MY2 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: 2022

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

Environmental Quality

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November 30, 2022

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

RE: WLS Responses to NCDEQ DMS Review Comments for Task 8 Submittal, Draft Monitoring Year 2 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 2 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 2 Report and associated deliverables accordingly. We are providing the electronic deliverables via cloud link. The electronic deliverables are organized under the following folder structure as required under the digital submission requirements:

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

We are providing our written responses to DMS' review comments on the Draft Monitoring Year 2 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. **The 4th paragraph of the Project Summary says that there are 20 veg plots. After MY0, an additional veg plot was added, so this should be 21. Additionally, it may be more clear to say 23 veg plots (21 fixed and 2 random).** Response: The final monitoring report is updated with clearer language in the Project Summary to correctly state the number of vegetation plots.

2. **Section 4.4 says 3 random transects were done, but there were only 2 completed for MY2. Please update.** Response: Section 4.4 was updated to 2 random transects.

3. **Flow Gauge 2 should be shown on the CCPV (Figure 1d) as not meeting success criteria. A simple callout with the FG-2 label would suffice or use an alternative color.** Response: A callout was added stating FG-2 did not meet success criteria.

4. **Random veg transects on the CCPV should be labeled 22 & 23 to match the veg table in App. B.** Response: Labels of random transects were updated on the CCPV.

5. **In the Vegetation Plot Counts and Densities Table, Veg Plot 4F is shown as having 7 stems and 162 stems/acre. 7 stems in the plot should calculate to 283 stems/acre. Please clarify the stem density reported or update the table as necessary.** Response: Veg plot 4 had 6 stems of willow oak and 1 stem of persimmon. Per guidance a single species can only account for up to 50% of the total success, which is why the tables are only showing 162 stems/acre. Including all 7 stems is 283 stems/acre. A note was added to the vegetation tables and in the report.

6. **In Appendix C, we recommend removing BHR calculations from pool cross sections.** Response: Pool BHRs are no longer displayed in the cross-section morphology table. Pool BHR data is still shown on the cross-section graphs.

7. **Are there any concerns with sedimentation and maintaining a channel through UT3? The cross sections show a 35% loss of cross sectional area in the riffle and 47% in the pool, and there is a clear sediment source upstream of the restored channel. DMS understands that vegetation and natural point bar formation could be contributing factors, but the relatively low gradient channel and sediment source upstream are concerning.** Response: A significant amount of sediment is coming from the actively eroding field outside of the easement above UT3. UT3 flowed for 264 days straight and the in-channel vegetation during the growing season is trapping some sediment. As the vegetation dies off this winter sediment should move through the system. At this time UT3 is maintaining a channel and no remedial action is proposed but we will continue to monitor UT3 closely and any actions will be documented in future reports.

8. **Please note that UT1C and W8A will need to be assessed for potential designation as at-risk credits in MY3 if the gauge data does not meet success criteria.** Response: WLS understands this comment. UT1C upper is preservation, and the lower part of the reach is restoration. WLS will address in the MY3 report as needed.

Digital Files

1. **The stream visual assessment submission is incomplete; tables for only two project reaches submitted. The missing tables indicated stream problem areas (3) in the report, please submit the missing visual assessment tables and shapefiles for the three problem areas.** Response: The visual assessment tables have been updated to include all project reaches. Shapefiles for the problem areas are provided in the CCPV folder.

2. **Report data has conflicting information regarding three random vegetation plots versus two. Two locations were included in the shapefile. Please submit a revised file if three plots were completed.** Response: The shapefile with 2 random vegetation plots is correct and provided in the CCPV folder.

3. **Surface flow data and graphs were missing from the digital submission, please submit.** Response: Flow data and graphs are provided in the Hydro folder.

4. **Groundwater graphs were missing from the digital submission, please submit.** Response: Groundwater graphs are provided in the Hydro folder.

Please contact me if you have any questions or comments.

Sincerely,

Water & Land Solutions, LLC

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LIST OF APPENDICES

1 Project Summary

1.1 Project Location and Description

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

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

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

Monitoring Year 2 (MY2) activities occurred during September 2022. This report presents the data for MY2. The Project meets the MY2 success criteria for stream hydrology, stream horizontal and vertical stability, and streambed condition and stability. One of the six flow gauges is not meeting the 30-day flow criteria. Eight of the nine wetlands are meeting success criteria for hydrology. One of the 23 (21 fixed and 2 random transects) vegetation plots is 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	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**

Wetland Mitigation Category

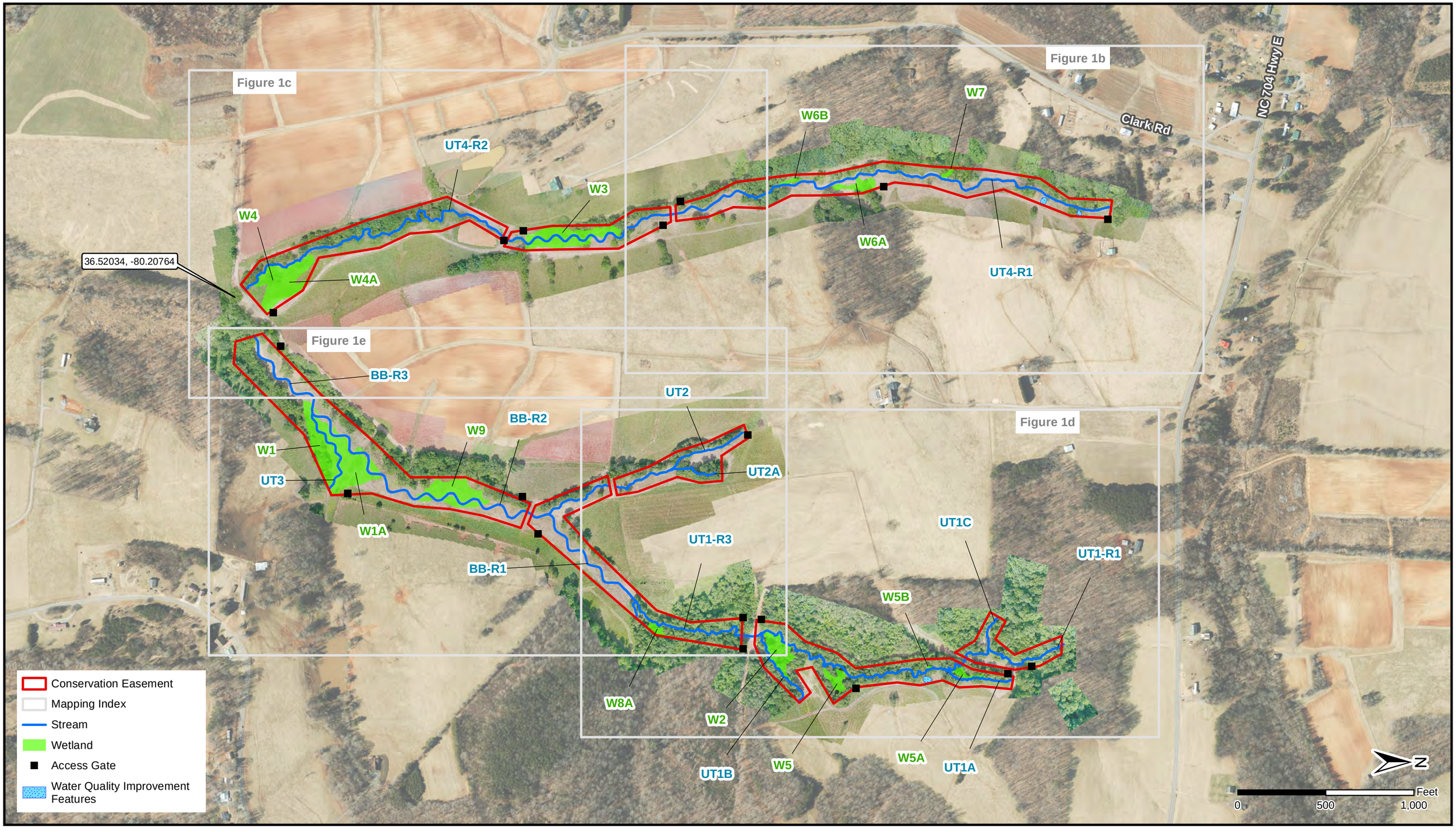
CM	Coastal Marsh
R	Riparian
NR	Non-Riparian

Restoration Level

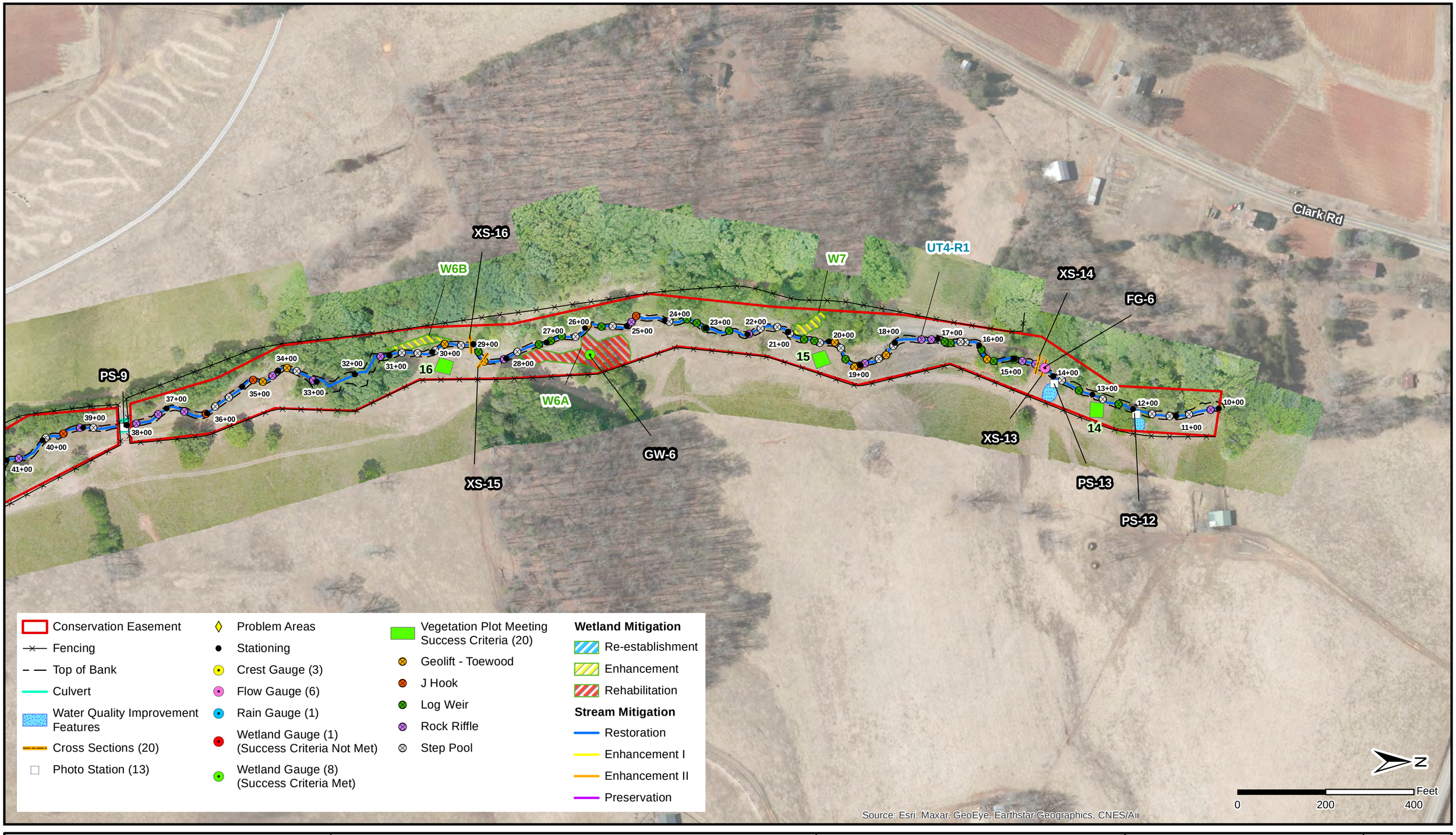
HQP	High Quality Preservation
P	Preservation
E	Wetland Enhancement - Veg and Hydro
EII	Stream Enhancement II
EI	Stream Enhancement I
C	Wetland Creation
RH	Wetland Rehabilitation - Veg and Hydro
REE	Wetland Re-establishment Veg and Hydro
R	Restoration

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 November 2022 MY2	USACE Current Conditions Plan View Monitoring Year 2 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
November 2022
MY2

USACE
Current Conditions Plan View
Monitoring Year 2

NAD 1983 2011 State Plane
North Carolina FIPS 3200 FT US

FIGURE
1b

Conservation Easement
Fencing
Top of Bank
Culvert
Water Quality Improvement Features
Cross Sections (20)
Photo Station (13)
Stationing

Problem Areas
Invasive Areas
Crest Gauge (3)
Flow Gauge (6)
Rain Gauge (1)
Wetland Gauge (1) (Success Criteria Not Met)
Wetland Gauge (8) (Success Criteria Met)
Benthic Sampling Location

Fixed Vegeation Plots (21)
Vegetation Plot Meeting Success Criteria (20)
Vegetation Plot Not Meeting Success Criteria (1)
Random Transect Meeting Success Criteria (2)
Geolift - Toewood
J Hook
Log Weir
Rock Riffle
Step Pool

Wetland Mitigation
Re-establishment
Enhancement
Rehabilitation

Stream Mitigation
Restoration
Enhancement I
Enhancement II
Preservation

UT4-R1
UT4-R2
BB-R3
XS-11
XS-12
XS-17
XS-18
XS-19
XS-20
PS-9
PS-10
CG-3
RG
W3
W4
W4A
GW-7
GW-8
GW-9
17
18
19
20
23
Benthic Sampling Location (MY3 & MY7)
Benthic Sampling Location (MY3 & MY7)
36.52034, -80.20764
SPA-3: Rock roller not functioning as intended
32+00
33+00
34+00
35+00
36+00
37+00
38+00
39+00
40+00
41+00
42+00
43+00
44+00
45+00
46+00
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71+00
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73+00
74+00
75+00
76+00
N
0
200
400
Feet
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Ai

