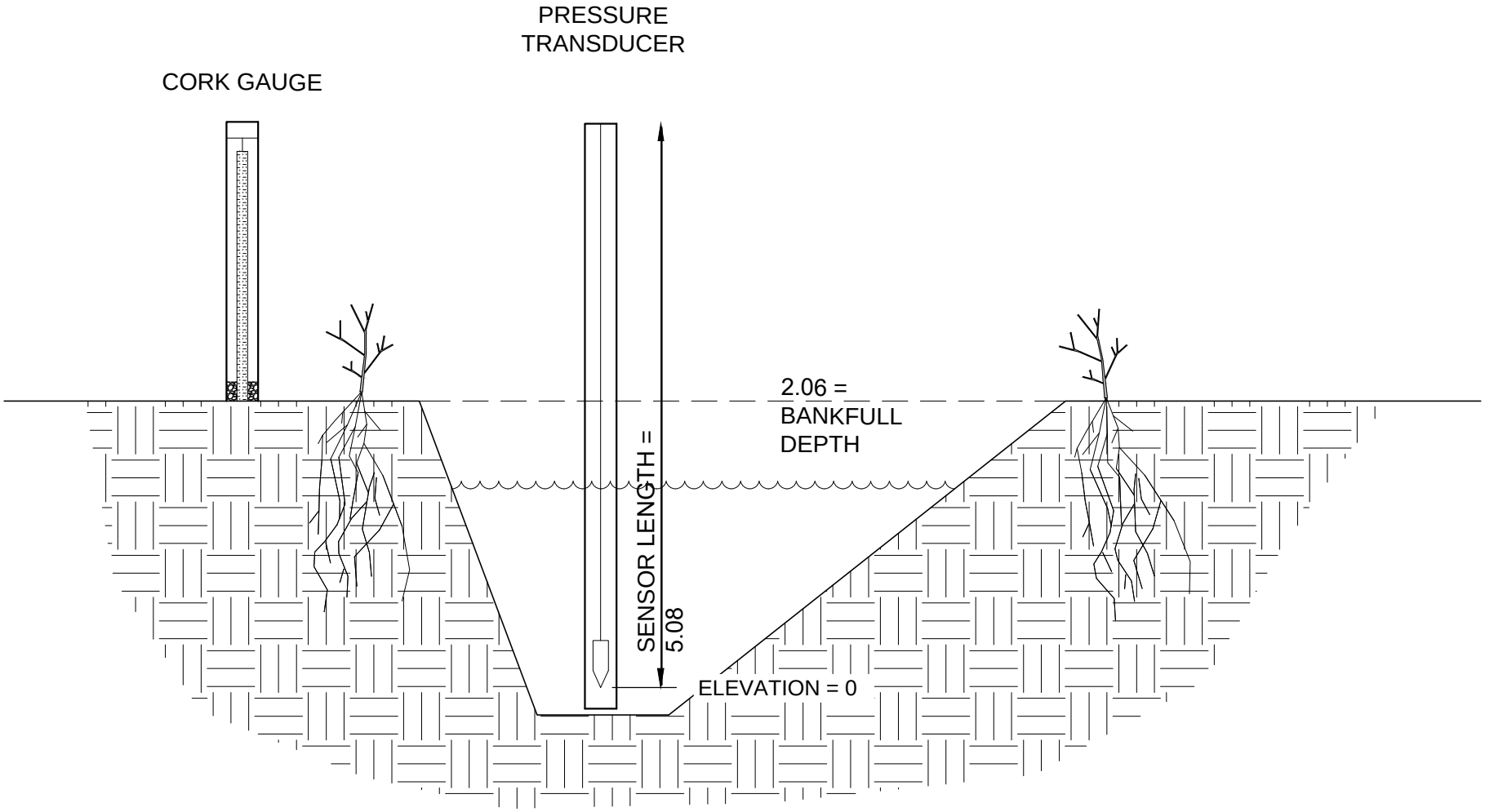


Crest Gauge CG-2 (BB-R2)

Bankfull Event Depth = 1.94

*All elevations relative to sensor depth

CROSS SECTIONAL VIEW OF STREAM

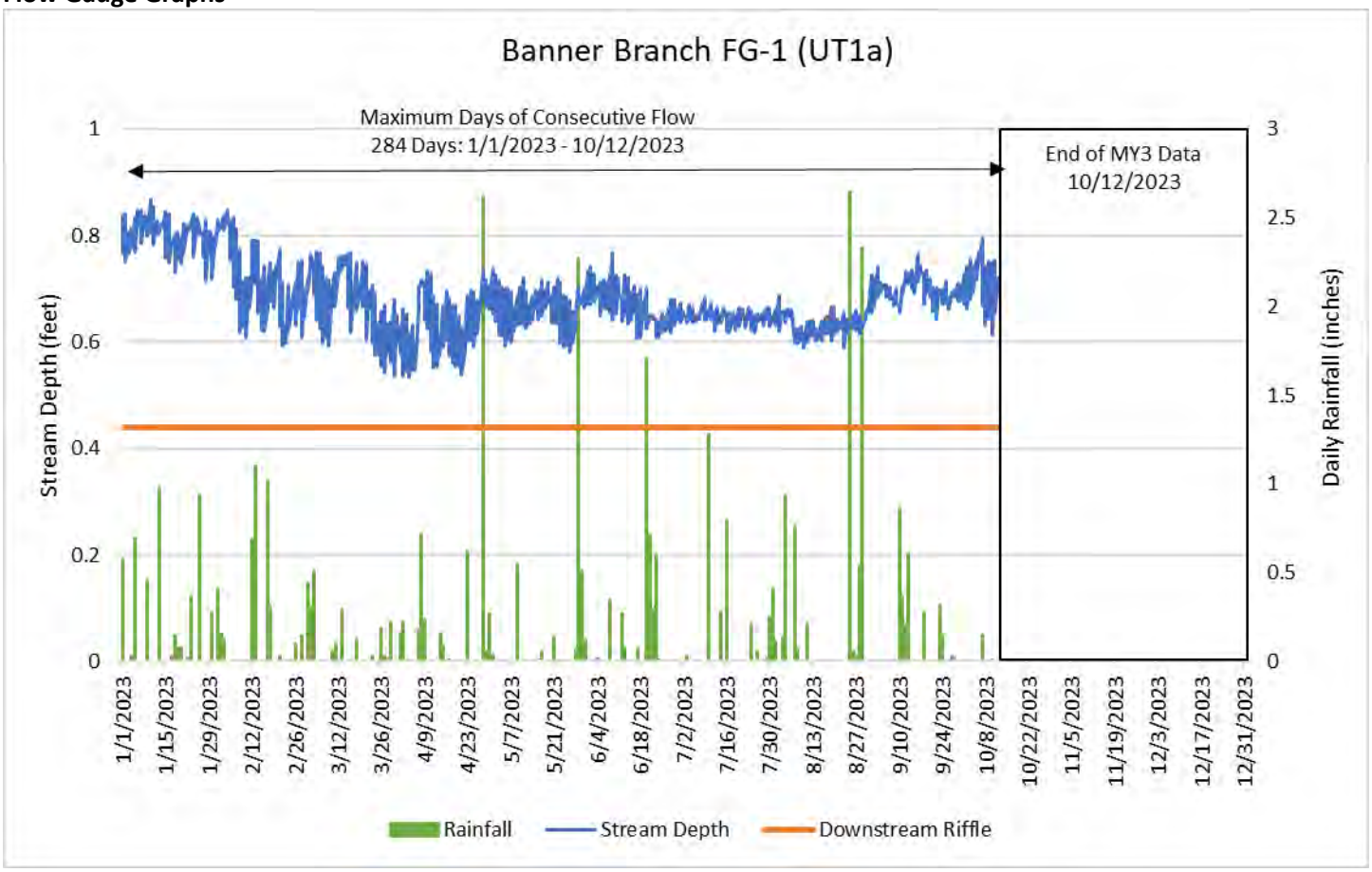


Crest Gauge CG-3 (UT4-R2)