WATER & LAND™ SOLUTIONS

Banner Branch Mitigation Project
Stokes County, North Carolina

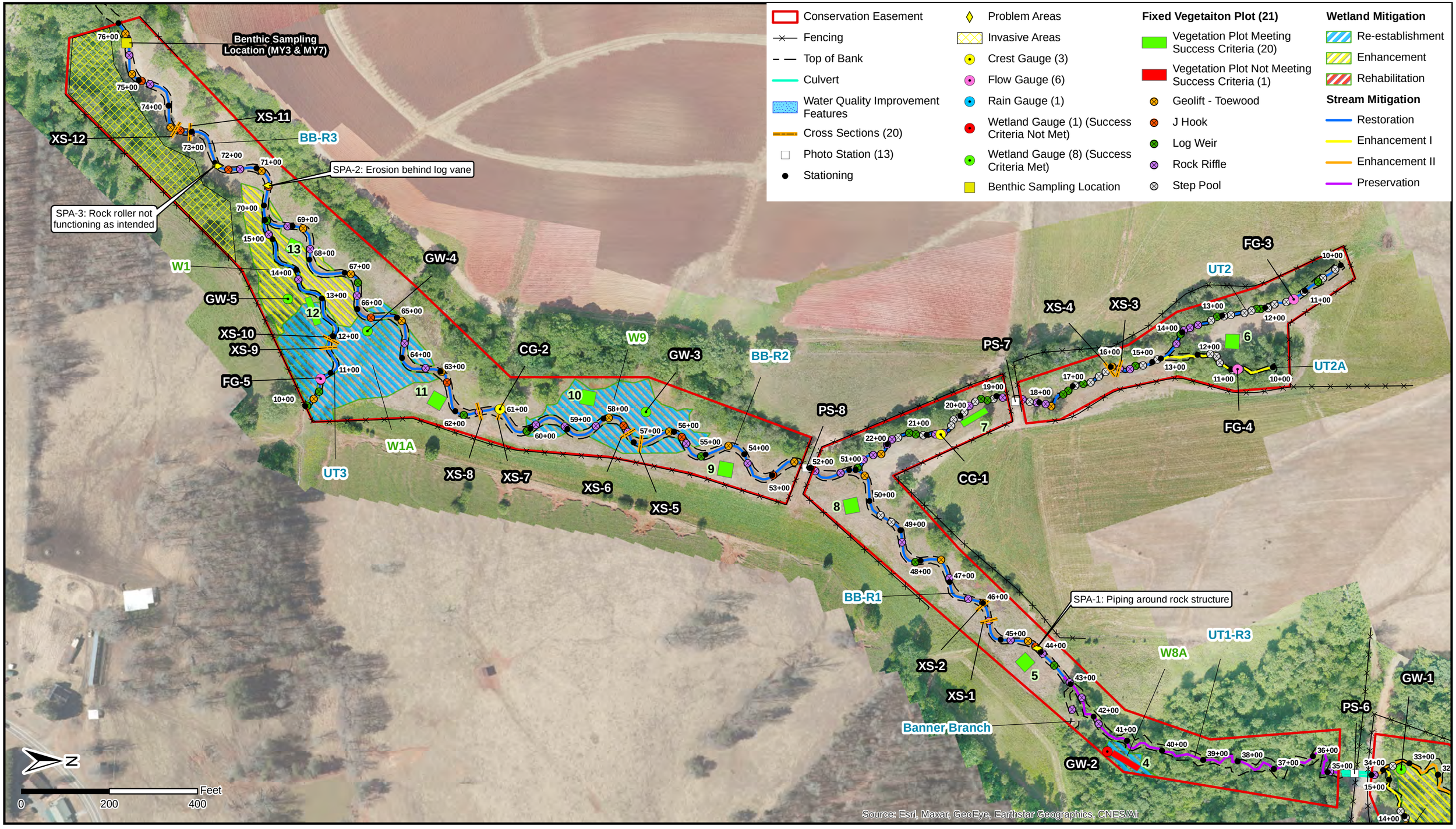
USACE Action ID Number:
SAW-2018-01760
November 2022
MY2

USACE
Current Conditions Plan View
Monitoring Year 2

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 November 2022 MY2	USACE Current Conditions Plan View Monitoring Year 2 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 November 2022 MY2	USACE Current Conditions Plan View Monitoring Year 2 NAD 1983 2011 State Plane North Carolina FIPS 3200 FT US	FIGURE 1e

2 Goals, Performance Criteria, and Functional Improvements

2.1 Project Goals and Objectives

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

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

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

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

Table 2: Summary - Goals, Performance and Results					
Goal	**Objective/Treatment**	**Likely Functional Uplift**	**Performance Criteria**	**Measurement**	**Cumulative Monitoring Results**
Improve Stream Base Flow Duration	Improve and/or remove existing stream crossings and restore a more natural flow regime and aquatic passage.	Create a more natural and higher functioning headwater flow regime and provide aquatic passage; re-establish appropriate wetland hydroperiods and provide hydrologic storage	Maintain seasonal flow on intermittent stream for a minimum of 30 consecutive days during normal annual rainfall	6 Flow Gauges (UT1A, UT1C, UT2, UT2A, UT3, UT4-R1). Devices record 2x/day and inspected quarterly.	5/6 Flow Gauges documented flow for a minimum of 30 consective days.
Reconnect channels with floodplains and riparian wetlands to allow a natural flooding regime.	Design BHRs to not exceed 1.2 and increase ERs no less than 2.2 for Rosgen 'C' and 'E' stream types and 1.4 for 'B' stream types.	Provide temporary water storage and reduce erosive forces (shear stress) in channel during larger flow events.	Minimum of four bankfull events in separate years. Wetland hydrology for 8% of growing season.	3 Crest gauges/pressure transducers (UT2, BB-R2, UT4-R2); Devices record hourly & inspected quarterly. 9 Wetland gauges (W1,W1A, W2, W3, W4, W4A, W6A, W8A, W9); inspected quarterly.	3/3 crest guages recorded out of bank events in MY2. 8/9 wetland gauges met hydrology criteria of 8%.
Improve stabilty of stream channels	Construct stream channels that will maintain stable cross-sections, patterns, and profiles over time.	Reduction in sediment inputs from bank erosion, reduction of shear stress, and improved overall hydraulic function.	Bank height ratios remain below 1.2 over the monitoring period. Visual assessments showing progression towards stability.	20 Cross sections surveys and visual assessment; Cross-sections in Years 1, 2, 3, 5, and 7.	20/20 cross sections BHR<1.2
Establish Riparian Buffer Vegetation	Plant native species vegetation a minimum 30' wide from the top of the streambanks with a composition/density comparable to downstream reference condition.	Increase woody and herbaceous vegetation will provide channel stability and reduce streambank erosion, runoff rates and exotic species vegetation.	Within planted portions of the site, a minimum of 320 stems per acre must be present at year three; a minimum of 260 stems per acre must be present at year five with average height of six feet; and a minimum of 210 stems per acre and average eight foot tree heights must be present at year seven.	CVS Level I & II Protocol Tree for 21 fixed veg plots (Strata Composition, Vigor, and Density), 3 random transects/plots, and visual assessment. Years 1, 2, 3, 5, and 7 for veg plots.	20/21 Fixed Veg Plots met in 2022 and 2/2 Random Veg Plots met in 2022
Improve streambed material and stability	Improve bedform diversity and increase lateral stability.	Reduce embeddedness to allow for interstitial flow habitat.	N/A	N/A	N/A
Improve Benthic Macroinverebrate Communities and Aquatic Habitat	Increase native woody debris and structures in channel.	Increase leaf litter and organic matter critical to provide in-stream cover/shade, wood recruitment, and carbon sourcing.	N/A	Evaluate BMI Communities at two sites (BB-R3 and UT4-R2) in MY3 and MY7	Data in MY3 and MY7

2.2 Project Success Criteria

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

2.2.1 Streams

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

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

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

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

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

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

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

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

2.2.2 Wetlands

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

2.2.3 Vegetation

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

Vegetation success is being monitored at a total of 21 permanent/fixed vegetation plots and 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 are processed using the DMS ShinyApp tool. In the field, the four corners of each fixed plot were permanently marked with PVC at the origin and rebar at the other corners. Tree species and height will be recorded for each planted stem and photos of each plot are to be taken from the origin each monitoring year.

2.2.4 Visual Assessment

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

3 Project Attributes

3.1 Design Approach

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

3.2 Project Attributes

See Table 3 for Project Attributes.

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

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

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

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

4 Monitoring Year 2 Assessment and Results

The dates of Year 2 monitoring activities are detailed in Appendix E. All year 2 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 MY2 was collected in September 2022. 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 MY2 horizontal and vertical stream stability. The visual assessments for each stream reach concluded that the MY2 stream channel pattern and longitudinal profiles, and in-stream structure location/function, still closely match the MY0/baseline conditions (Appendix D). Overall, the MY2 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 MY2, these problem areas were monitored and no new 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 is not functioning as intended but remains stable. WLS will continue to monitor this area closely.
- **SPA-2:** On BB-R3 near station 70+50, erosion is occurring on the right bank upstream of a log vane. The structure is functioning and stable. Livestakes were added to prevent further bank erosion on 11/3/2021. WLS will continue to monitor this area closely.
- **SPA-3:** On BB-R3 near station 72+00, a rock roller is rolling water toward the right bank, and not toward the log vane. The structure is not functioning as intended but remains stable. The right bank is currently stable and not actively eroding. Livestakes were added on 11/3/2021 and WLS will continue to monitor this area closely.

4.1.2 Stream Horizontal Dimension

The MY2 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 showed significant aggradation from MY1 due to active erosion outside of the conservation easement. UT3 will be monitored closely in MY3, and any remedial actions will be documented in future reports. 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. Five of the six flow gauges exhibited surface flow for a minimum of 30 consecutive days throughout the monitoring year (Appendix D). FG-2 on UT1C exhibited a maximum consecutive flow for 11 days in 2022. Prior to restoration, UT1C flowed subsurface and is continuing that pattern after restoration. UT1C will be monitored closely in MY3. 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	264 days 1/1/2022 – 9/21/2022	264 days	0 days	0 days
FG-2	UT1C	11 days 5/24/2022 – 6/3/2022	64 days	200 days	50 days
FG-3	UT2	264 days 1/1/2022 – 9/21/2022	264 days	0 days	0 days
FG-4	UT2A	264 days 1/1/2022 – 9/21/2022	264 days	0 days	0 days
FG-5	UT3	264 days 1/1/2022 – 9/21/2022	264 days	0 days	0 days
FG-6	UT4-R1	264 days 1/1/2022 – 9/21/2022	264 days	0 days	0 days

4.2.2 Bankfull Events

Three crest gauges were installed in April 2021 to document bankfull events. WLS installed a conventional cork crest gauge, along with a pressure transducer to validate flood status on UT2, BB-R2, UT4-R2. During MY2, bankfull events were recorded on all three pressure transducer crest gauges. CG-1 (UT2) recorded five events with a maximum event of 0.354 feet above bankfull. CG-2 (BB-R2) recorded seven events with a maximum event of 0.923 feet above bankfull. CG-3 (UT4-R2) recorded two events with a maximum event of 0.429 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 MY2, eight of the nine wetland groundwater wells are meeting the eight percent wetland hydrology criterion. GW-2 (W8a) had a hydroperiod of four percent which is not meeting the eight percent criteria. GW-2 failed to meet in MY1, but there was a significant

hydroperiod increase from MY1 to MY2. GW-2 will continue to be monitored closely and no remedial action is proposed at this time.

4.4 Vegetation

Monitoring of the 21 permanent vegetation plots and two random transects was completed during September 2022. Vegetation data photos can be found in Appendix B. The MY2 average density is 549 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. 22 of the 23 vegetation plots are also meeting the interim measure requirements and all plots have 162 – 1012 stems per acre including appropriate volunteers. Vegetation plot 4, located in W8a is not meeting success criteria due to an existing mature canopy. Per DMS guidance no single species can account for greater than 50% of stems in a vegetation plot, without this dominance rule there would be 283 stems/acre in plot 4. This area was supplementally planted at construction. A random vegetation plot will be surveyed in W8a during MY3 to document existing and planted vegetation. Volunteer tulip poplar (*Liriodendron tulipifera*), spicebush (*Lindera benzoin*), pawpaw (*Asimina triloba*), hazel alder (*Alnus serrulata*), sycamore (*Platanus occidentalis*), and persimmon (*Diospyros virginiana*) were noted in MY2, 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.

Areas of privet (*Ligustrum sinense*) and tree of heaven (*Ailanthus altissima*) are in scattered areas across the project (~2.99 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
MY2	4/27-4/28/2022	Privet, Tree of Heaven	Rodeo backpack foliar spray and cut-sump
	11/23/2022	Privet	Garlon 3a Cut-sump

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			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	12	13		92%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	8	8		100%

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

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

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

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

Visual Vegetation Assessment				
Planted acreage	**30**			
Vegetation Category	**Definitions**	**Mapping Threshold**	**Combined Acreage**	**% of Planted Acreage**
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10 acres	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10 acres	0.00	0.0%
	Total		0.00	0.0%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10 acres	0.00	0.0%
	Cumulative Total		0.00	0.0%
Easement Acreage	**41**			
Vegetation Category	**Definitions**	**Mapping Threshold**	**Combined Acreage**	**% of Easement Acreage**
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Species included in summation above should be identified in report summary.	0.10 acres	2.99	7.3%
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-02)

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

BB-R1, XS1, Downstream (MY-02)

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

BB-R1, XS1, Left Bank (MY-02)

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

BB-R1, XS1, Right Bank (MY-02)

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

BB-R1, XS2, Upstream (MY-02)

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

BB-R1, XS2, Downstream (MY-02)

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

BB-R1, XS2, Left Bank (MY-02)

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

BB-R1, XS2, Right Bank (MY-02)

UT2, XS3, Upstream (MY-00)

UT2, XS3, Upstream (MY-02)

UT2, XS3, Downstream (MY-00)

UT2, XS3, Downstream (MY-02)

UT2, XS3, Left Bank (MY-00)

UT2, XS3, Left Bank (MY-02)

UT2, XS3, Right Bank (MY-00)

UT2, XS3, Right Bank (MY-02)

UT2, XS4, Upstream (MY-00)

UT2, XS4, Upstream (MY-02)

UT2, XS4, Downstream (MY-00)

UT2, XS4, Downstream (MY-02)

UT2, XS4, Left Bank (MY-00)

UT2, XS4, Left Bank (MY-02)

UT2, XS4, Right Bank (MY-00)

UT2, XS4, Right Bank (MY-02)

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

BB-R2, XS5, Upstream (MY-02)

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

BB-R2, XS5, Downstream (MY-02)

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

BB-R2, XS5, Left Bank (MY-02)

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

BB-R2, XS5, Right Bank (MY-02)

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

BB-R2, XS6, Upstream (MY-02)

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

BB-R2, XS6, Downstream (MY-02)

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

BB-R2, XS6, Left Bank (MY-02)

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

BB-R2, XS6, Right Bank (MY-02)

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

BB-R2, XS7, Upstream (MY-02)

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

BB-R2, XS7, Downstream (MY-02)

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

BB-R2, XS7, Left Bank (MY-02)

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

BB-R2, XS7, Right Bank (MY-02)

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

BB-R2, XS8, Upstream (MY-02)

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

BB-R2, XS8, Downstream (MY-02)

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

BB-R2, XS8, Left Bank (MY-02)

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

BB-R2, XS8, Right Bank (MY-02)

UT3, XS9, Upstream (MY-00)

UT3, XS9, Upstream (MY-02)

UT3, XS9, Downstream (MY-00)

UT3, XS9, Downstream (MY-02)

UT3, XS9, Left Bank (MY-00)

UT3, XS9, Left Bank (MY-02)

UT3, XS9, Right Bank (MY-00)

UT3, XS9, Right Bank (MY-02)

UT3, XS10, Upstream (MY-00)

UT3, XS10, Upstream (MY-02)

UT3, XS10, Downstream (MY-00)

UT3, XS10, Downstream (MY-02)

UT3, XS10, Left Bank (MY-00)

UT3, XS10, Left Bank (MY-02)

UT3, XS10, Right Bank (MY-00)

UT3, XS10, Right Bank (MY-02)

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

BB-R3, XS11, Upstream (MY-02)

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

BB-R3, XS11, Downstream (MY-02)

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

BB-R3, XS11, Left Bank (MY-02)

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

BB-R3, XS11, Right Bank (MY-02)

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

BB-R3, XS12, Upstream (MY-02)

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

BB-R3, XS12, Downstream (MY-02)

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

BB-R3, XS12, Left Bank (MY-02)

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

BB-R3, XS12, Right Bank (MY-02)

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

UT4-R1, XS13, Upstream (MY-02)

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

UT4-R1, XS13, Downstream (MY-02)

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

UT4-R1, XS13, Left Bank (MY-02)

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

UT4-R1, XS13, Right Bank (MY-02)

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

UT4-R1, XS14, Upstream (MY-02)

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

UT4-R1, XS14, Downstream (MY-02)

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

UT4-R1, XS14, Left Bank (MY-02)

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

UT4-R1, XS14, Right Bank (MY-02)

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

UT4-R1, XS15, Upstream (MY-02)

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

UT4-R1, XS15, Downstream (MY-02)

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

UT4-R1, XS15, Left Bank (MY-02)

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

UT4-R1, XS15, Right Bank (MY-02)

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

UT4-R1, XS16, Upstream (MY-02)

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

UT4-R1, XS16, Downstream (MY-02)

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

UT4-R1, XS16, Left Bank (MY-02)

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

UT4-R1, XS16, Right Bank (MY-02)

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

UT4-R1, XS17, Upstream (MY-02)

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

UT4-R1, XS17, Downstream (MY-02)

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

UT4-R1, XS17, Left Bank (MY-02)

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

UT4-R1, XS17, Right Bank (MY-02)

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

UT4-R1, XS18, Upstream (MY-02)

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

UT4-R1, XS18, Downstream (MY-02)

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

UT4-R1, XS18, Left Bank (MY-02)

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

UT4-R1, XS18, Right Bank (MY-02)

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

UT4-R2, XS19, Upstream (MY-02)

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

UT4-R2, XS19, Downstream (MY-02)

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

UT4-R2, XS19, Left Bank (MY-02)

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

UT4-R2, XS19, Right Bank (MY-02)

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

UT4-R2, XS20, Upstream (MY-02)

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

UT4-R2, XS20, Downstream (MY-02)

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

UT4-R2, XS20, Left Bank (MY-02)

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

UT4-R2, XS20, Right Bank (MY-02)

PS-1 – UT1-R1, EII, Upstream (MY-00)

PS-1 – UT1-R1, EII, Upstream (MY-02)

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

PS-1 – UT1-R1, EII, Downstream (MY-02)

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

PS-2 – UT1-R1 Culvert Crossing, Upstream (MY-02)

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

PS-2 – UT1-R1 Culvert Crossing, Downstream (MY-02)

PS-3 – UT1A, EII, Upstream (MY-00)

PS-3 – UT1A, EII, Upstream (MY-02)

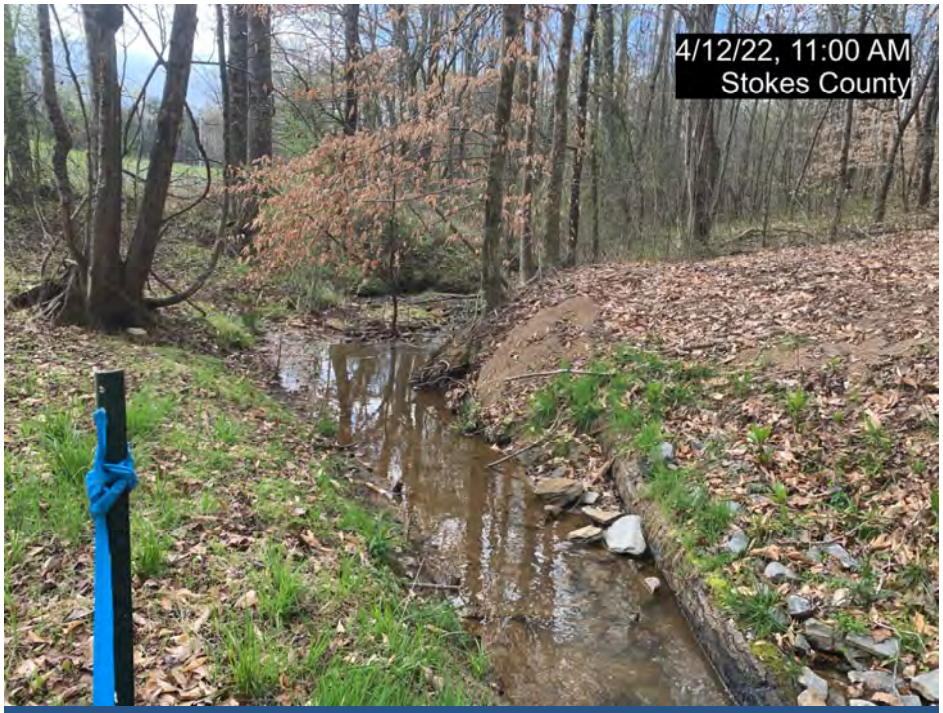
PS-3 – UT1A, EII, Downstream (MY-00)

PS-3 – UT1A, EII, Downstream (MY-02)

PS-4 – UT1-R2, EII, Upstream (MY-00)

PS-4 – UT1-R2, EII, Upstream (MY-02)

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



PS-4 – UT1-R2, EII, Downstream (MY-02)

PS-5 – UT1B, EII, Upstream (MY-00)

PS-5 – UT1B, EII, Upstream (MY-02)

PS-5 – UT1B, EII, Downstream (MY-00)

PS-5 – UT1B, EII, Downstream (MY-02)

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

PS-6 – UT1-R2 Culvert Crossing, Upstream (MY-02)

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

PS-6 – UT1-R2 Culvert Crossing, Downstream (MY-02)

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

PS-7 – UT2 Ford Crossing, Upstream (MY-02)

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

PS-7 – UT2 Ford Crossing, Downstream (MY-02)

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

PS-8 – BB-R2 Ford Crossing, Upstream (MY-02)

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

PS-8 – BB-R2 Ford Crossing, Downstream (MY-02)

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

PS-9 – UT4-R1 Culvert Crossing, Upstream (MY-02)

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

PS-9 – UT4-R1 Culvert Crossing, Downstream (MY-02)

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

PS-10 – UT4-R1 Ford Crossing, Upstream (MY-02)

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

PS-10 – UT4-R1 Ford Crossing, Downstream (MY-02)

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

PS-11 – UT1-R1, BMP @ STA 21+00 (MY-02)

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

PS-12 – UT4-R1, BMP @ STA 12+00 (MY-02)

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

PS-13 – UT4-R1, BMP @ STA 14+00 (MY-02)

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-02)

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-02)

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-02)

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 Plot Counts and Densities Table

Planted Acreage	30
Date of Initial Plant	2021-04-07
Date(s) of Supplemental Plant(s)	N/A
Date(s) Mowing	N/A
Date of Current Survey	2022-09-21
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	
					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	FACW										1								
	Amelanchier arborea	common serviceberry	Tree	FACU															2	2		
	Amelanchier canadensis	Canadian serviceberry	Tree	FAC											1	1						
	Asimina triloba	pawpaw	Tree	FAC						1							1	1				
	Betula nigra	river birch	Tree	FACW					1	1					3	3			1	1	3	3
	Carpinus caroliniana	American hornbeam	Tree	FAC			1	1					1	1							1	1
	Corylus americana	American hazelnut	Shrub	FACU			1	1					3	3			1	1				
	Diospyros virginiana	common persimmon	Tree	FAC							1	1						2				
	Fraxinus pennsylvanica	green ash	Tree	FACW	6	6							1	1					3	3	2	2
	Hamamelis virginiana	American witchhazel	Tree	FACU			2	2							1	1	1	1				
	Lindera benzoin	northern spicebush	Tree	FACW		11	1	1							3	3						
	Liriodendron tulipifera	tuliptree	Tree	FACU		4																
	Nyssa sylvatica	blackgum	Tree	FAC			1	1					2	2					1	1		
	Platanus occidentalis	American sycamore	Tree	FACW	4	4			5	5			2	2	1	2	4	4			2	2
	Quercus alba	white oak	Tree	FACU			1	1					1	1	4	4	2	2				
	Quercus falcata	southern red oak	Tree	FACU											1	1					1	1
	Quercus michauxii	swamp chestnut oak	Tree	FACW			1	1	1	1			3	3	1	1	1	1	1	1	1	1
	Quercus phellos	willow oak	Tree	FACW			3	3	2	2	6	6	1	1	1	1						
	Tilia americana	American basswood	Tree	FACU											1	1						
Sum	Performance Standard				10	25	11	11	9	10	7	7	14	15	17	18	10	12	8	8	10	10
Post Mitigation Plan Species	Magnolia tripetala	umbrella-tree	Tree	FACU															1	1	2	2
	Salix nigra	*black willow*	*Tree*	*OBL*																		*3*
Sum	Proposed Standard				10	25	11	11	9	10	7	7	14	15	17	18	10	12	9	9	12	12
Mitigation Plan Performance Standard	Current Year Stem Count					25		11		10		7		15		18		12		8		10
	Stems/Acre					1012		445		405		162		607		729		486		324		405
	Species Count					4		8		5		2		9		10		7		5		6
	Dominant Species Composition (%)					44		27		50		86		20		22		33		33		20
	Average Plot Height (ft.)					4		2		2		1		2		2		2		2		3
	% Invasives					0		0		0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					25		11		10		7		15		18		12		9		12
	Stems/Acre					1012		445		405		162		607		729		486		364		486
	Species Count					4		8		5		2		9		10		7		6		7
	Dominant Species Composition (%)					44		27		50		86		20		22		33		33		20
	Average Plot Height (ft.)					4		2		2		1		2		2		2		2		2
	% Invasives					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.

*** Veg Plot 4 stems/acre is only including 4 stems per DMS guidance. There are 6 stems of willow oak and a single species can only account for up to 50% of the veg plot. Without the 50% dominance the veg plot would have 283 stems/acre.**

Vegetation Plot Counts and Densities Table

Planted Acreage	30
Date of Initial Plant	2021-04-07
Date(s) of Supplemental Plant(s)	N/A
Date(s) Mowing	N/A
Date of Current Survey	2022-09-21
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 10 F		Veg Plot 11 F		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	Planted	Total	Planted	Total	Total	Total
Species Included in Approved Mitigation Plan	Alnus serrulata	hazel alder	Tree	FACW					1	1							1	1	1	1	1	1			1	1				
	Amelanchier arborea	common serviceberry	Tree	FACU	1	1					3	3							1	1					1	1	1	1		
	Amelanchier canadensis	Canadian serviceberry	Tree	FAC																									1	1
	Asimina triloba	pawpaw	Tree	FAC	1	1					1	1			3	3			3	3					1	1			1	
	Betula nigra	river birch	Tree	FACW	4	4	2	2							4	4			1	1			1	1						
	Carpinus caroliniana	American hornbeam	Tree	FAC			1	1																						
	Corylus americana	American hazelnut	Shrub	FACU			1	1	2	2	1	1							1	1			1	1						
	Diospyros virginiana	common persimmon	Tree	FAC	1	1	1	1					1	4	1	1	1	1					2	2					1	
	Fraxinus pennsylvanica	green ash	Tree	FACW			1	1	3	3	3	3					2	2	1	1			2	2	1	1	2	2	1	
	Hamamelis virginiana	American witchhazel	Tree	FACU					1	1			3	3	1	1	1	1					1	1					2	1
	Lindera benzoin	northern spicebush	Tree	FACW													2	2	1	1			1	1	1	1	2	2	1	
	Liriodendron tulipifera	tuliptree	Tree	FACU	1	1													1	1					1	1				1
	Nyssa sylvatica	blackgum	Tree	FAC	2	2	1	1			1	1	2	2			2	2			2	2			1	1	1	1		2
	Platanus occidentalis	American sycamore	Tree	FACW	1	1	2	2	2	2	1	1			2	2	1	1	1	1			2	2	4	4	4	4	4	7
	Quercus alba	white oak	Tree	FACU	2	2	1	1	1	1	1	1	2	2	1	1			2	2					1	1			2	1
	Quercus falcata	southern red oak	Tree	FACU					1	1	2	2	4	4			1	1	2	2					1	1	4	4		
	Quercus michauxii	swamp chestnut oak	Tree	FACW							1	1			1	1	1	1	1	1										
	Quercus phellos	willow oak	Tree	FACW	3	3	2	2	1	1	1	1			2	2	1	1	2	2	3	3	3	3	1	1				
	Tilia americana	American basswood	Tree	FACU					1	1	1	1	1	1			3	3	1	1	2	2			1	1	1	1		
Sum	Performance Standard				16	16	12	12	13	13	16	16	13	16	15	15	16	16	19	19	8	8	13	13	15	15	15	15	13	13
Post Mitigation Plan Species	Magnolia tripetala	umbrella-tree	Tree	FACU							1	1	1	1			1	1									1	1		
	Salix nigra	*black willow*	*Tree*	*OBL*						*8*		*9*																		
Sum	Proposed Standard				16	16	12	12	13	13	17	17	14	17	15	15	17	17	19	19	8	8	13	13	15	15	16	16	13	13
Mitigation Plan Performance Standard	Current Year Stem Count					16		12		13		16		16		15		16		19		8		13		15		15	13	13
	Stems/Acre					648		486		526		648		648		607		648		769		324		526		607		607	526	486
	Species Count					9		9		9		11		6		8		11		14		4		8		12		7	8	6
	Dominant Species Composition (%)					25		17		38		35		24		27		18		16		38		23		27		25	31	54
	Average Plot Height (ft.)					2		2		2		2		2		3		2		2		2		3		3		2	2	3
	% Invasives					0		0		0		0		0		0		0		0		0		0		0		0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count					16		12		13		17		17		15		17		19		8		13		15		16	13	13
	Stems/Acre					648		486		526		688		688		607		688		769		324		526		607		648	526	486
	Species Count					9		9		9		12		7		8		12		14		4		8		12		8	8	6
	Dominant Species Composition (%)					25		17		38		35		24		27		18		16		38		23		27		25	31	54
	Average Plot Height (ft.)					2		2		2		2		2		3		2		2		2		3		3		2	2	3
	% Invasives					0		0		0		0		0		0		0		0		0		0		0		0	0	0