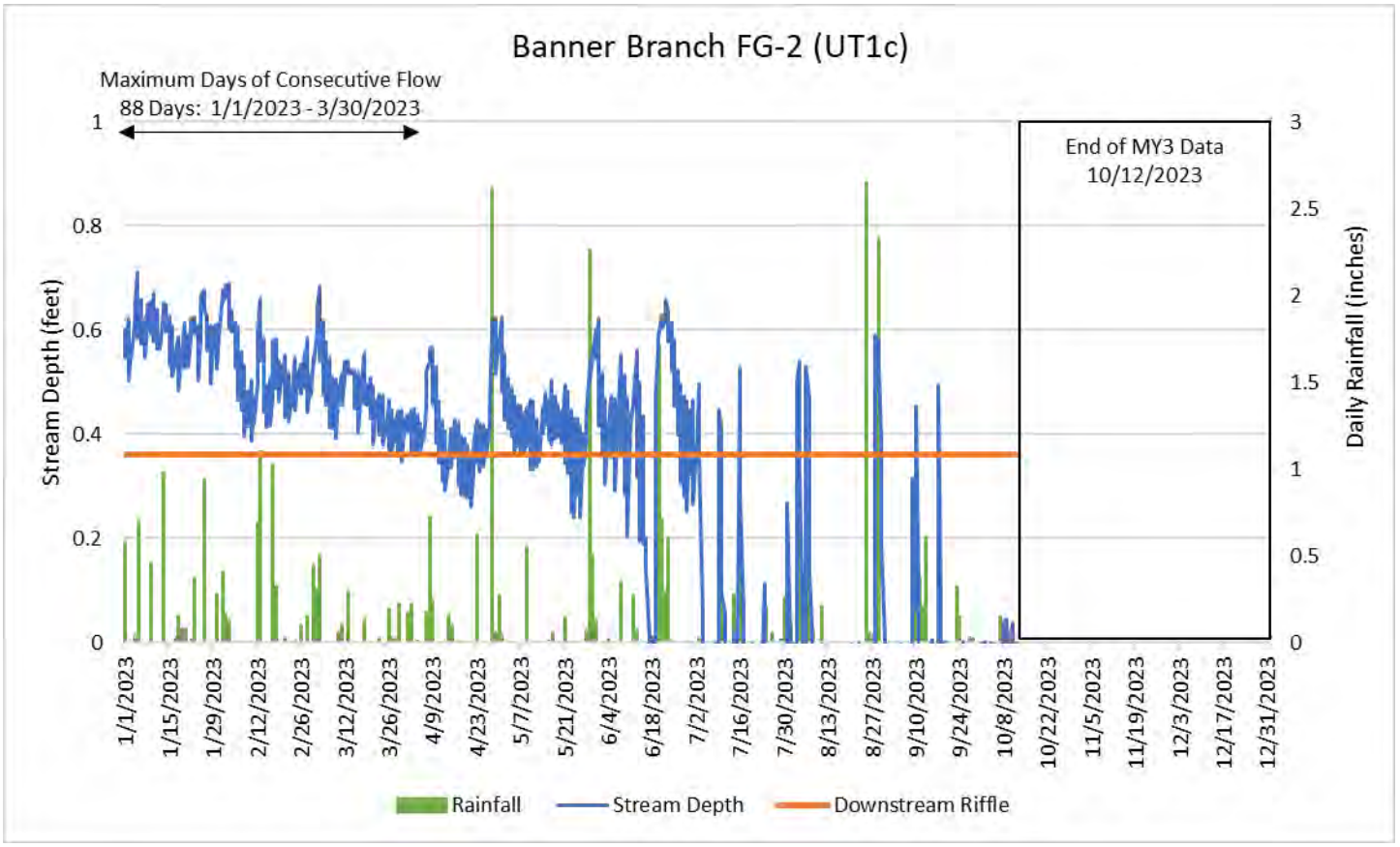
Bankfull Event Depth = 2.06

*All elevations relative to sensor depth

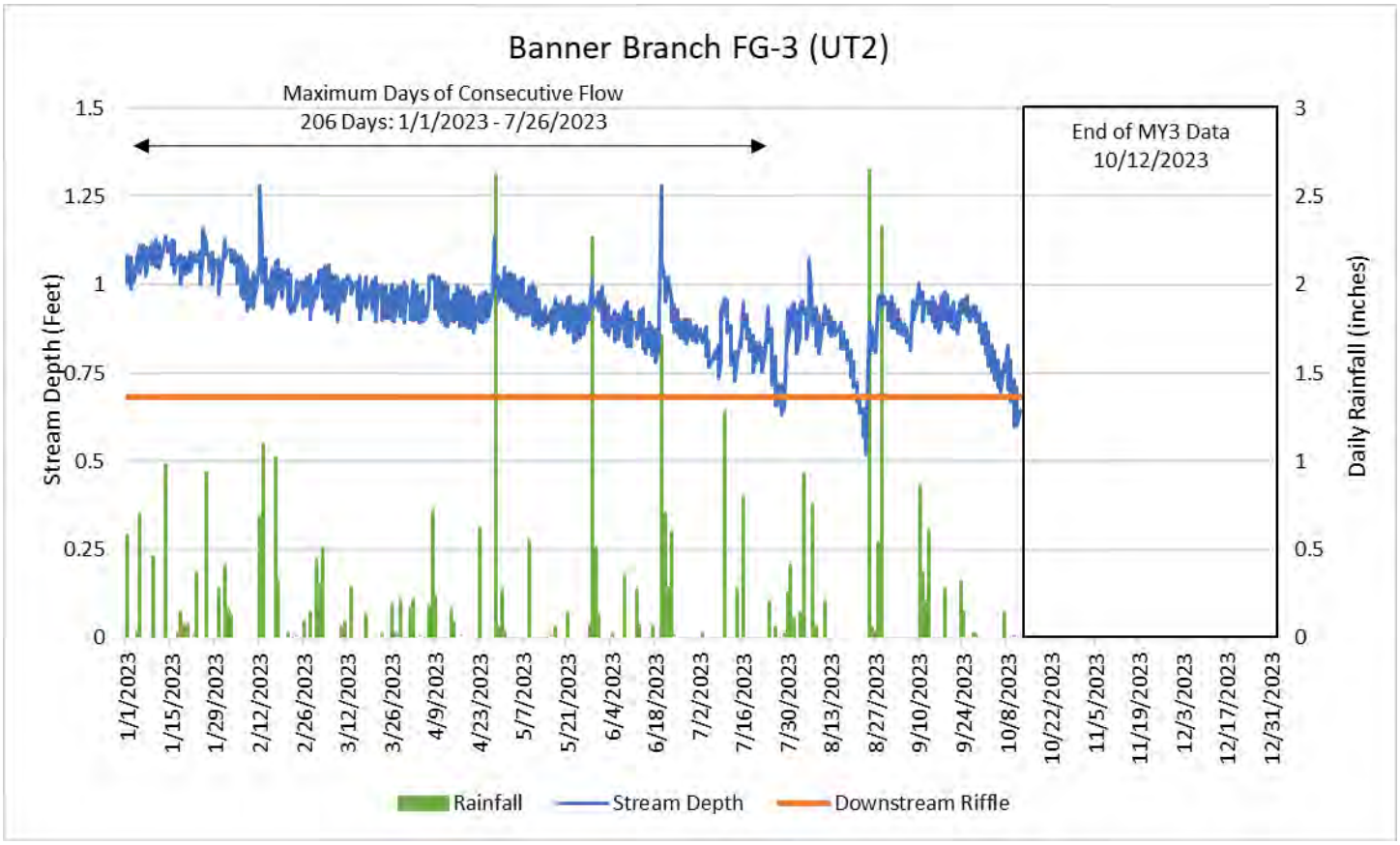
Flow Gauge Graphs



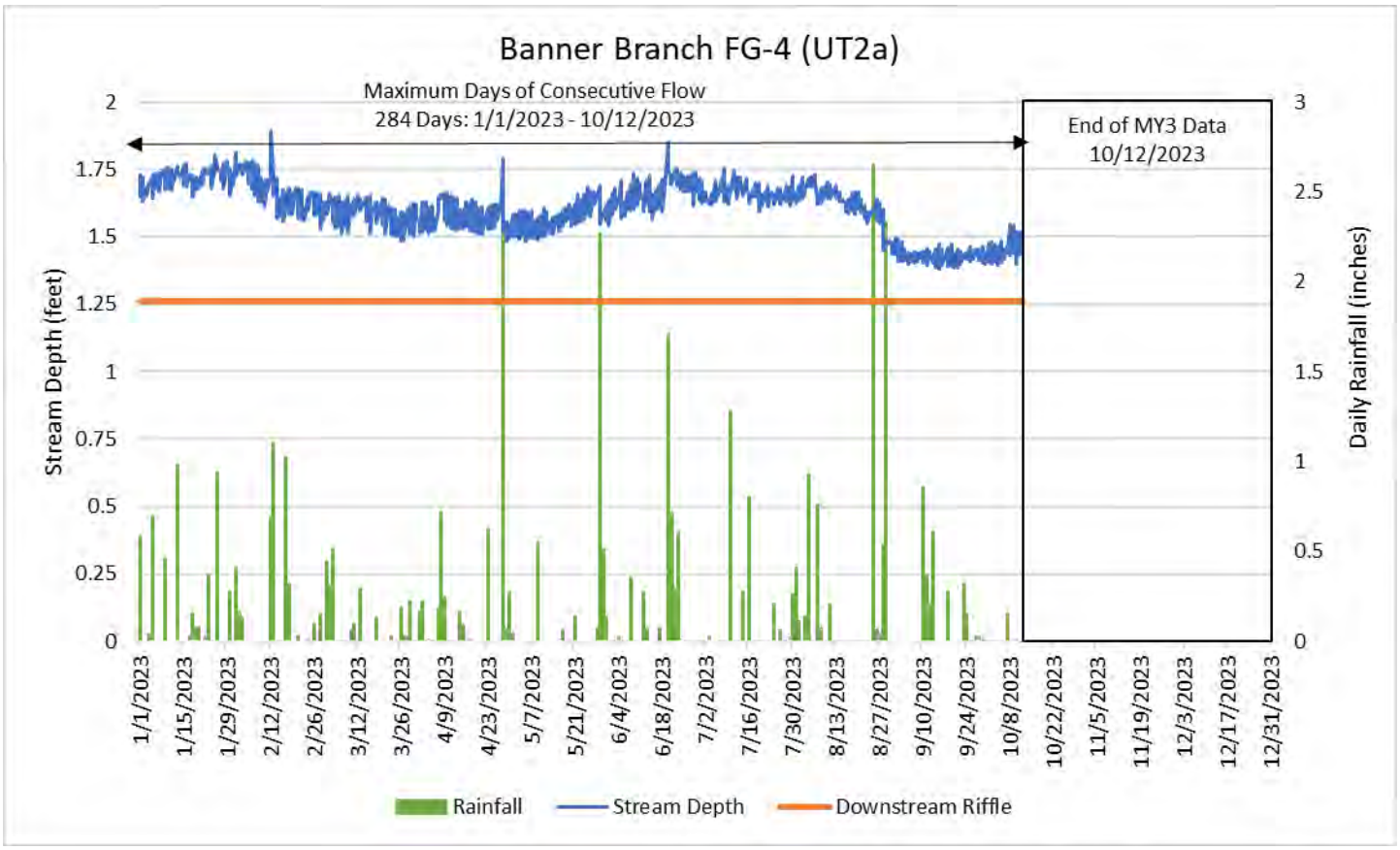
***FG-1:** 284 days of cumulative flow, 0 days of no flow



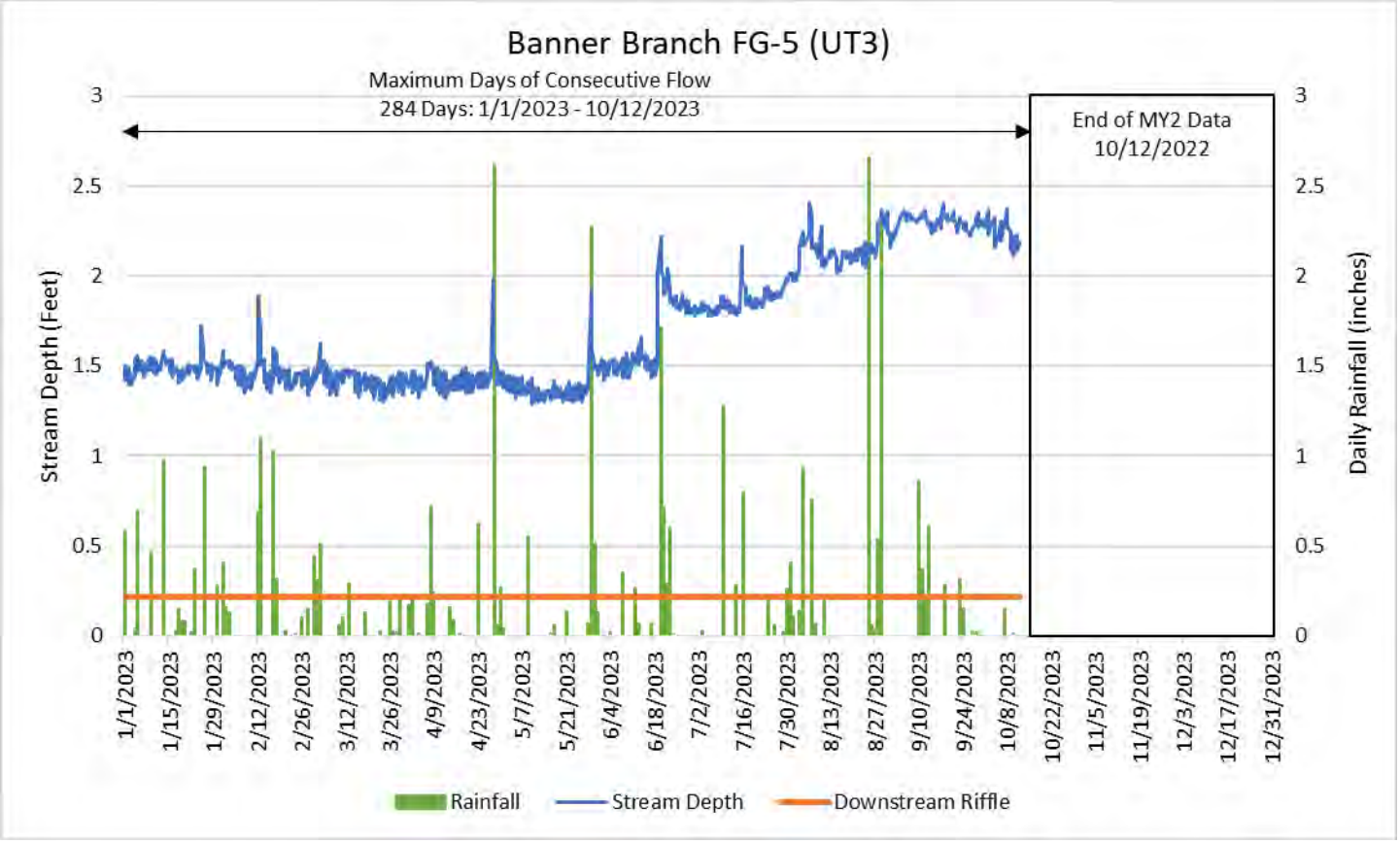
***FG-2:** 165 days of cumulative flow, 120 days of no flow



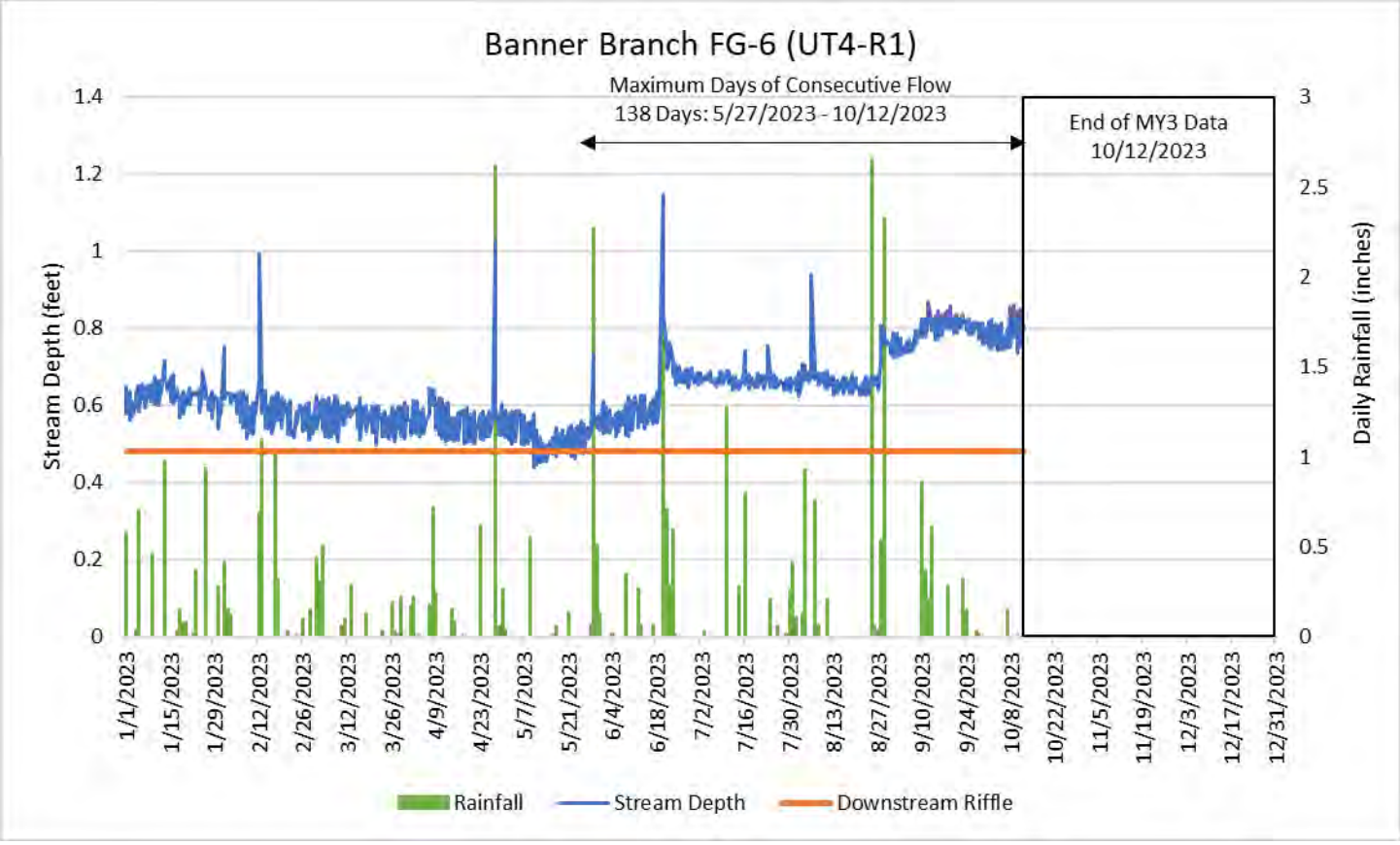
***FG-3:** 278 days of cumulative flow, 7 days of cumulative no flow