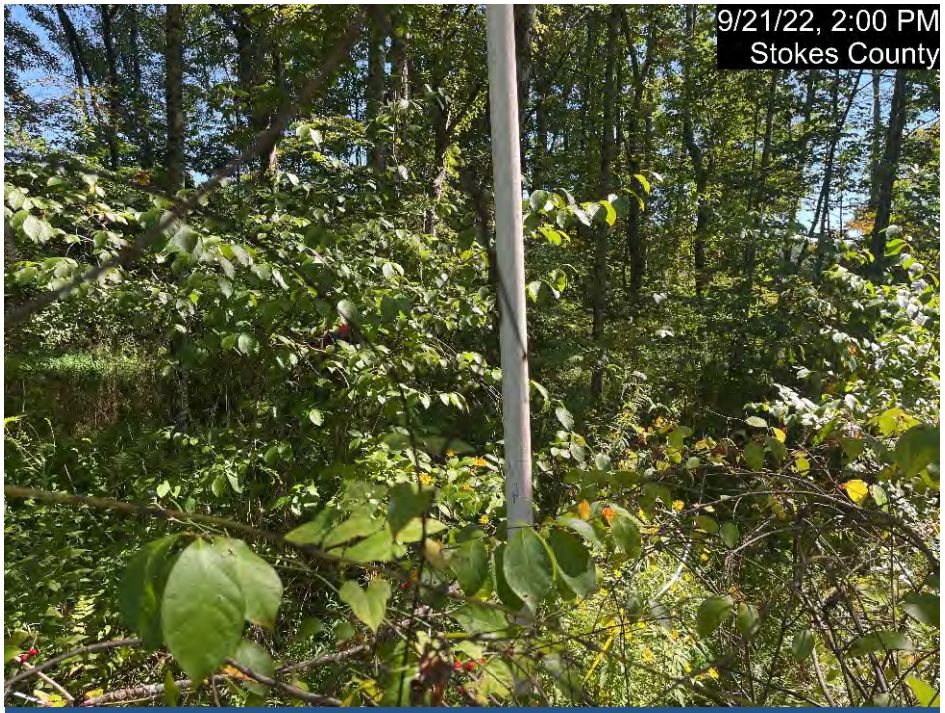
1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved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

Vegetation Performance Standards Summary Table												
	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	1012	4	4	0	445	2	8	0	405	2	5	0
Monitoring Year 1	648	1	5	0	648	1	12	0	607	1	5	0
Monitoring Year 0	769	2	6	0	810	2	13	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												
Monitoring Year 2	162	1	2	0	607	2	9	0	729	2	10	0
Monitoring Year 1	486	1	4	0	850	2	10	0	891	2	13	0
Monitoring Year 0	729	1	5	0	850	2	10	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												
Monitoring Year 2	486	2	7	0	324	2	5	0	405	3	6	0
Monitoring Year 1	486	2	7	0	607	2	9	0	445	2	6	0
Monitoring Year 0	810	2	9	0	607	2	9	0	567	2	9	0
	Veg Plot 10 F				Veg Plot 11 F				Veg Plot 12 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	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												
Monitoring Year 2	648	2	11	0	648	2	6	0	607	3	8	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	10	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												
Monitoring Year 2	648	2	11	0	769	2	14	0	324	2	4	0
Monitoring Year 1	810	2	14	0	931	2	14	0	729	2	9	0
Monitoring Year 0	1052	2	14	0	1093	2	15	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												
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	14	0				
	Veg Plot Group 22 R				Veg Plot Group 23 R				Veg Plot Group 24 R			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	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.

**Veg Plot 4 stems/acre is only including 4 stems per DMS guidance. There are 6 stems of willow oak and a single species can only account for up to 50% of the veg plot. Without the 50% dominance the veg plot would have 283 stems/acre.

Fixed Veg Plot 1 (MY-00)



Fixed Veg Plot 1 (MY-02)

Fixed Veg Plot 2 (MY-00)

Fixed Veg Plot 2 (MY-02)

Fixed Veg Plot 3 (MY-00)

Fixed Veg Plot 3 (MY-02)

Fixed Veg Plot 4 (MY-00)

Fixed Veg Plot 4 (MY-02)

Fixed Veg Plot 5 (MY-00)

Fixed Veg Plot 5 (MY-02)

Fixed Veg Plot 6 (MY-00)

Fixed Veg Plot 6 (MY-02)

Fixed Veg Plot 7 (MY-00)

Fixed Veg Plot 7 (MY-02)

Fixed Veg Plot 8 (MY-00)

Fixed Veg Plot 8 (MY-02)

Fixed Veg Plot 9 (MY-00)

Fixed Veg Plot 9 (MY-02)

Fixed Veg Plot 10 (MY-00)

Fixed Veg Plot 10 (MY-02)

Fixed Veg Plot 11 (MY-00)

Fixed Veg Plot 11 (MY-02)

Fixed Veg Plot 12 (MY-00)

Fixed Veg Plot 12 (MY-02)

Fixed Veg Plot 13 (MY-00)

Fixed Veg Plot 13 (MY-02)

Fixed Veg Plot 14 (MY-00)

Fixed Veg Plot 14 (MY-02)

Fixed Veg Plot 15 (MY-00)

Fixed Veg Plot 15 (MY-02)

Fixed Veg Plot 16 (MY-00)

Fixed Veg Plot 16 (MY-02)

Fixed Veg Plot 17 (MY-00)

Fixed Veg Plot 17 (MY-02)

Fixed Veg Plot 18 (MY-00)

Fixed Veg Plot 18 (MY-02)

Fixed Veg Plot 19 (MY-00)

Fixed Veg Plot 19 (MY-02)

Fixed Veg Plot 20 (MY-00)

Fixed Veg Plot 20 (MY-02)

Fixed Veg Plot 21 (New Plot MY-01)

Fixed Veg Plot 21 (MY-02)

Random Veg Plot 22 (View South) (MY-02)

Random Veg Plot 22 (View North) (MY-02)

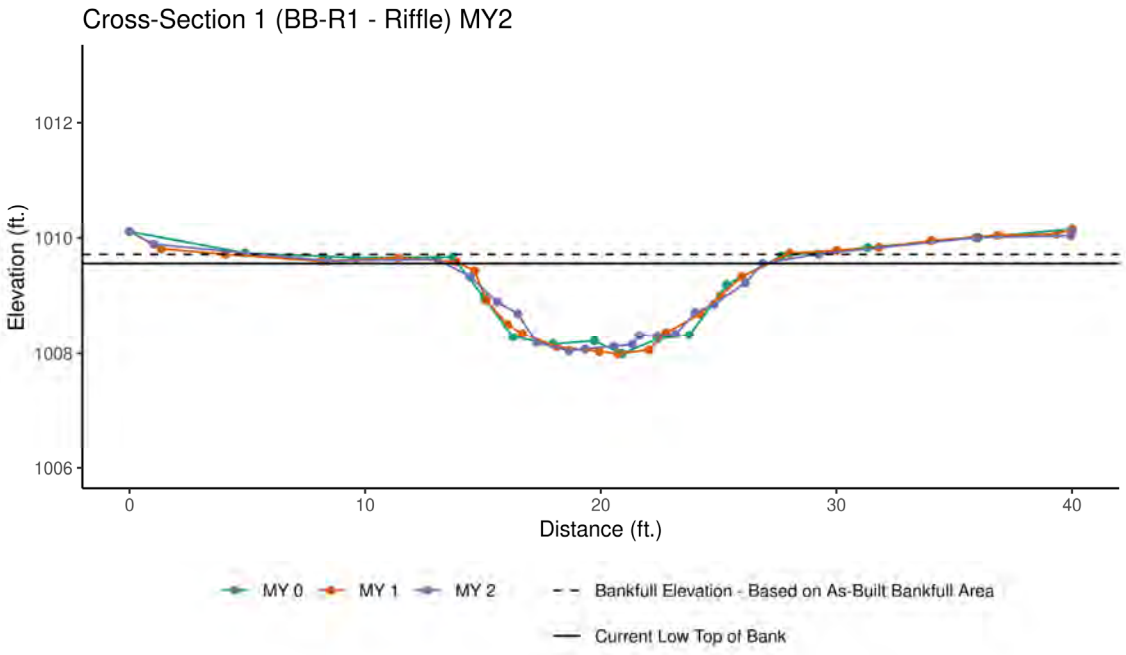
Random Veg Plot 23 (View North) (MY-02)

Random Veg Plot 23 (View South) (MY-02)

Appendix C:

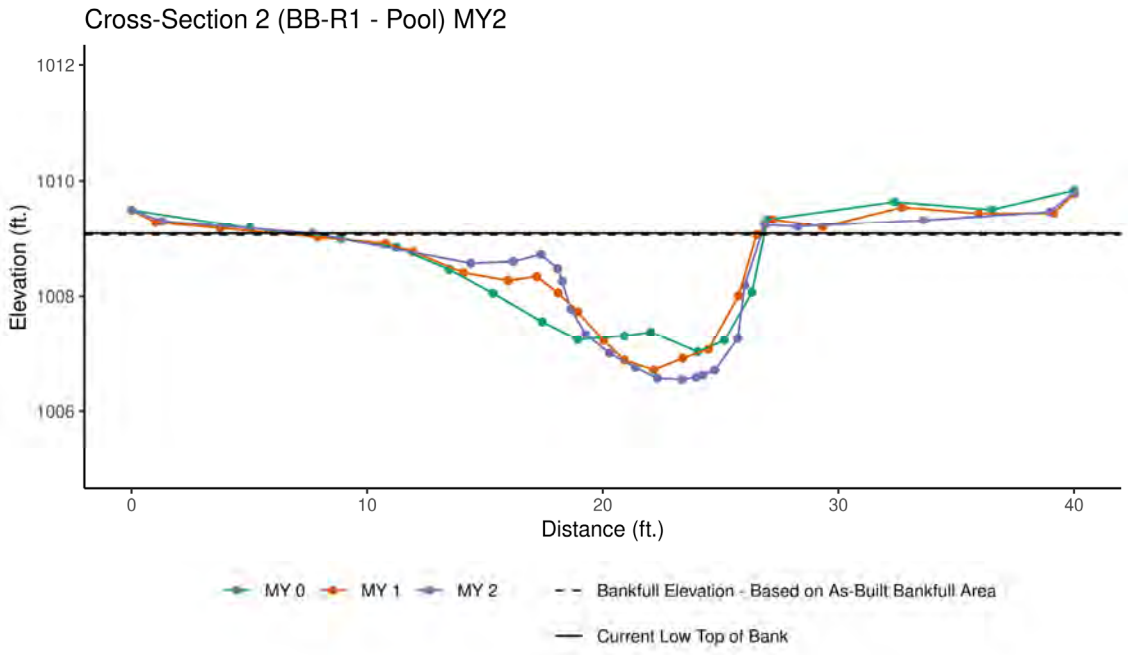
Stream Geomorphology Data

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



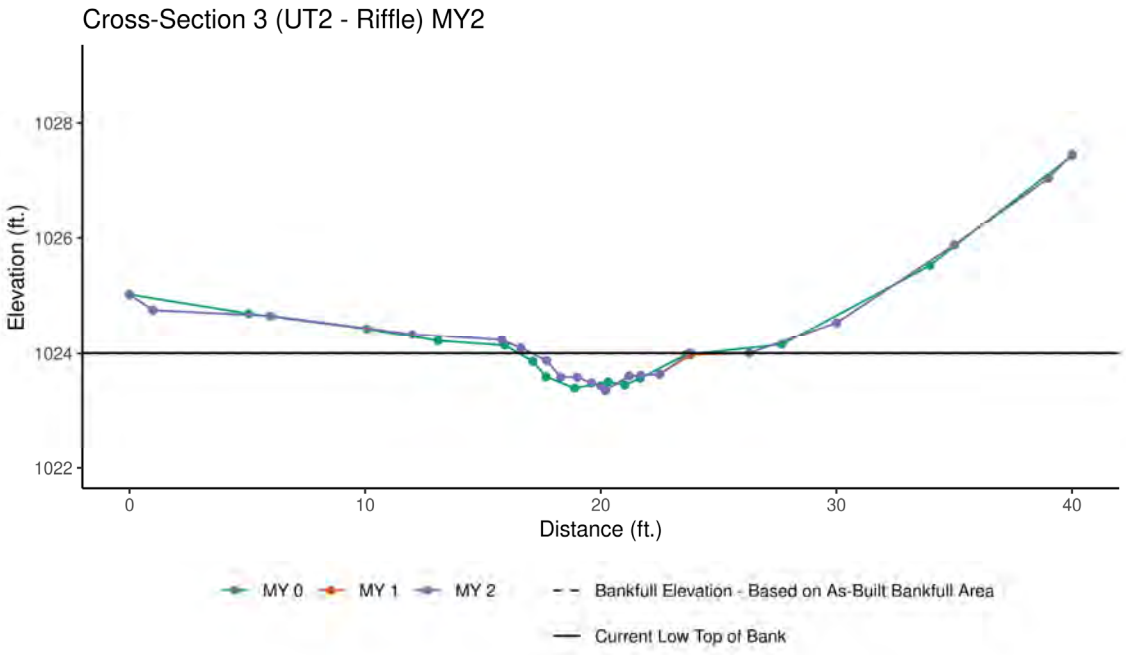
Distance	Elevation	Features
0	1010.108	TLP
1.02379344	1009.891	
8.43618504	1009.604	
13.0823992	1009.629	TLB
14.4531943	1009.333	
15.615932	1008.899	
16.4765376	1008.697	
17.2875462	1008.195	
18.6497917	1008.048	THW
19.336906	1008.077	
20.558412	1008.125	
21.3424186	1008.16	
21.6438126	1008.318	
22.4066847	1008.307	
23.1732273	1008.342	
24.0141659	1008.714	
24.7921051	1008.858	
26.1342894	1009.226	
26.8688516	1009.56	TRB, BKF
29.2408263	1009.722	
35.9166289	1010.004	
39.9538811	1010.038	
40	1010.116	TRP

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



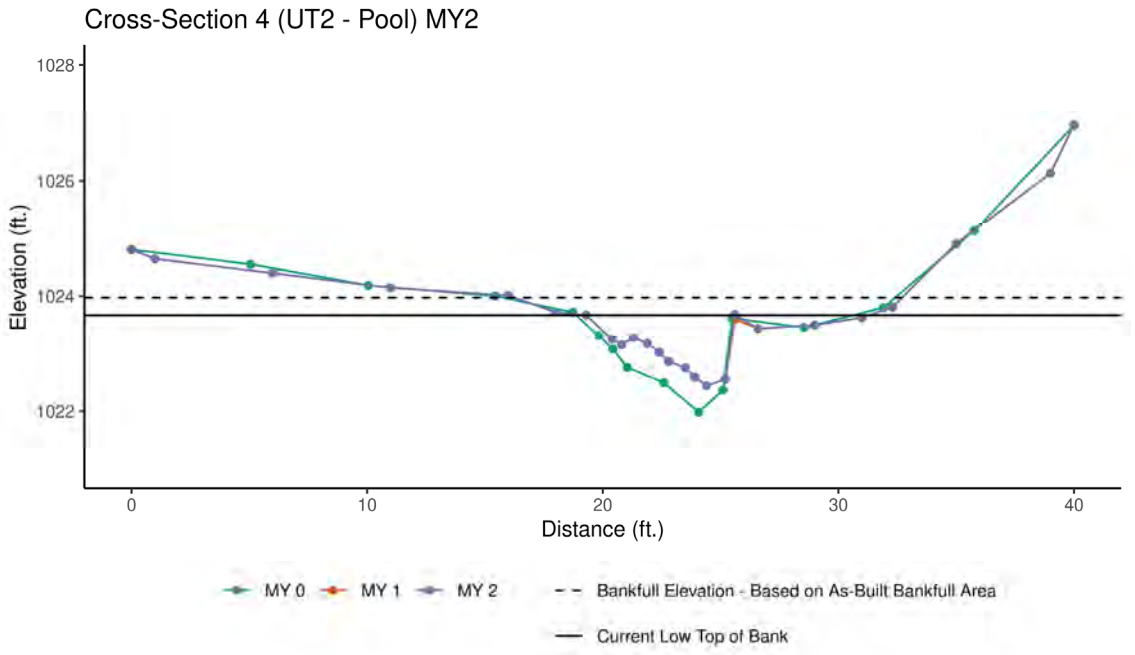
Distance	Elevation	Features
0	1009.489	TLP
1.28438507	1009.297	
7.70026655	1009.082	TLB, BKF
14.4020709	1008.565	
16.2054113	1008.595	
17.366032	1008.716	
18.0838988	1008.474	
18.2762859	1008.256	
18.6416371	1007.774	
19.2780147	1007.34	
20.2848228	1007.006	
21.3909517	1006.758	
22.3193044	1006.569	
23.3748174	1006.548	THW
23.9703943	1006.587	
24.2428786	1006.628	
24.7569829	1006.708	
25.72895	1007.266	
26.0235806	1008.191	
26.871212	1009.229	TRB
28.2700703	1009.203	
33.6096654	1009.311	
38.9585636	1009.459	
40	1009.798	TRP

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



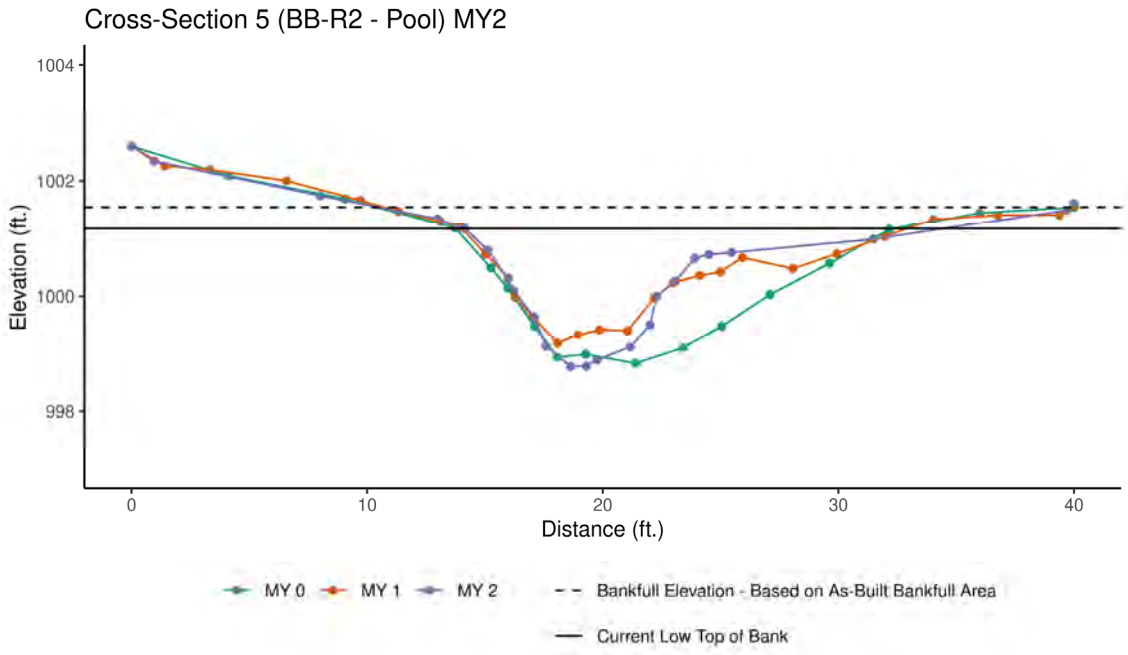
Distance	Elevation	Features
0	1025.028	TLP
1	1024.758	
6	1024.658	
12	1024.338	
15.8	1024.238	TLB
16.6	1024.098	
17.7	1023.878	
18.3	1023.588	LEW
19	1023.588	
19.6	1023.488	
20	1023.438	
20.2	1023.358	THW
21.2	1023.608	
21.7	1023.618	REW
22.5	1023.638	
23.8	1024.008	TRB, BKF
26.3	1024.008	
30	1024.538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

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



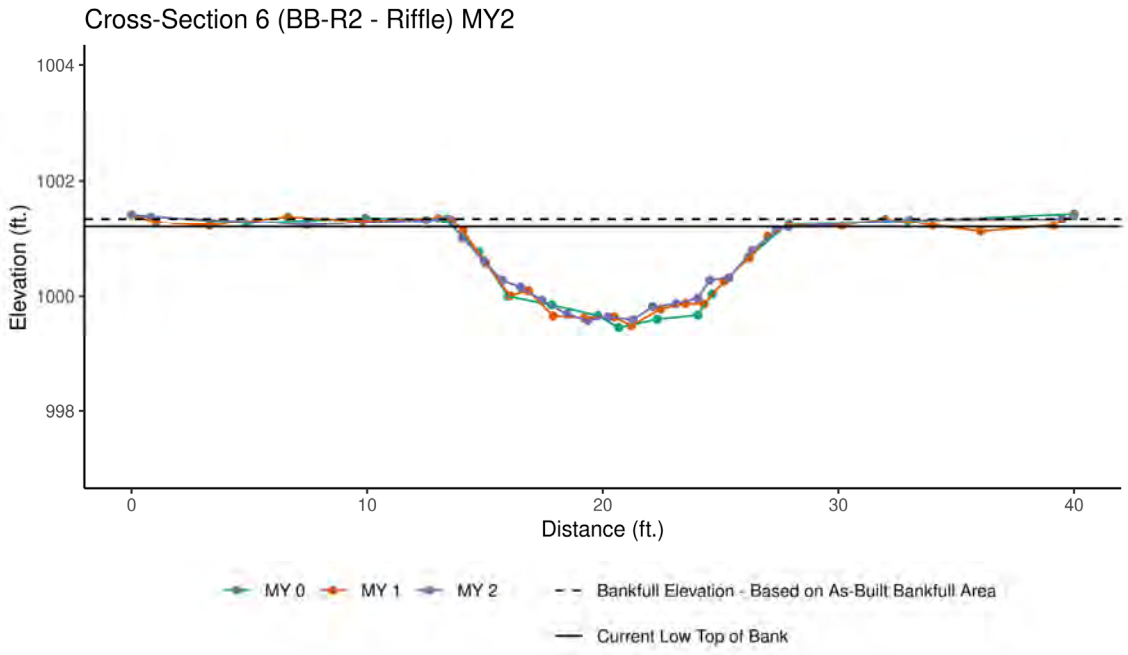
Distance	Elevation	Features
0	1024.802	TLP
1	1024.642	
6	1024.392	
11	1024.142	
16	1024.012	
18	1023.722	
19.3	1023.672	TLB, BKF
20.4	1023.252	
20.8	1023.152	
21.3	1023.282	
21.9	1023.172	
22.4	1023.022	LEW
22.8	1022.862	
23.5	1022.752	
23.9	1022.592	
24.4	1022.442	THW
25.2	1022.552	REW
25.6	1023.682	TRB
26.6	1023.442	
29	1023.502	
31	1023.632	
32.3	1023.812	
35	1024.902	
39	1026.132	
40	1026.972	TLP

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



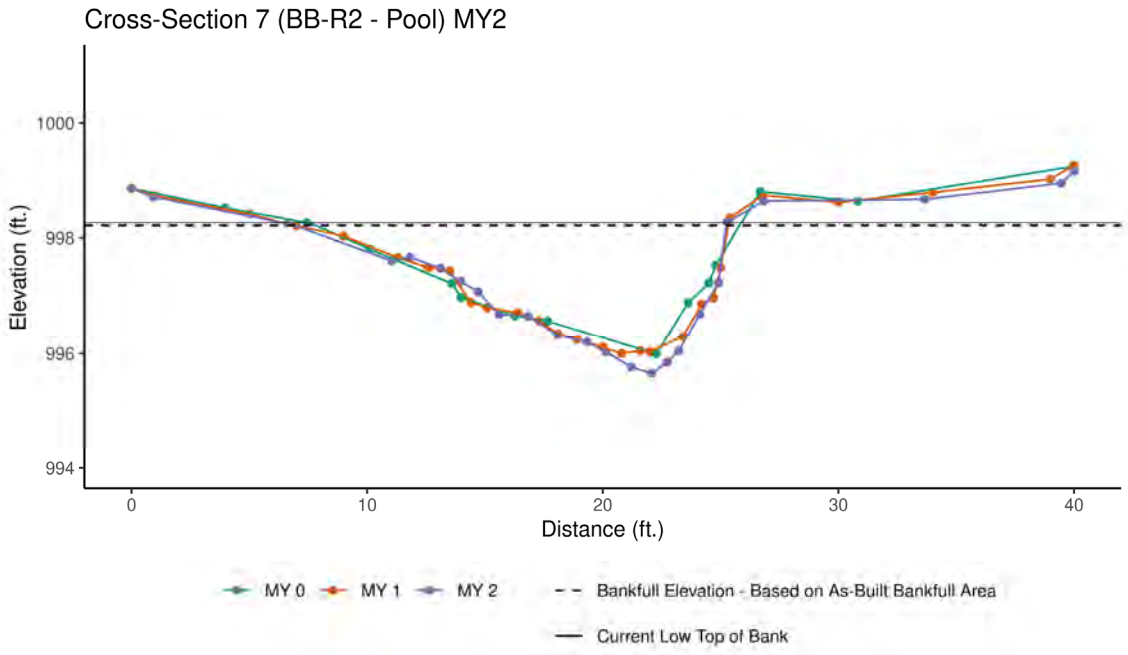
Distance	Elevation	Features
0	1002.598	TLP
0.96786879	1002.342	
8.0062781	1001.741	
12.9828221	1001.337	
14.1476557	1001.165	TLB, BKF
15.1118362	1000.795	
15.9828599	1000.296	
16.2060189	1000.099	
17.1033151	999.63	
17.589632	999.131	
18.6374374	998.777	THW
19.3070164	998.781	
19.7609624	998.891	
21.1646468	999.115	
22.0088828	999.505	
22.2814047	999.993	
23.0853451	1000.261	
23.9054801	1000.653	
24.5047201	1000.717	
25.4613538	1000.75	
31.4849517	1000.982	
39.6777015	1001.488	TRB
40	1001.607	TRP