***FG-4:** 284 days of cumulative flow, 0 days of cumulative no flow

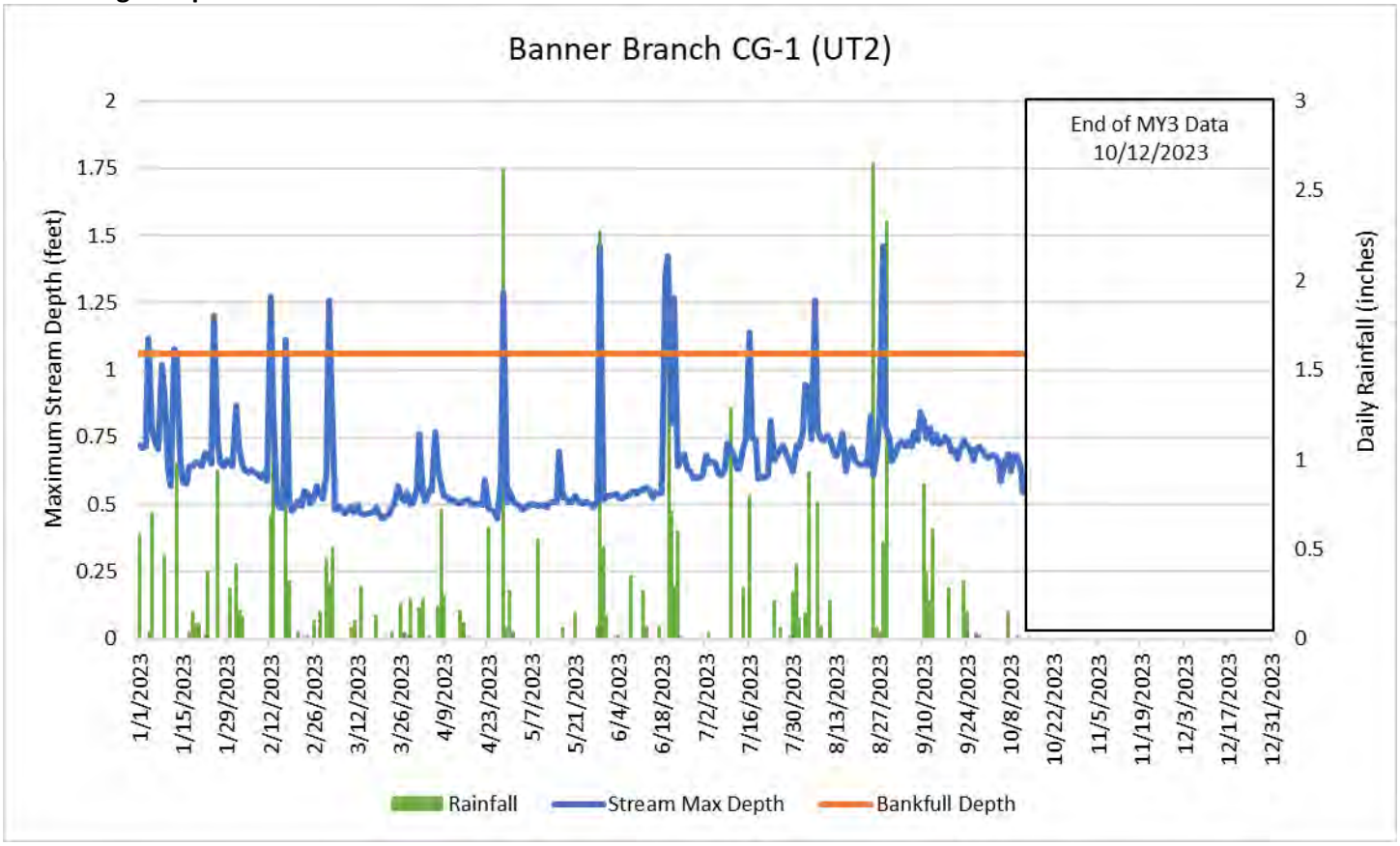


***FG-5:** 284 days of cumulative flow, 0 days of cumulative no flow

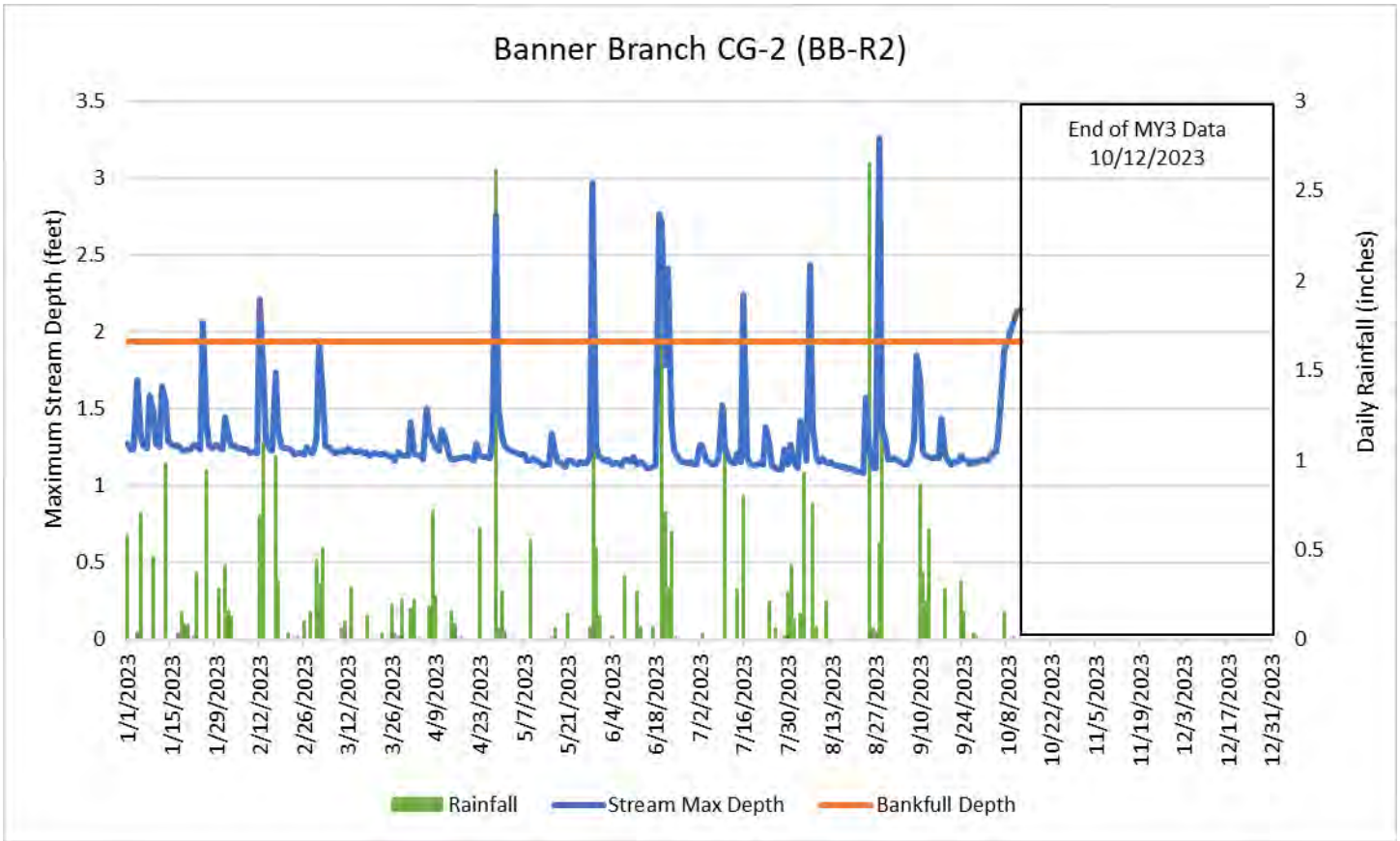


***FG-6:** 279 days of cumulative flow, 6 days of cumulative no flow

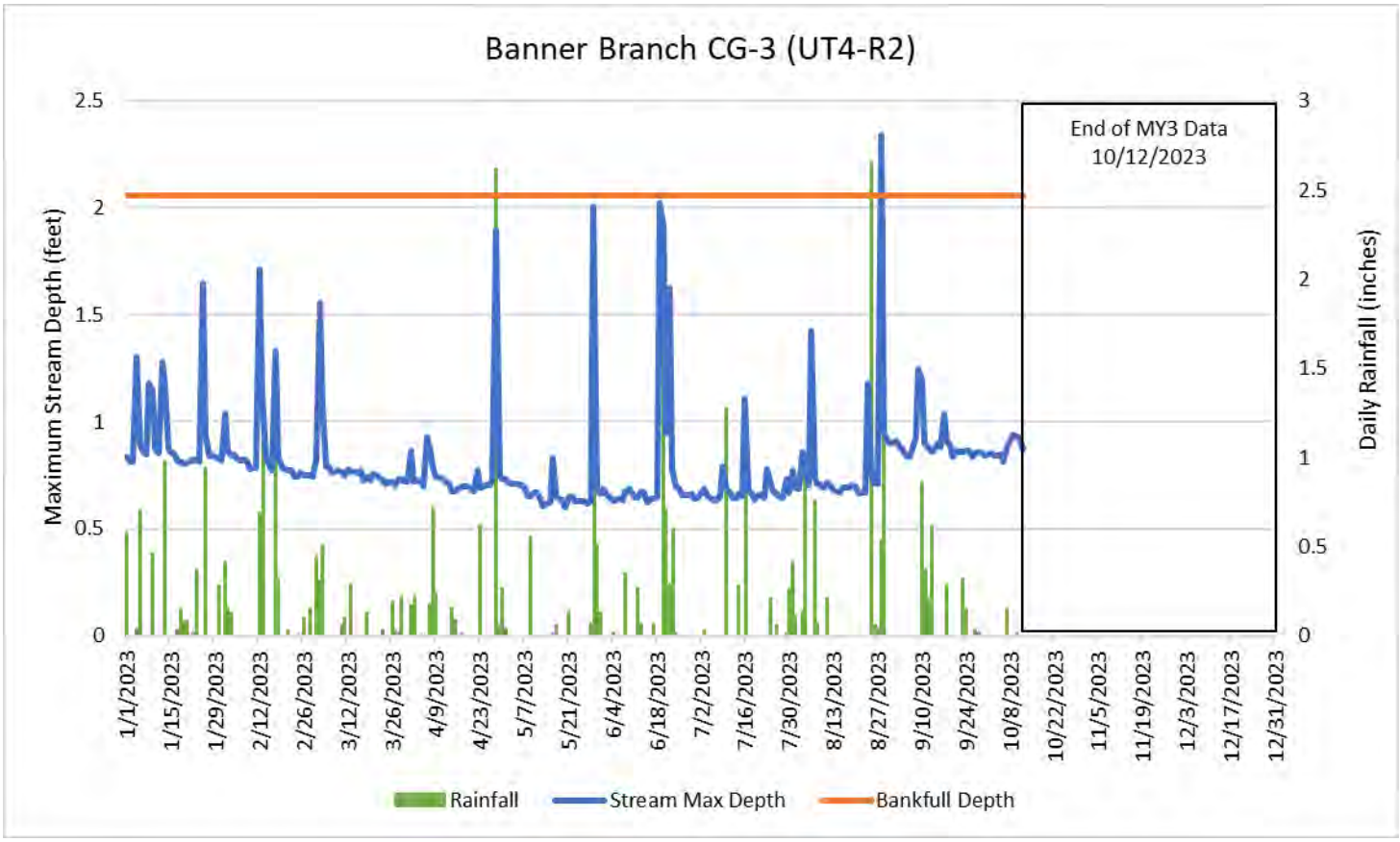
Crest Gauge Graphs



***CG-1:** 13 overbank events with a maximum of 0.401'



***CG-2:** 11 overbank events with a maximum of 1.32'



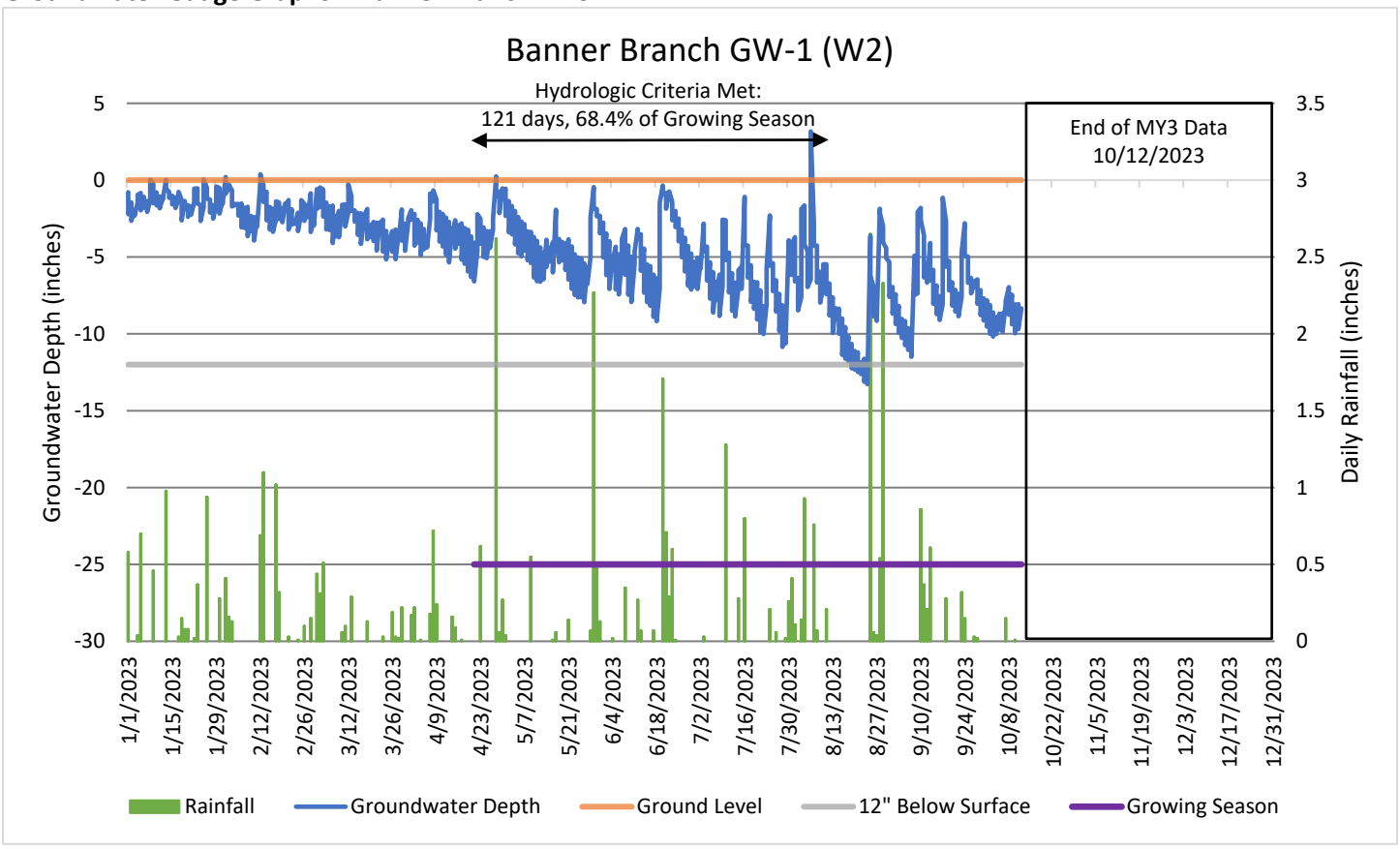
***CG-3:** 1 overbank event with a maximum of 0.281’