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



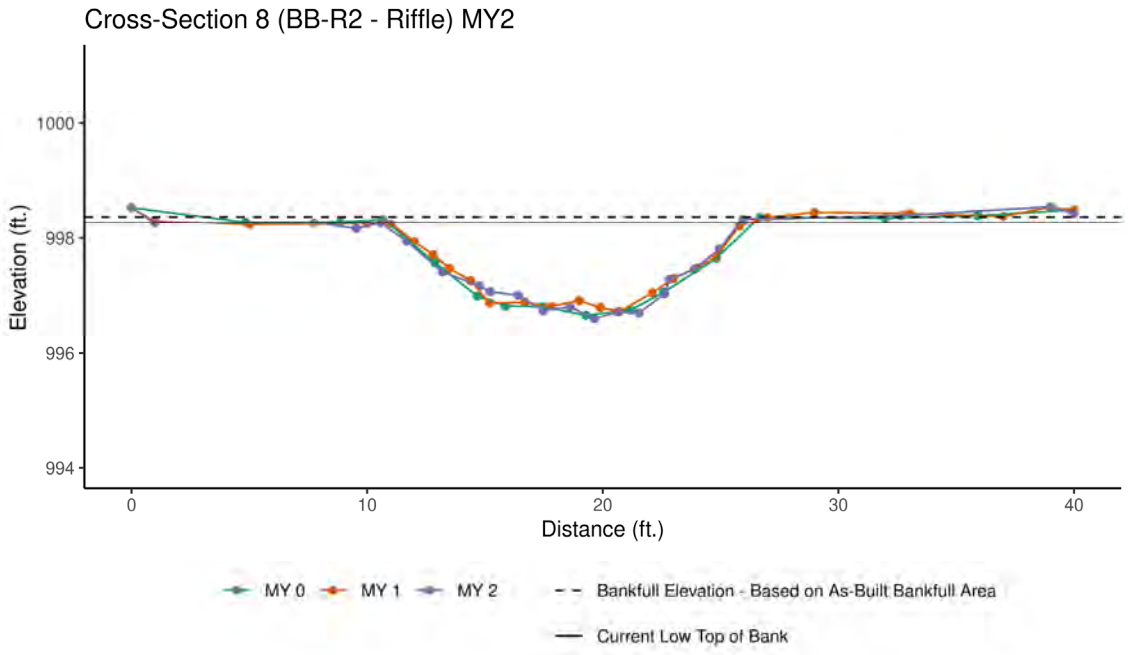
Distance	Elevation	Features
0	1001.408	TLP
0.82469449	1001.373	
7.4441336	1001.233	
12.5195334	1001.308	
13.4384871	1001.339	TLB
14.0471914	1001.001	
14.9612322	1000.604	
15.7332062	1000.272	
16.5046704	1000.157	
17.422678	999.928	
18.4806539	999.691	
19.3670659	999.585	THW
20.2099683	999.644	
21.2893195	999.597	
22.1104689	999.819	
23.1172284	999.871	
24.0391242	999.966	
24.5379364	1000.276	
25.3564908	1000.315	
26.3404435	1000.783	
27.3740658	1001.142	
27.8817084	1001.197	TRB, BKF
33.0213292	1001.318	
39.4838914	1001.331	
40	1001.391	TRP

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



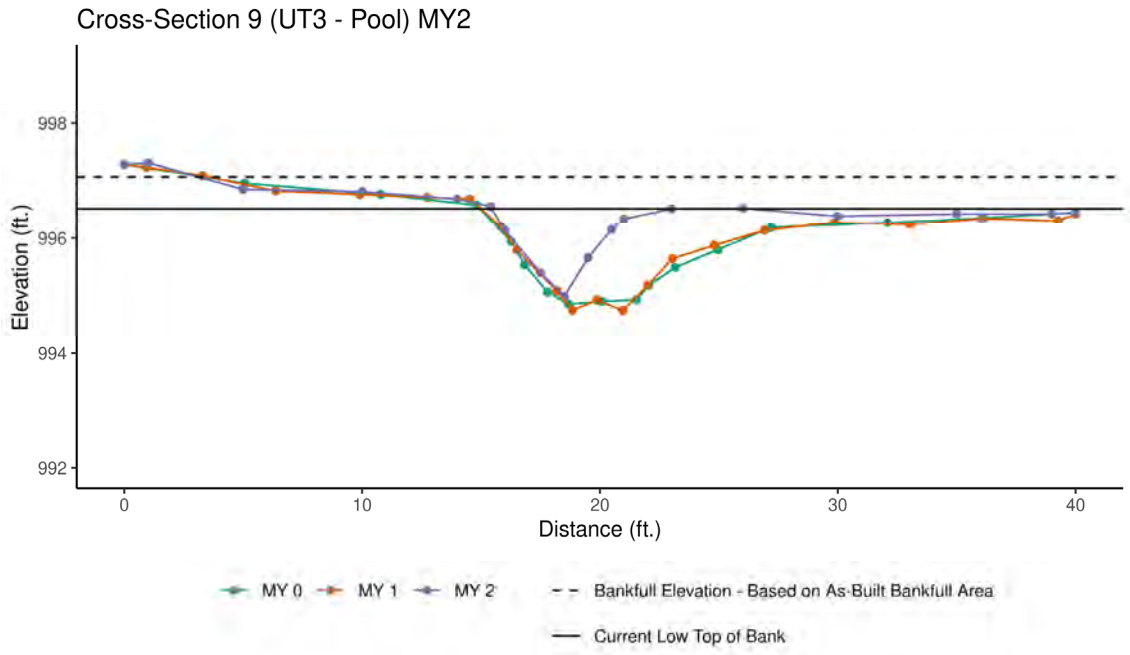
Distance	Elevation	Features
0	998.871	TLP
0.90737534	998.725	
6.59707337	998.262	TLB
11.0402361	997.605	
11.8118308	997.668	
13.1079668	997.482	
13.9657511	997.251	
14.7144821	997.072	
15.5947572	996.681	
16.8315364	996.657	
18.0643406	996.324	
19.3327728	996.2	
20.1439718	996.03	THW
21.2064445	995.765	
22.086563	995.653	
22.7249075	995.847	
23.2231131	996.046	
24.1119503	996.684	
24.9090326	997.229	
25.2620281	998.28	TRB, BKF
26.8322155	998.652	
33.6639438	998.682	
39.4467844	998.96	
40	999.166	TRP

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



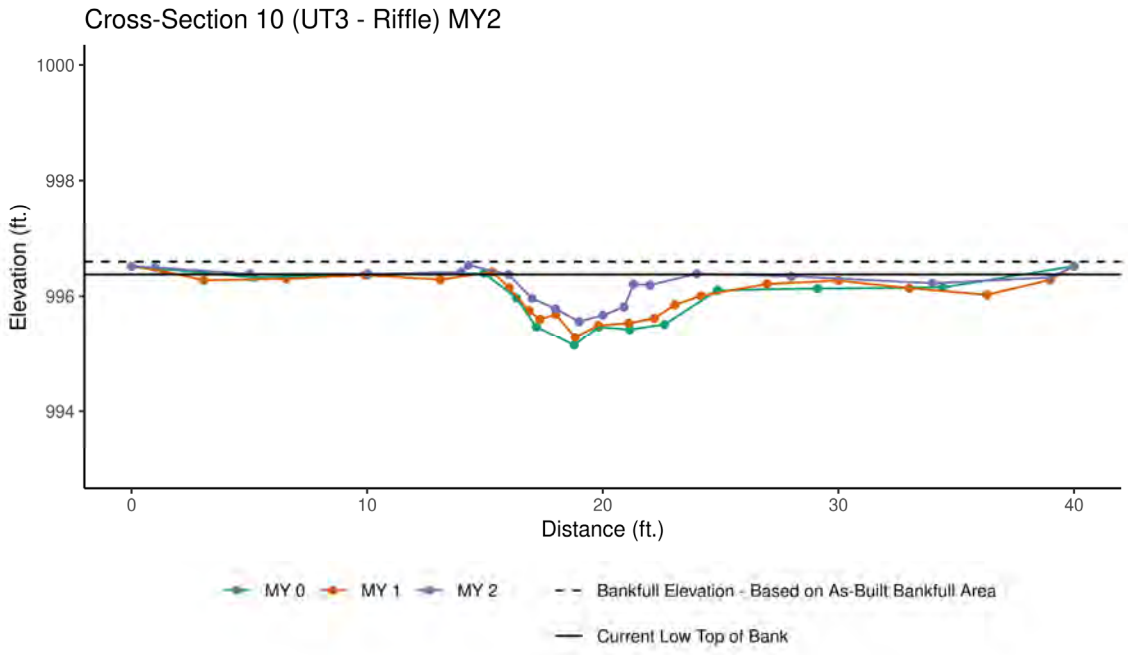
Distance	Elevation	Features
0	998.535	TLP
0.99115942	998.264	
7.74420519	998.267	
9.53186876	998.162	
10.577278	998.263	TLB, BKF
11.674944	997.946	
13.1900695	997.416	
14.7580427	997.179	
15.2143349	997.076	
16.41377	997.015	
17.4742695	996.751	
18.6159962	996.814	
19.6568256	996.616	THW
20.6217761	996.728	
21.5338741	996.71	
22.6221884	997.041	
22.8264392	997.29	
23.8956368	997.464	
24.9394162	997.808	
25.953637	998.33	TRB
32.660767	998.399	
39.0108473	998.552	
40	998.433	TRP

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



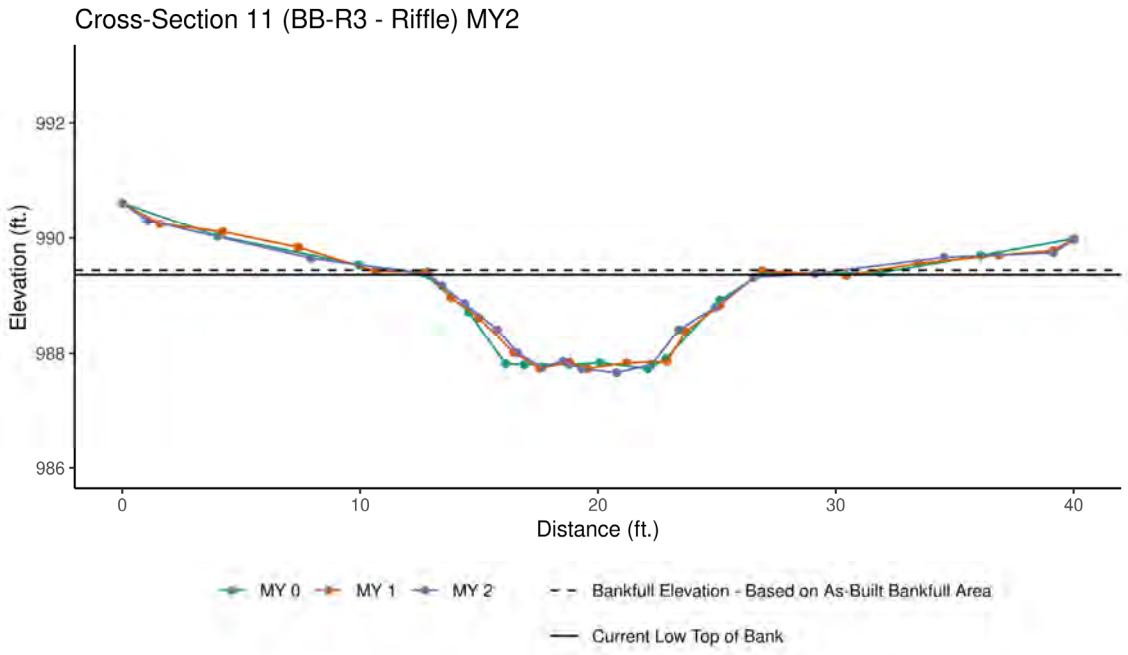
Distance	Elevation	Features
0	997.283	TLP
1	997.313	
5	996.853	
10	996.813	
14	996.683	
15.4	996.553	TLB
16	996.133	
17.5	995.403	
18.5	994.993	THW
19.5	995.663	
20.5	996.153	
21	996.333	
23	996.513	TRB, BKF
26	996.523	
30	996.383	
35	996.423	
39	996.423	
40	996.443	TRP

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



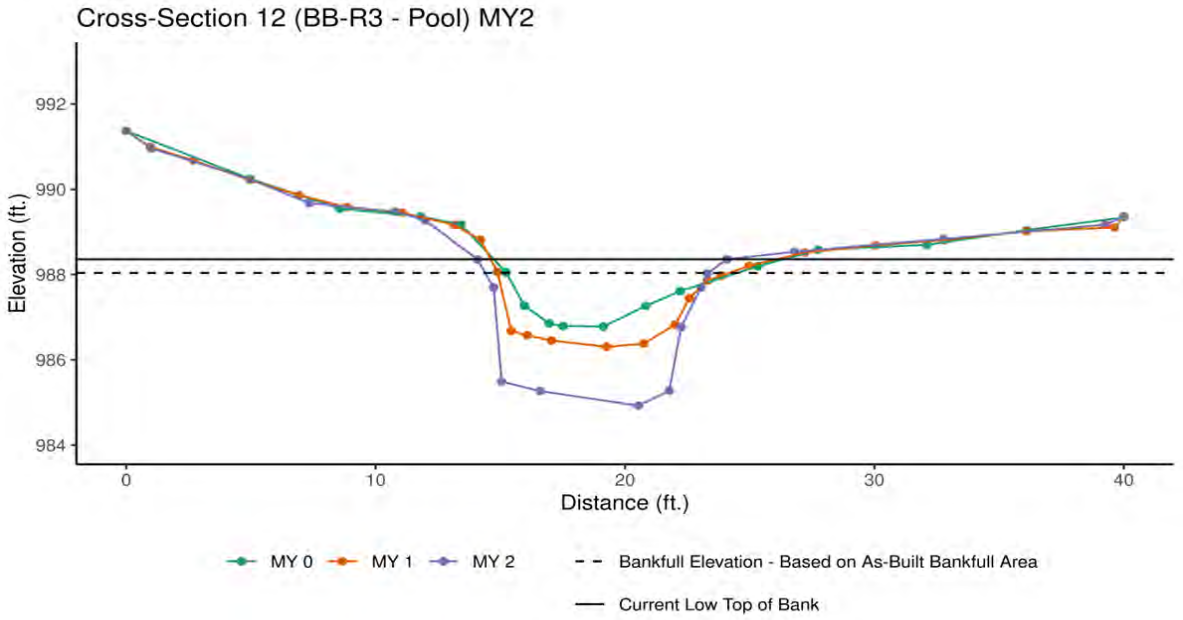
Distance	Elevation	Features
0	996.512	TLP
1	996.492	
5	996.382	
10	996.382	
14	996.412	
14.3	996.532	
16	996.372	TLB
17	995.962	
18	995.782	
19	995.562	THW
20	995.672	
20.9	995.812	
21.3	996.202	
22	996.192	
24	996.382	TRB, BKF
28	996.342	
34	996.222	
39	996.322	
40	996.512	TRP