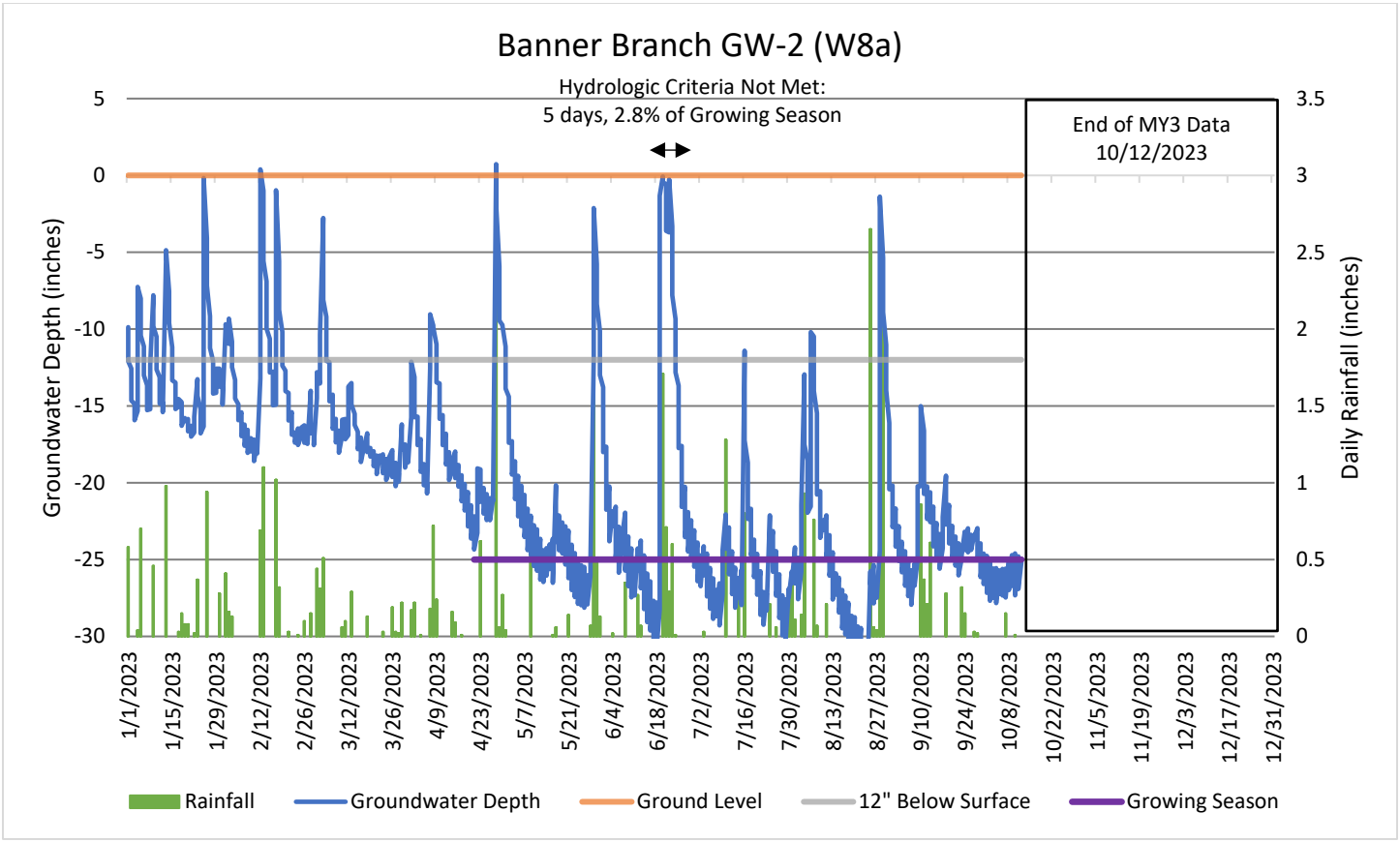
Cumulative Flow Gauge Data Chart Banner Branch Mitigation Project						
Flow Gauge and Reach Location	**Monitoring Year**	**Longest Consecutive Flow**	**Total Days of Cumulative Flow**	**Total Days of No Flow**	**Longest Period of Consecutive No Flow**	**Success Criteria Met**
FG-1	**MY1**	202 days	202 days	0 days	0 days	Yes
	MY2	264 days	264 days	0 days	0 days	Yes
	MY3	284 days	284 days	0 days	0 days	Yes
FG-2	***MY1**	43 days	43 days	0 days	0 days	Yes
	MY2	11 days	64 days	200 days	50 days	No
	MY3	88 days	165 days	120 days	25 days	Yes
FG-3	**MY1**	202 days	202 days	0 days	0 days	Yes
	MY2	264 days	264 days	0 days	0 days	Yes
	MY3	206 days	278 days	7 days	3 days	Yes
FG-4	**MY1**	202 days	202 days	0 days	0 days	Yes
	MY2	264 days	264 days	0 days	0 days	Yes
	MY3	284 days	284 days	0 days	0 days	Yes
FG-5	**MY1**	202 days	202 days	0 days	0 days	Yes
	MY2	264 days	264 days	0 days	0 days	Yes
	MY3	284 days	284 days	0 days	0 days	Yes
FG-6	**MY1**	202 days	202 days	0 days	0 days	Yes
	MY2	264 days	264 days	0 days	0 days	Yes
	MY3	138 days	279 days	6 days	1 day	Yes

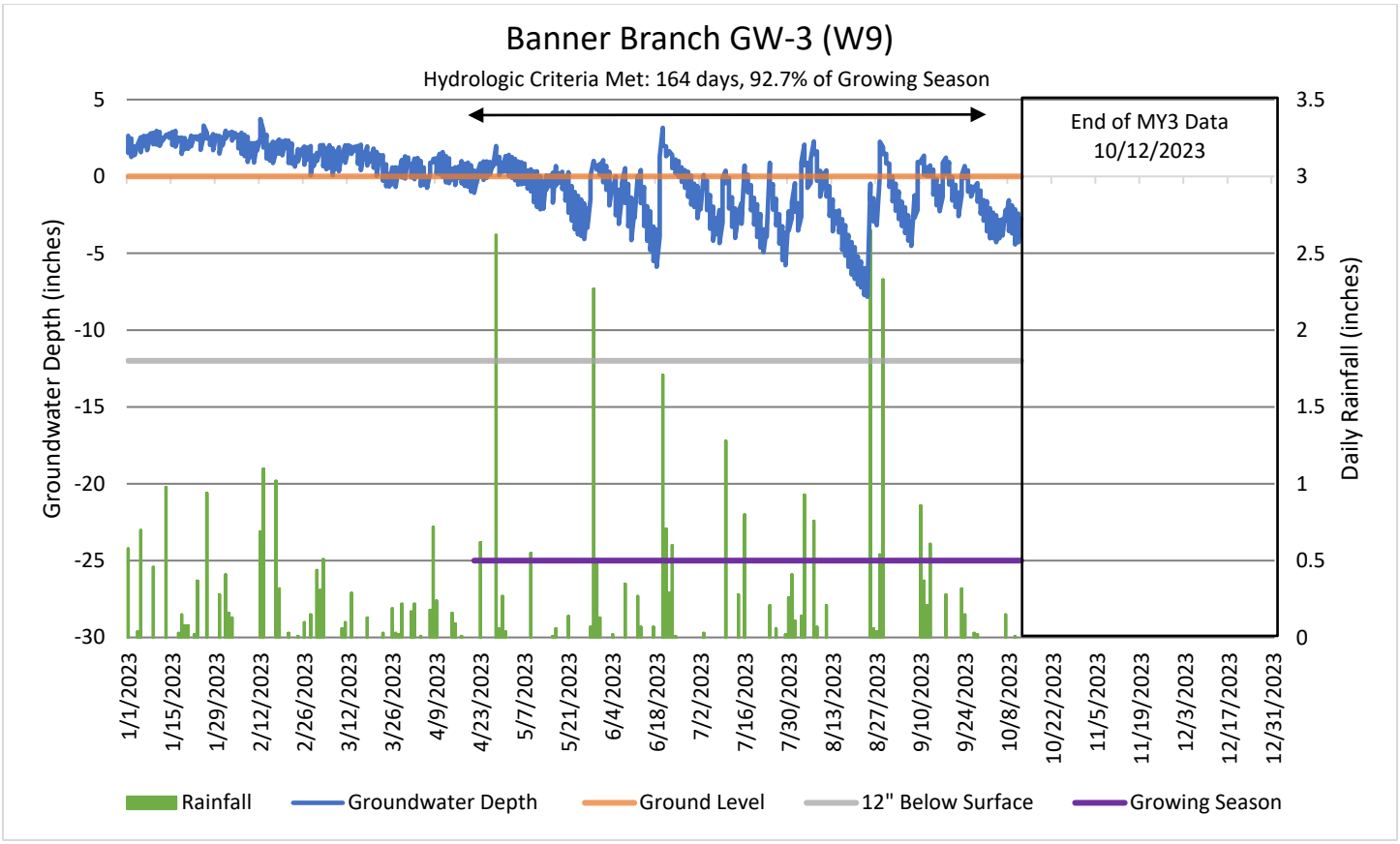
** Indicates data was missing for a portion of the monitoring season*