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



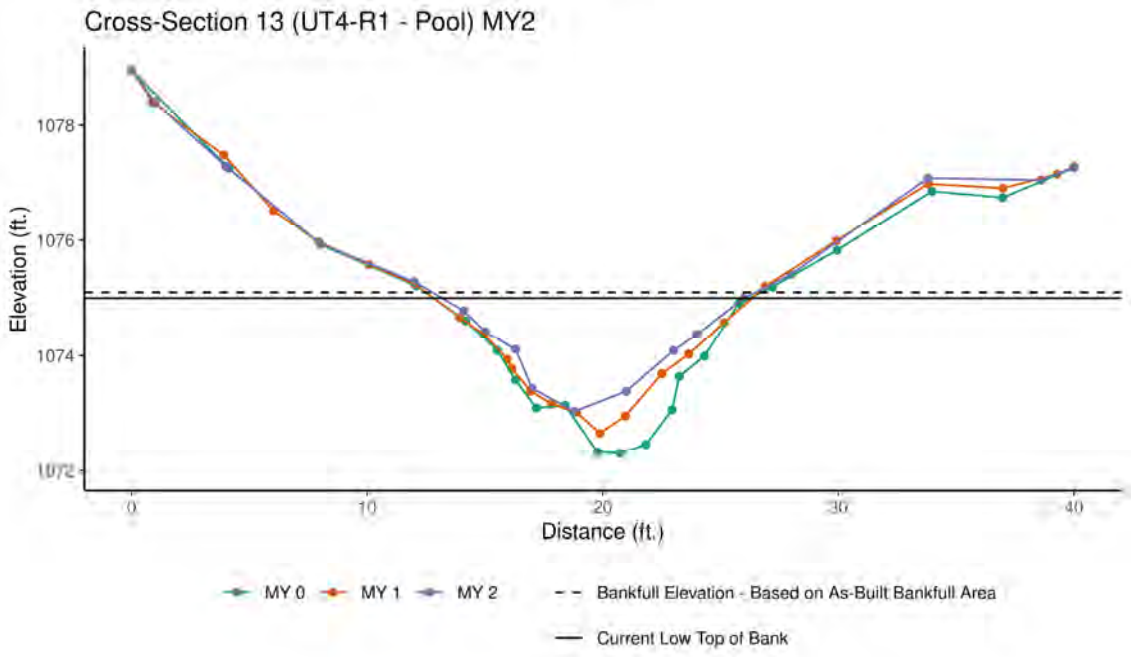
Distance	Elevation	Features
0	990.615	TLP
1.06871184	990.304	
7.92732288	989.652	
12.8772843	989.368	TLB
13.4470767	989.179	
14.3960684	988.871	
15.7770366	988.418	
16.6175689	988.013	
17.6485744	987.759	
18.5280437	987.862	
19.321477	987.736	
20.7827702	987.666	THW
22.2694788	987.811	
23.4135363	988.42	
24.93755	988.807	
26.5487603	989.322	
29.1306006	989.387	TRB, BKF
34.5551979	989.665	
39.1490753	989.743	
40	989.967	TRP

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



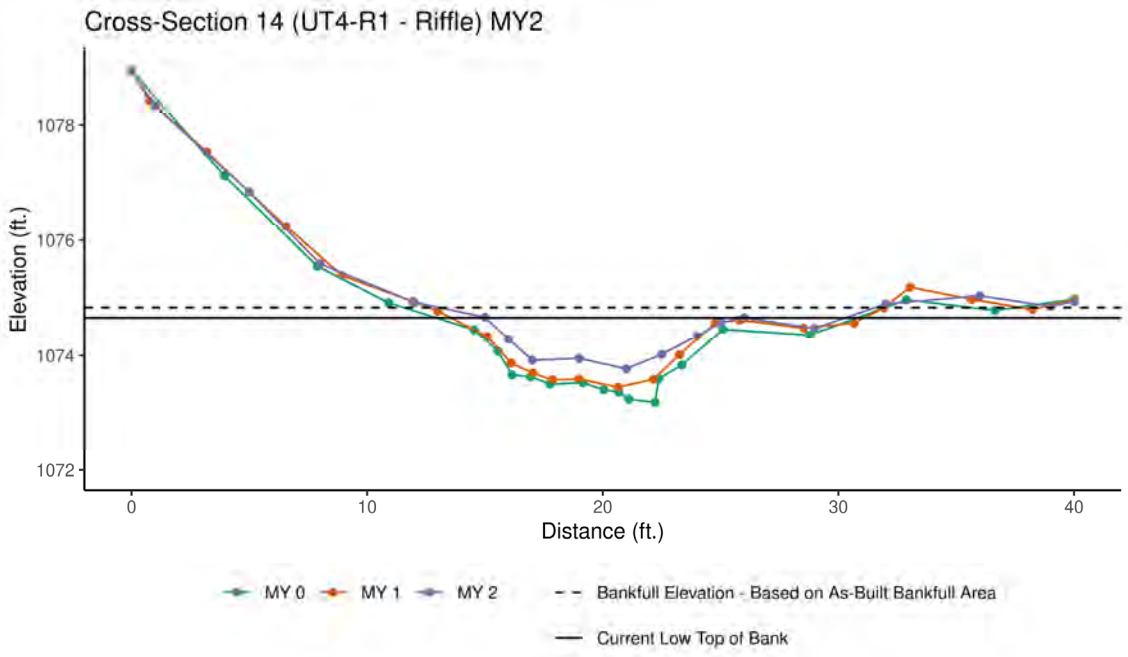
Distance	Elevation	Features
0	991.368	TLP
1.01038804	990.959	
4.94128981	990.238	
7.34802429	989.676	
10.7814553	989.475	TLB
11.9877478	989.274	
14.0756515	988.355	
14.7322639	987.696	
15.0529766	985.489	
16.6001767	985.267	
20.5406803	984.925	THW
21.7702023	985.274	
22.2490982	986.765	
23.0510125	987.695	
23.3046566	988.024	
24.0876195	988.359	TRB, BKF
26.7897109	988.535	
32.7826894	988.837	
39.2543077	989.169	
40	989.357	TRP

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



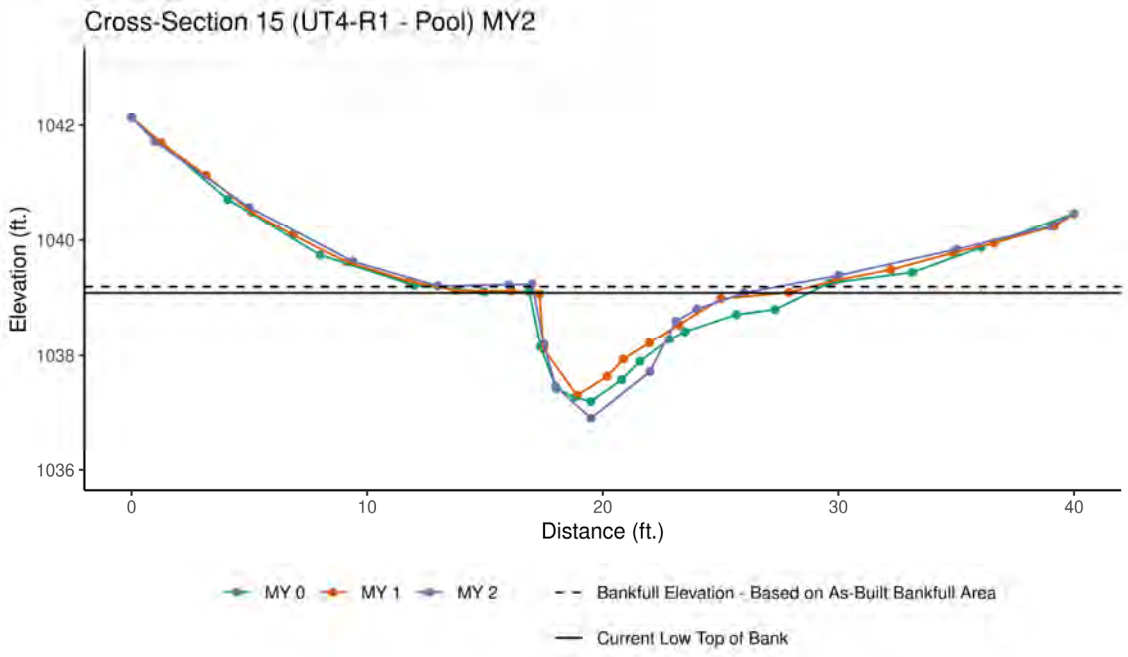
Distance	Elevation	Features
0	1078.95	TLP
1	1078.4	
4	1077.29	
8	1075.94	
12	1075.28	TLB
14.1	1074.78	
15	1074.42	
16.3	1074.11	LEW
17	1073.43	
18.8	1073.03	THW
21	1073.38	
23	1074.09	
24	1074.37	
26	1075	TRB, BKF
28	1075.41	
33.8	1077.08	
38.6	1077.05	
40	1077.27	TRP

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



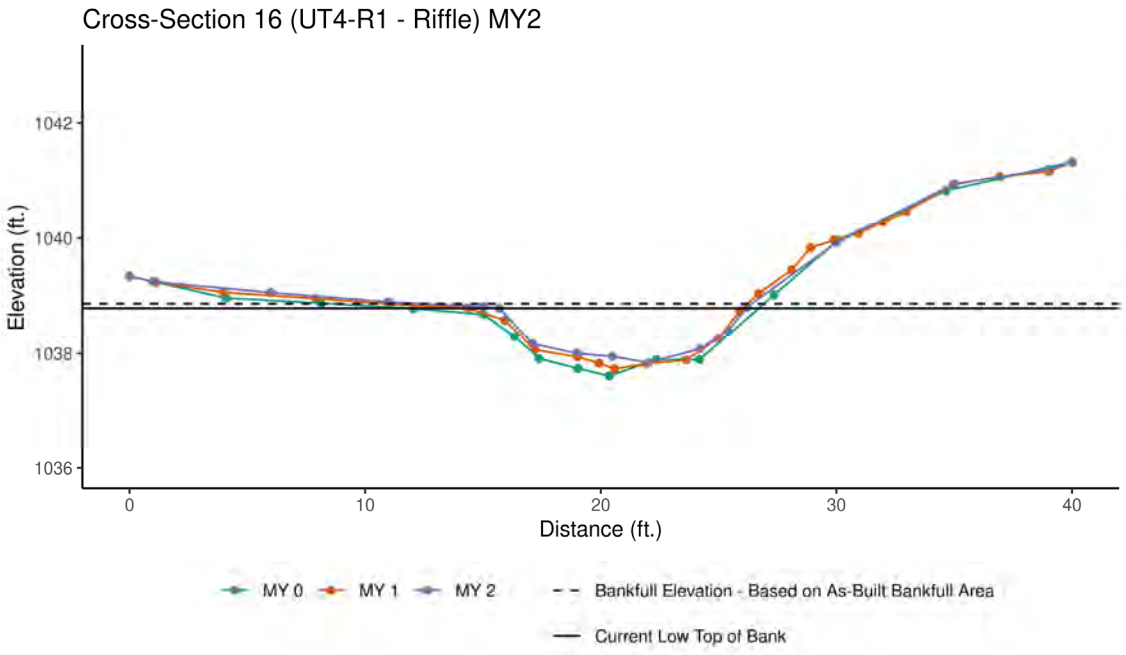
Distance	Elevation	Features
0	1078.94	TLP
1	1078.33	
5	1076.84	
8	1075.59	
12	1074.93	
15	1074.67	TLB
16	1074.29	
17	1073.92	LEW
19	1073.95	
21	1073.77	THW
22.5	1074.02	REW
24	1074.34	
25	1074.58	
26	1074.66	TRB, BKF
29	1074.48	
32	1074.9	
36	1075.04	
39	1074.86	
40	1074.94	TLP

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



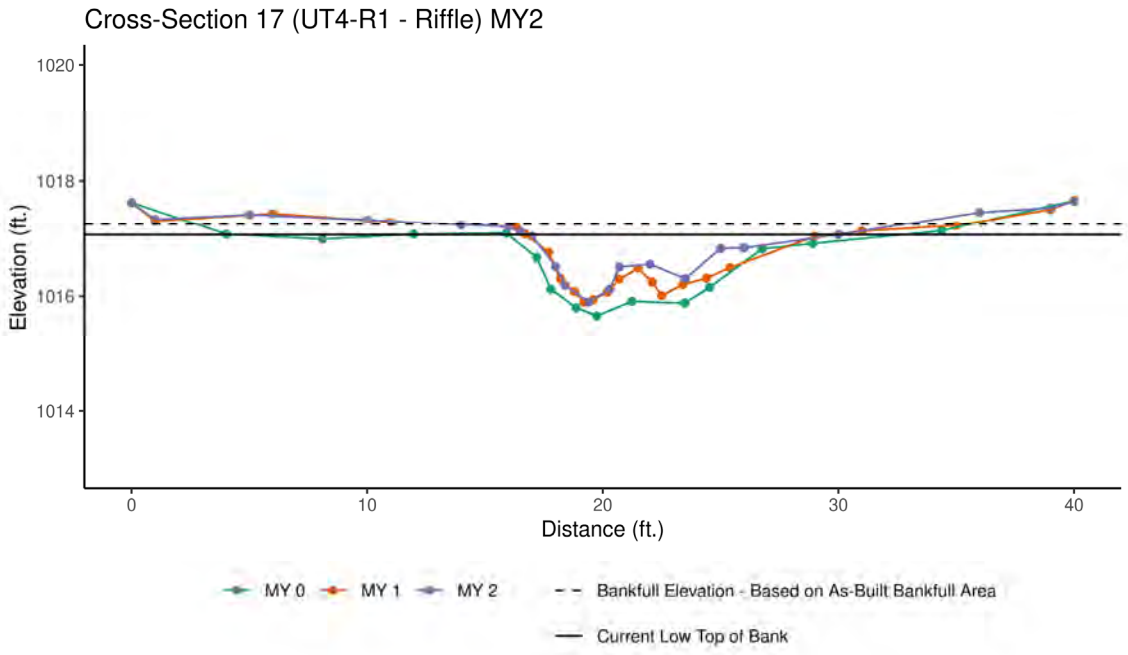
Distance	Elevation	Features
0	1042.14	TLP
1	1041.72	
5	1040.57	
9.4	1039.63	
13	1039.21	
16	1039.23	
17	1039.24	TLB
17.5	1038.2	LEW
18	1037.46	
19.5	1036.91	THW
22	1037.72	
23.1	1038.6	REW
24	1038.81	
26	1039.09	TRB, BKF
30	1039.39	
35	1039.84	
39	1040.24	
40	1040.47	TRP