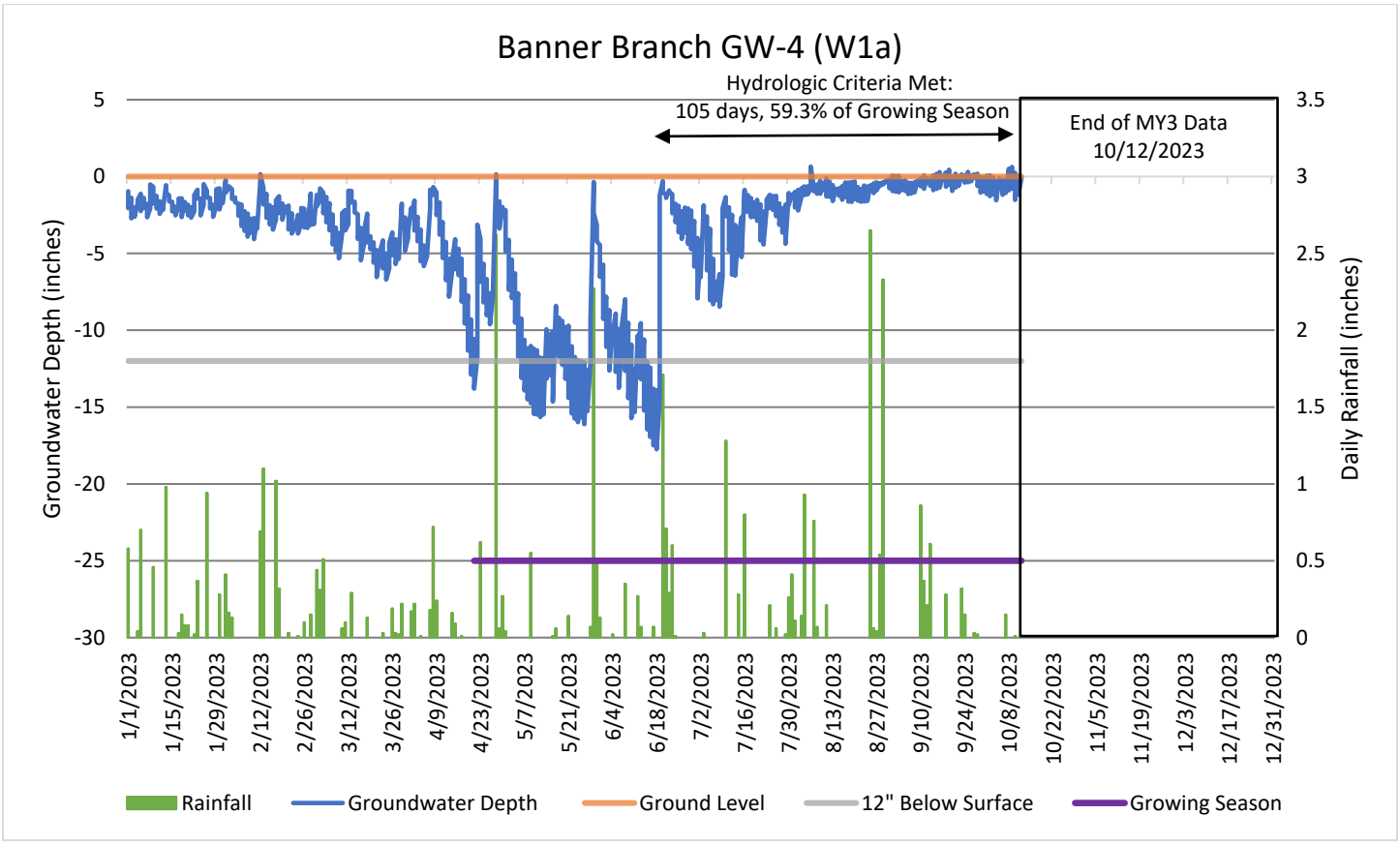
Max Consecutive Hydroperiod Saturation within 12 Inches of Soil Surface (Percent of Growing Season 4/21-10/16) CRONOS Station: Danbury									
Monitoring Gauge Name	MY1 2021	MY2 2022	MY3 2023	MY4 2024	MY4 2025	MY5 2026	MY6 2027	MY7 2028	Mean
Wetland Gauge 1	71.8%	87.0%	68.4%						75.7%
Wetland Gauge 2	1.7%	4.0%	2.8%						2.8%
Wetland Gauge 3	100.0%	87.0%	92.7%						93.2%
Wetland Gauge 4	40.1%	8.5%	59.3%						36.0%
Wetland Gauge 5	40.7%	8.5%	4.5%						17.9%
Wetland Gauge 6	100.0%	37.3%	92.7%						76.7%
Wetland Gauge 7	100.0%	87.0%	74.0%						87.0%
Wetland Gauge 8	14.1%	15.8%	9.0%						13.0%
Wetland Gauge 9	14.7%	17.5%	13.6%						15.3%

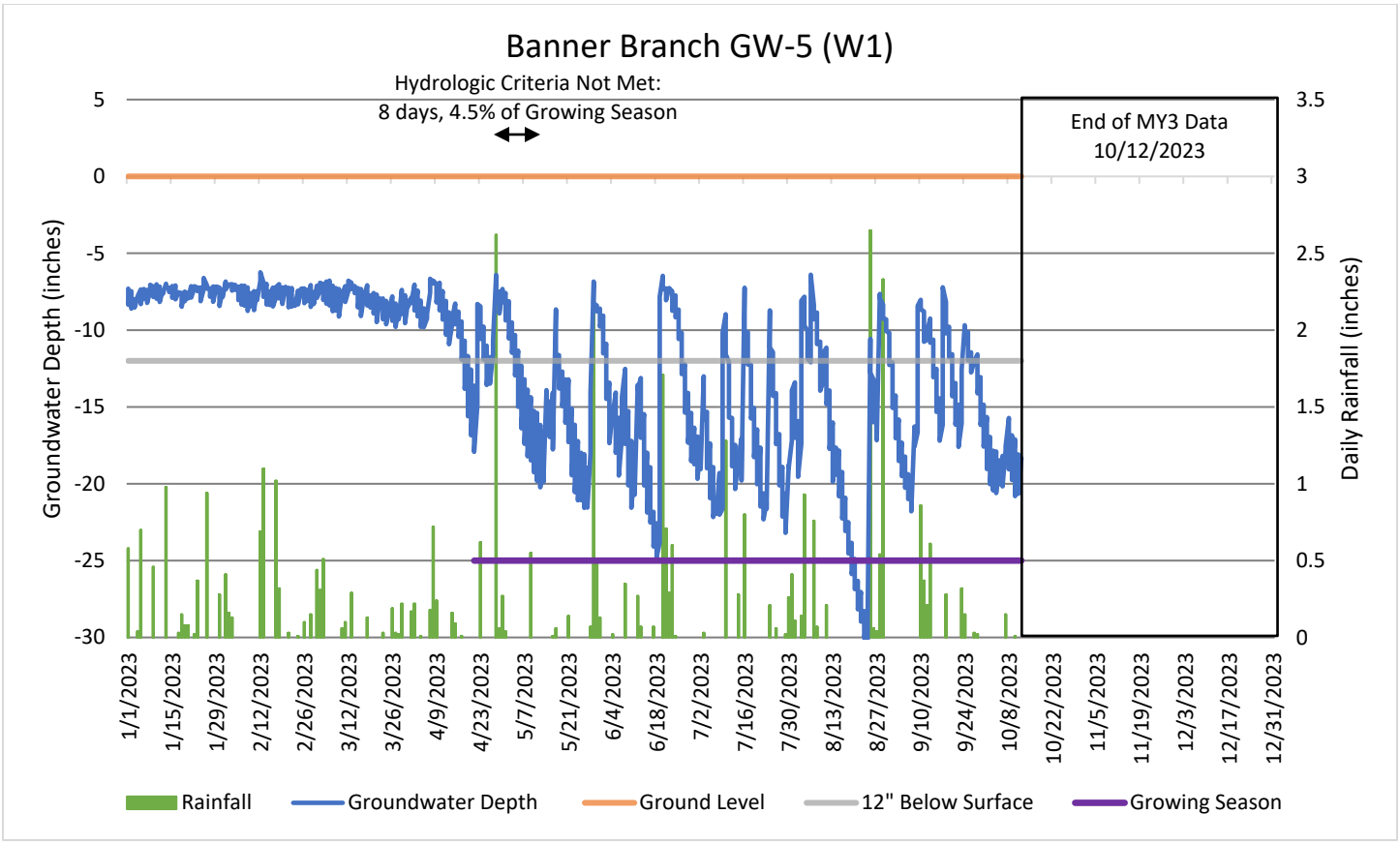
Groundwater Gauge Graphs – Banner Branch MY3

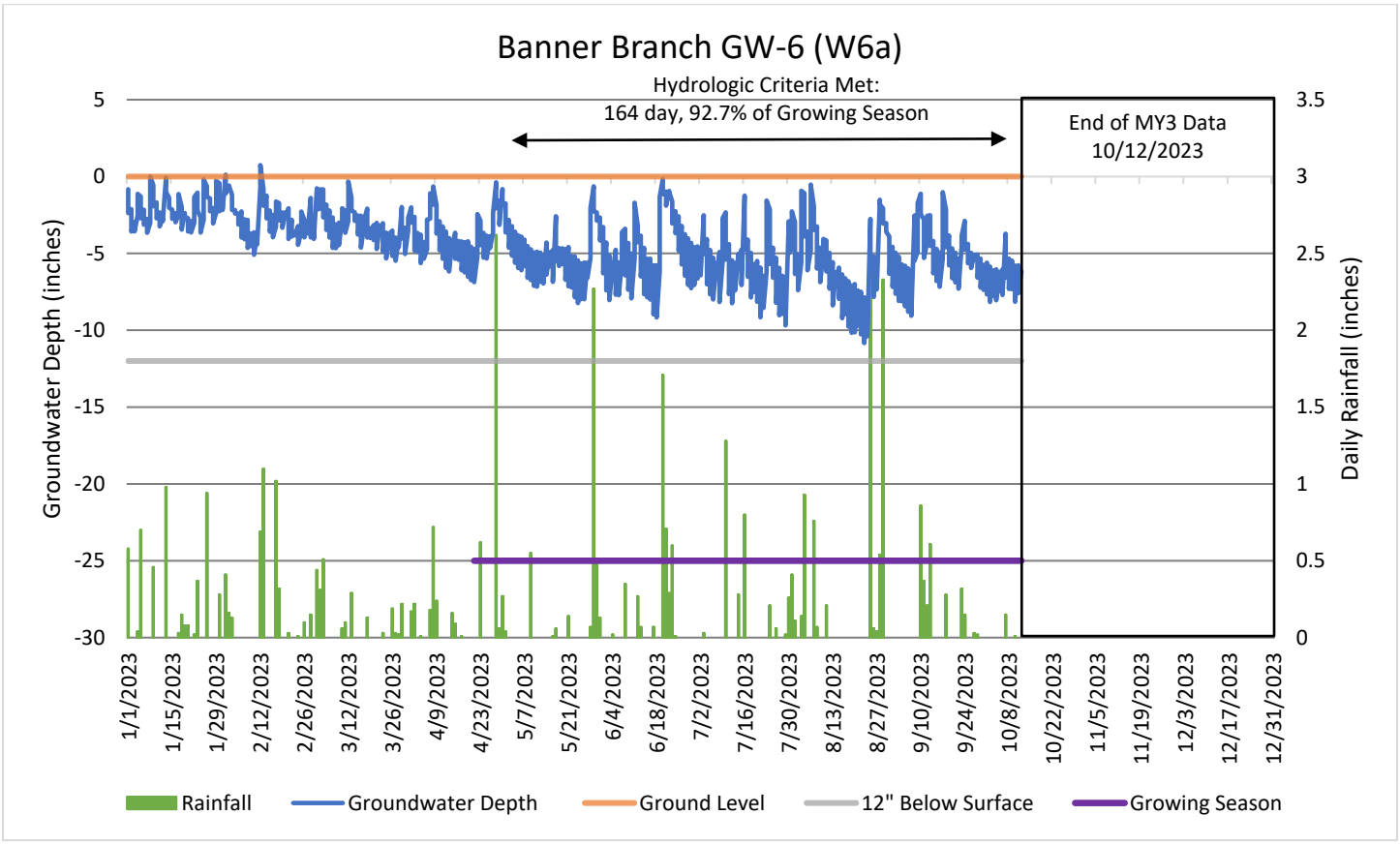


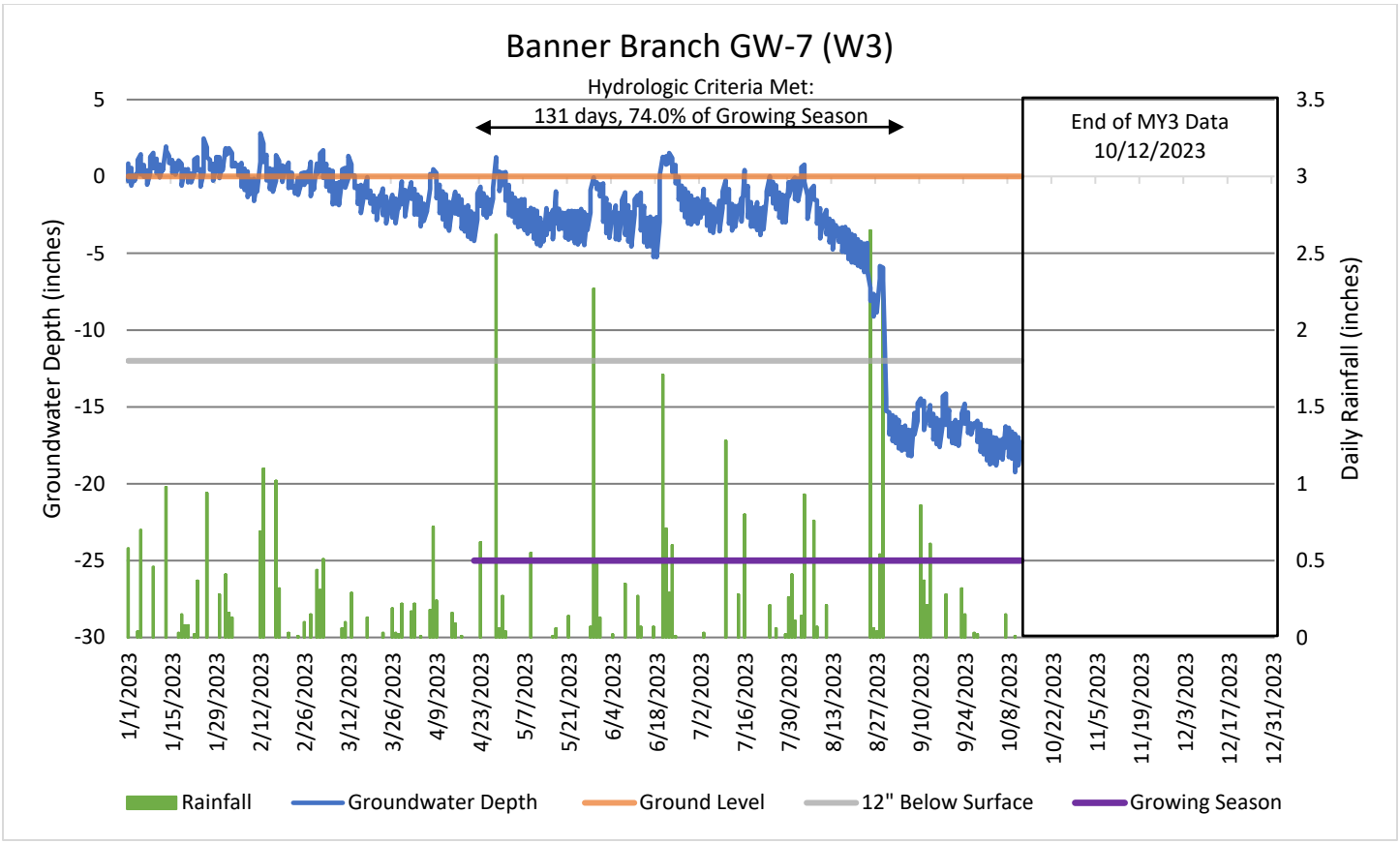


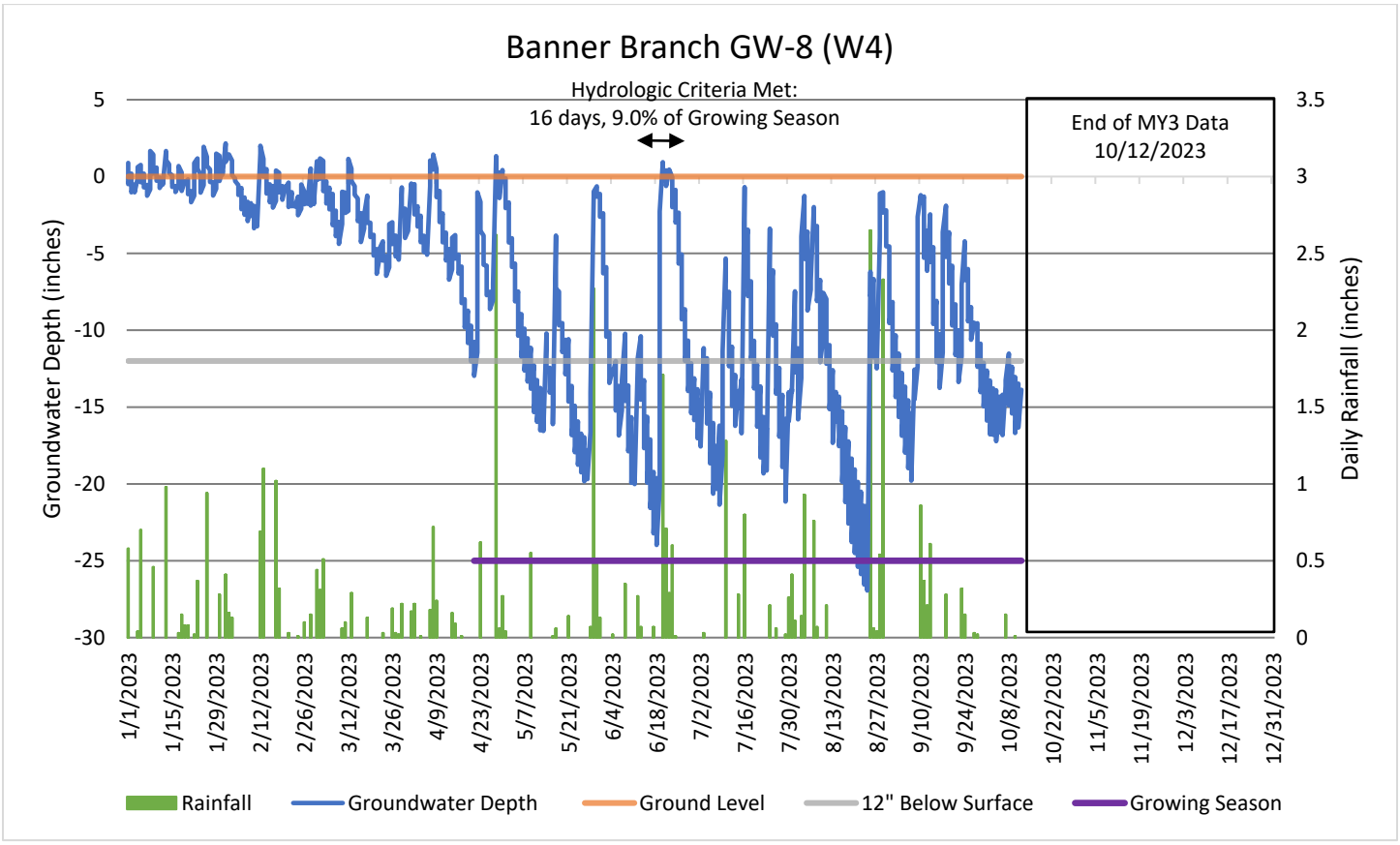

Banner Branch GW-3 (W9)
Hydrologic Criteria Met: 164 days, 92.7% of Growing Season
End of MY3 Data
10/12/2023
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season

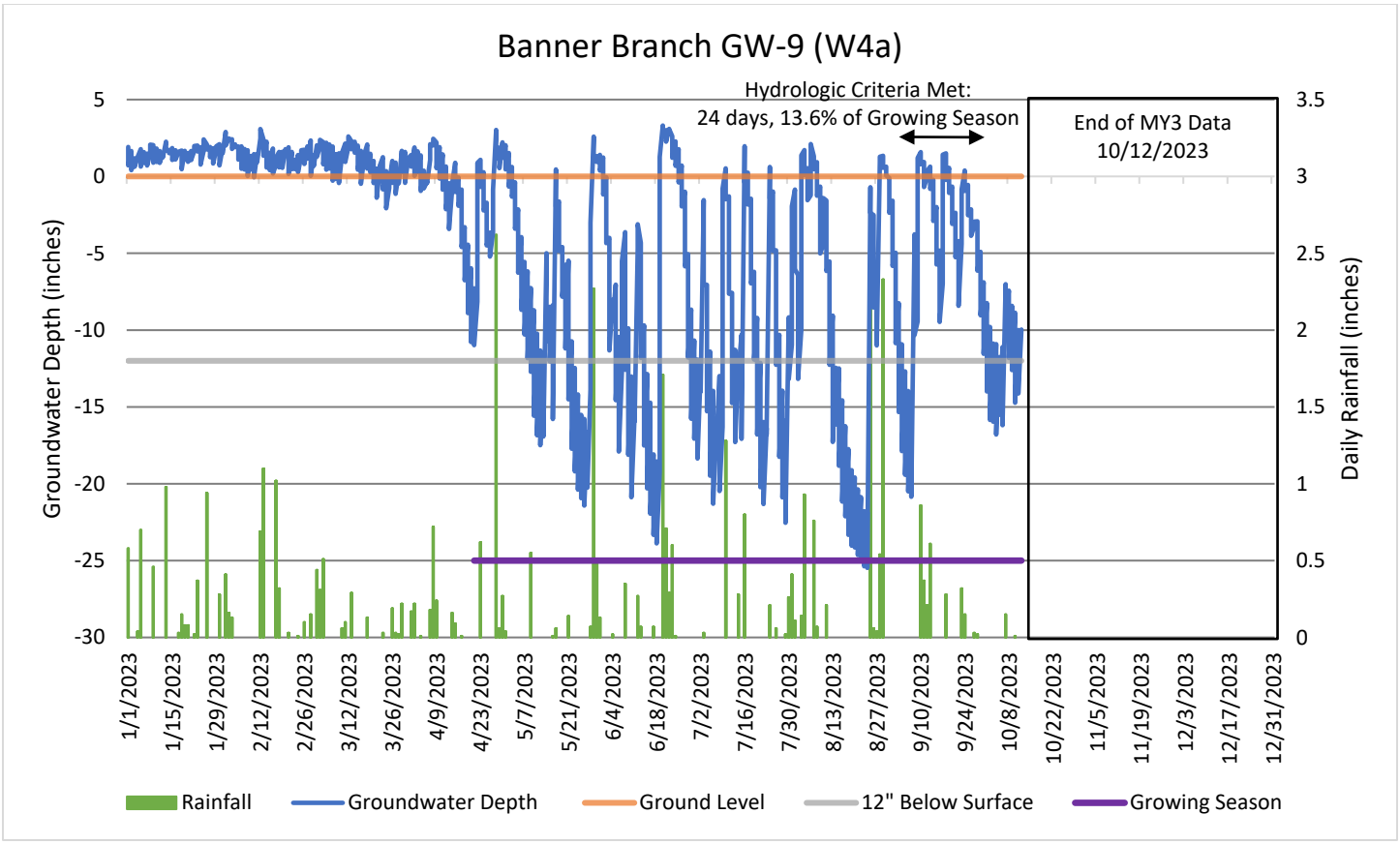

Banner Branch GW-4 (W1a)
Hydrologic Criteria Met:
105 days, 59.3% of Growing Season
End of MY3 Data
10/12/2023
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season

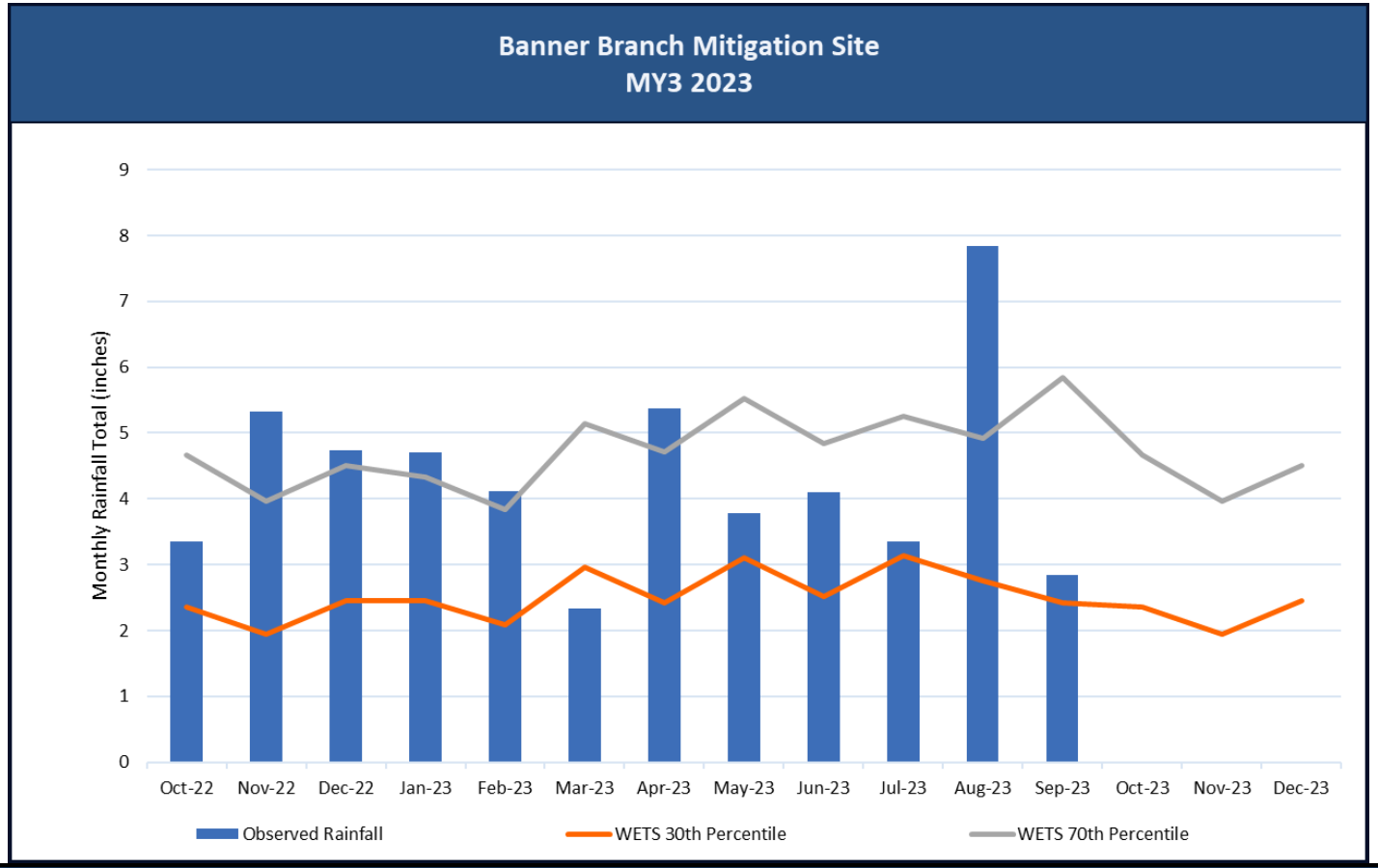

Banner Branch GW-5 (W1)
Hydrologic Criteria Not Met:
8 days, 4.5% of Growing Season
End of MY3 Data
10/12/2023
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Banner Branch GW-6 (W6a)
Hydrologic Criteria Met:
164 day, 92.7% of Growing Season
End of MY3 Data
10/12/2023
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
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Banner Branch GW-7 (W3)
Hydrologic Criteria Met:
131 days, 74.0% of Growing Season
End of MY3 Data
10/12/2023
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
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Banner Branch GW-8 (W4)
Hydrologic Criteria Met:
16 days, 9.0% of Growing Season
End of MY3 Data
10/12/2023
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
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Banner Branch GW-9 (W4a)
Hydrologic Criteria Met:
24 days, 13.6% of Growing Season
End of MY3 Data
10/12/2023
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
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season



Banner Branch Mitigation Project Monthly Rainfall Summary															
	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
Observed Rainfall	3.35	5.33	4.74	4.71	4.12	2.33	5.37	3.78	4.10	3.35	7.84	2.85	**	**	**
WETS 30th Percentile	2.36	1.94	2.46	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	4.66	3.97	4.51	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	L	N	L	N	H	N	N	H	L	H	N	N	**	**	**

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

** Incomplete Month

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
Invasive Species Treatment	N/A	4/28/2022
Invasive Species Treatment	N/A	11/23/2022
MY2 Monitoring Report	9/21/2022	11/30/2022
Invasive Species Treatment	N/A	6/29/2023
Invasive Species Treatment	N/A	8/30/2023
MY3 Monitoring Report	10/12/2023	12/18/2023

Banner Branch Mitigation Project/DMS: 100080	
Provider	7721 Six Forks Road, Suite 130
Water & Land Solutions, LLC	Raleigh, NC 27615
Mitigation Provider POC: Leah Farr	(919) 971 - 4575
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:
MY3 Benthic Data

Macrobenthic Sampling Data

BB1 (BB-R3) - Banner Branch Mitigation Site			
Monitoring Year	MY0	MY3	
Biotic Index Score	5.94	5.19	
Water Quality Level	Fair	Good-Fair	

View Upstream

Macrobenthic Sampling Data

BB2 (UT4-R2) - Banner Branch Mitigation Site			
Monitoring Year	MY0	MY3	
Biotic Index Score	6.65	4.90	
Water Quality Level	Poor	Good-Fair	

View Downstream

Table 8: Biotic Index Data and Scores

Pre-Construction 2019			MY3 2023		
Taxa / Biotic Index Value	**BB1 (BB-R3)**	**BB2 (UT4-R2)**	**Taxa / Biotic Index Value**	**BB1 (BB-R3)**	**BB2 (UT4-R2)**
EPHEMEROPTERA			**EPHEMEROPTERA**		
Family Ephemeridae			**Family Baetidae**		
Ephemera spp (2.0)	R		*Acentrella spp (2.5)*	R	
PLECOPTERA			*Baetis intercalaris (1.5)*	C	
Family Perlidae			*Callibaetis spp (9.2)*	R	
Eccoptura xanthenes (4.7)	C		*Labiobaetis spp (3.5)*	R	
TRICHOPTERA			*Baetis intercalaris (1.5)*		C
Family Hydropsychidae			**Family Isonychiidae**		
Cheumatopsyche spp (6.6)	R		*Isonychia spp (3.6)*	C	R
Hydropsyche betteni (7.9)	R		**Family Heptageniidae**		
MISC DIPTERA			*Stenonema femoratum (6.9)*		A
Family Tabanidae			**PLECOPTERA**		
Chrysops (6.7)	R		**Family Perlidae**		
Family Tipulidae			*Perlesta spp (2.9)*		R
Hexatoma spp (3.5)	R		**TRICHOPTERA**		
DIPTERA; CHIRONOMIDAE			**Family Hydropsychidae**		
Nanocladius (7.4)	R		*Hydropsyche betteni (7.9)*	A	C
Rheotanytarsus spp (6.5)	R		*Cheumatopsyche spp (6.6)*		R
Tanytarsus spp (6.6)	R		**Family Philopotamidae**		
Tribelos spp (6.4)		R	*Chimarra spp (3.3)*	R	A
ODONATA			**Family Thremmatidae**		
Family Aeshnidae			*Neophylax spp (1.6)*	R	C
Boyeria vinosa (5.6)	R	R	**ODONATA**		
Family Calopterygidae			**Family Aeshnidae**		
Calopteryx spp (7.5)	C	C	*Boyeria vinosa (5.8)*	R	R
Family Gomphidae			**Family Coenagrionidae**		
Gomphus spp (5.9)	R	R	*Argia spp (8.3)*	R	R
Ophiogomphus spp (5.9)	R		**MEGALOPTERA**		
Stylogomphus albistylus (5.0)	R		**Family Corydalidae**		
OLIGOCHAETA			*Corydalus cornutus (5.2)*		R
Family Naidae			*Nigronia serricornis (4.6)*		C
Aulodrilus pleuriseta (5.6)	R	R	**COLEOPTERA**		
Nais spp (8.7)	R		**Family Gyrinidae**		
MEGALOPTERA			*Gyrinus spp (5.8)*	R	
Family Corydalidae			*Dineutus spp (5.0)*	R	
Nigronia serricornis (4.6)	R		**DIPTERA; CHIRONOMIDAE**		
Family Sialidae			*no genus specified (7.2)*	R	R
Sialis spp (7.0)		R	**DIPTERA**		
			Family Dixidae		
Total Taxa Richness	**17**	**6**	*Dixa spp (2.5)*	C	
EPT Taxa Richness	**4**	**0**	**Family Simuliidae**		
EPT Abundance	**6**	**0**	*Simulium spp (4.9)*	A	
Biotic Index	**5.94**	**6.65**	*Prosimulium spp (4.5)*	R	
Key			**Family Limoniidae**		
R = Rare, C = Common, A = Abundant			*Hexatoma spp (3.5)*		R
			GASTROPODA		
			Family Physidae		
			Physa spp (8.7)		R
			Total Taxa Richness	**16**	**15**
			EPT Taxa Richness	**8**	**8**
			EPT Abundance	**42**	**40**
			Biotic Index	**5.19**	**4.9**