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



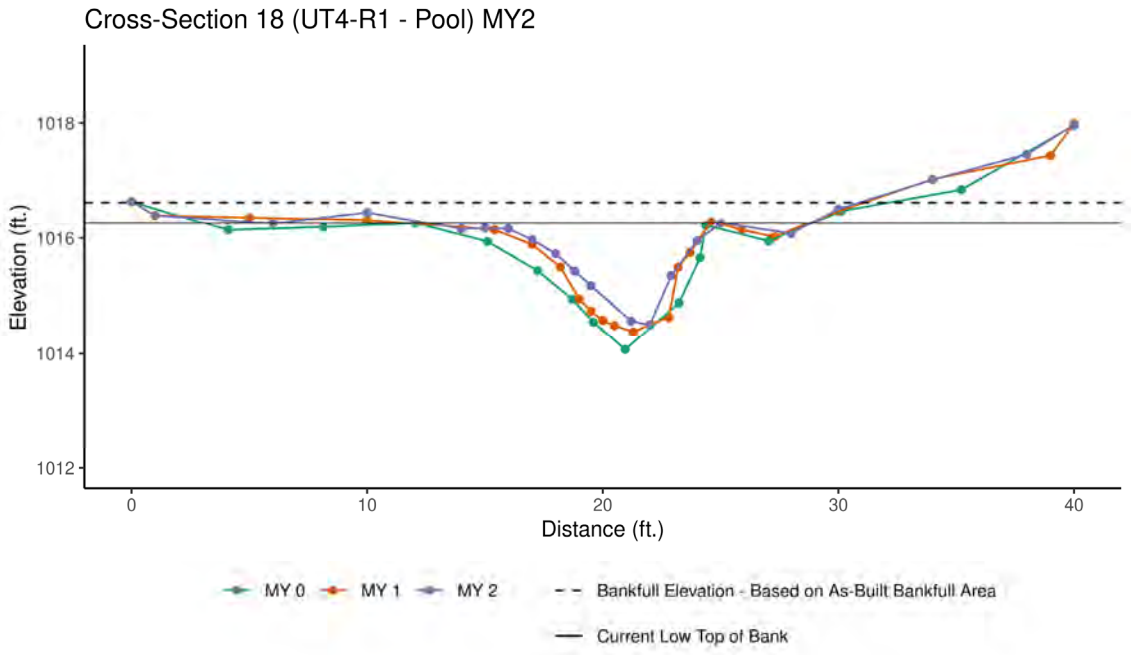
Distance	Elevation	Features
0	1039.34	TLP
1	1039.25	
6	1039.06	
11	1038.9	
15	1038.82	
15.7	1038.79	TLB, BKF
17.1	1038.17	
19	1038	LEW
20.5	1037.95	
22	1037.84	THW
24.2	1038.08	REW
25.4	1038.4	
26.2	1038.81	TRB
30	1039.92	
35	1040.95	
39	1041.2	
40	1041.32	TRP

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



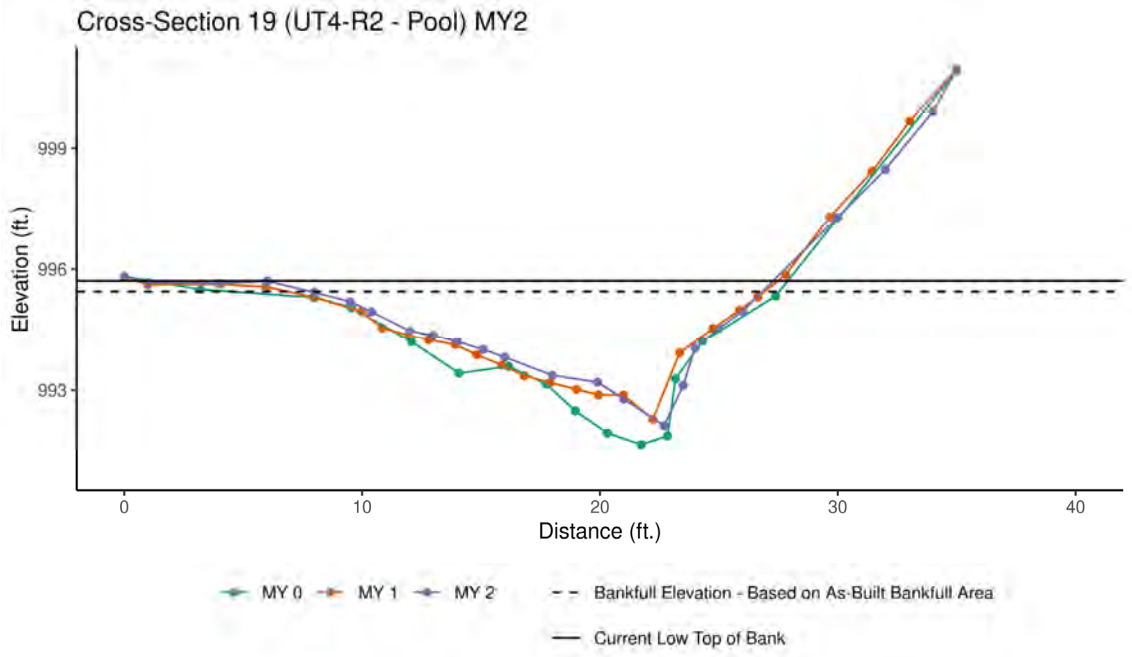
Distance	Elevation	Features
0	1017.62	TLP
1	1017.33	
5	1017.41	
10	1017.32	
14	1017.23	
16	1017.2	TLB
16.5	1017.12	
17	1017.03	
18	1016.51	
18.4	1016.19	LEW
19.4	1015.9	THW
20.3	1016.12	REW
20.7	1016.5	
22	1016.55	
23.5	1016.3	
25	1016.82	
26	1016.83	
30	1017.06	TRB, BKF
36	1017.45	
39	1017.53	
40	1017.64	TRP

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



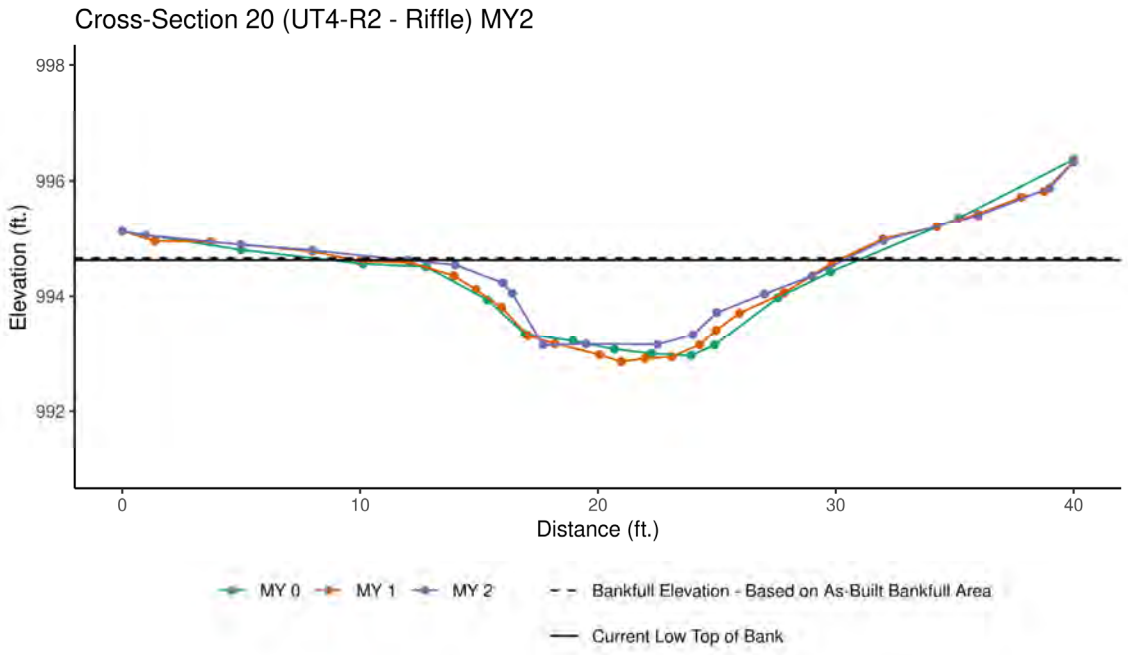
Distance	Elevation	Features
0	1016.64	TLP
1	1016.4	
6	1016.26	
10	1016.45	TLB
14	1016.16	
15	1016.17	
16	1016.16	
17	1015.97	
18	1015.73	
18.8	1015.43	LEW
19.5	1015.18	
21.2	1014.57	
22	1014.5	THW
22.9	1015.35	REW
24	1015.95	
25	1016.26	TRB, BKF
28	1016.08	
30	1016.51	
34	1017.02	
38	1017.46	
40	1017.97	TRP

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



Distance	Elevation	Features
0	995.816	TLP
1	995.666	
4	995.646	
6	995.706	TLB, BKF
8	995.426	
9.5	995.196	
10.4	994.946	
12	994.476	
13	994.356	
14	994.206	
15.1	994.006	
16	993.816	
18	993.366	
19.9	993.196	LEW
21	992.776	
22.7	992.116	THW
23.5	993.116	REW
24	994.046	
25	994.536	
26	994.966	
30	997.286	TRB
32	998.476	
34	999.906	
35	1000.956	TRP

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



Distance	Elevation	Features
0	995.117	TLP
1	995.047	
5	994.887	
8	994.787	
12	994.617	TLB, BKF
14	994.537	
16	994.227	
16.4	994.047	
17.7	993.147	LEW
19.5	993.167	
22.5	993.157	THW
24	993.327	
25	993.717	
27	994.037	
29	994.347	
32	994.957	TRB
36	995.397	
39	995.877	
40	996.327	TRP

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

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					1008.99	1009.12	1009.06					1023.98	1024.00	1024.00					1023.62	1023.98	1023.97				
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	0.94	0.91					N/A	N/A	N/A					1.00	0.96	1.01					N/A	N/A	N/A				
Thalweg Elevation	1008.00	1008.00	1008.05					1007.03	1006.72	1006.55					1023.45	1023.36	1023.36					1021.98	1022.44	1022.44				
LTOB[2] Elevation	1009.67	1009.59	1009.56					1008.99	1008.91	1009.08					1023.98	1023.98	1024.01					1023.62	1023.60	1023.67				
LTOB[2] Max Depth (ft)	1.68	1.59	1.51					1.96	2.19	2.53					0.53	0.62	0.65					1.63	1.16	1.23				
LTOB[2] Cross Sectional Area (ft^2)	14.77	13.52	12.66					19.91	16.61	20.41					2.36	2.21	2.39					6.12	3.82	4.24				

	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					1001.25	1001.29	1001.34					998.28	998.23	998.21					998.33	998.42	998.37				
Bank Height Ratio_Based on AB Bankfull[1] Area	N/A	N/A	N/A					1.00	0.96	0.92					N/A	N/A	N/A					1.00	0.90	0.94				
Thalweg Elevation	998.94	999.18	998.78					999.46	999.49	999.59					995.99	996.00	996.03					996.67	996.74	996.62				
LTOB[2] Elevation	1001.15	1001.18	1001.17					1001.25	1001.22	1001.20					998.28	998.36	998.26					998.33	998.26	998.26				
LTOB[2] Max Depth (ft)	2.22	2.01	2.39					1.79	1.73	1.61					2.28	2.36	2.23					1.66	1.52	1.65				
LTOB[2] Cross Sectional Area (ft^2)	24.67	17.50	17.12					16.63	15.67	14.61					22.81	25.31	23.82					17.48	14.98	15.79				

	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					996.10	996.21	996.59					989.39	989.43	989.44					989.04	988.82	988.04				
Bank Height Ratio_Based on AB Bankfull[1] Area	N/A	N/A	N/A					1.00	0.99	0.79					1.00	0.99	0.96					N/A	N/A	N/A				
Thalweg Elevation	994.86	994.75	994.99					995.15	995.29	995.56					987.74	987.74	987.67					986.79	986.31	984.93				
LTOB[2] Elevation	996.19	996.27	996.51					996.10	996.21	996.37					989.39	989.41	989.37					989.04	988.81	988.36				
LTOB[2] Max Depth (ft)	1.32	1.52	1.52					0.96	0.92	0.81					1.65	1.67	1.70					2.25	2.51	3.43				
LTOB[2] Cross Sectional Area (ft^2)	8.82	9.44	4.64					4.91	4.85	3.17					15.65	15.44	14.46					21.50	21.45	24.55				

	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					1074.45	1074.59	1074.84					1039.11	1039.39	1039.20					1038.68	1038.79	1038.87				
Bank Height Ratio_Based on AB Bankfull[1] Area	N/A	N/A	N/A					1.00	0.99	0.83					N/A	N/A	N/A					1.00	1.01	0.92				
Thalweg Elevation	1072.31	1072.65	1073.03					1073.24	1073.58	1073.77					1037.27	1037.31	1036.91					1037.61	1037.73	1037.84				
LTOB[2] Elevation	1074.60	1074.58	1075.00					1074.45	1074.58	1074.66					1039.11	1039.07	1039.09					1038.68	1038.79	1038.79				
LTOB[2] Max Depth (ft)	2.29	1.93	1.97					1.21	1.00	0.89					1.84	1.76	2.18					1.07	1.06	0.95				
LTOB[2] Cross Sectional Area (ft^2)	14.60	10.98	13.34					7.83	7.67	5.89					10.71	7.54	9.76					7.80	7.89	6.97				

	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					1016.26	1016.51	1016.62					995.05	995.40	995.44					994.42	994.41	994.65				
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	0.93	0.86					N/A	N/A	N/A					N/A	N/A	N/A					1.00	1.10	0.98				
Thalweg Elevation	1015.66	1015.90	1015.90					1014.07	1014.38	1014.50					991.65	992.28	992.12					993.07	992.86	993.16				
LTOB[2] Elevation	1016.91	1017.03	1017.01					1016.22	1016.29	1016.26					995.05	995.31	995.71					994.42	994.58	994.62				
LTOB[2] Max Depth (ft)	1.25	1.13	1.16					2.15	1.91	1.76					3.41	3.03	3.59					1.34	1.72	1.46				
LTOB[2] Cross Sectional Area (ft^2)	8.36	7.26	5.93					11.81	9.98	8.09					27.60	25.94	32.87					14.51	17.20	13.90				

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 bankfull area as the basis for adjusting each subsequent years bankfull elevation. For example if the As-built bankfull area was 10 ft2, then the MY1 bankfull elevation would be adjusted until the calculated bankfull area within the MY1 cross section survey = 10 ft2. The BHR would then be calculated with the difference between the low top of bank (LTOB) elevation for MY1 and the thalweg elevation for MY1 in the numerator with the difference between the MY1 bankfull elevation and the MY1 thalweg elevation in the denominator. This same process is then carried out in each successive year.

2 - **LTOB Area and Max depth -** These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as above. The difference between the LTOB elevation and the thalweg elevation (same as in the BHR calculation) will be recroded and tracked above as LTOB max depth.

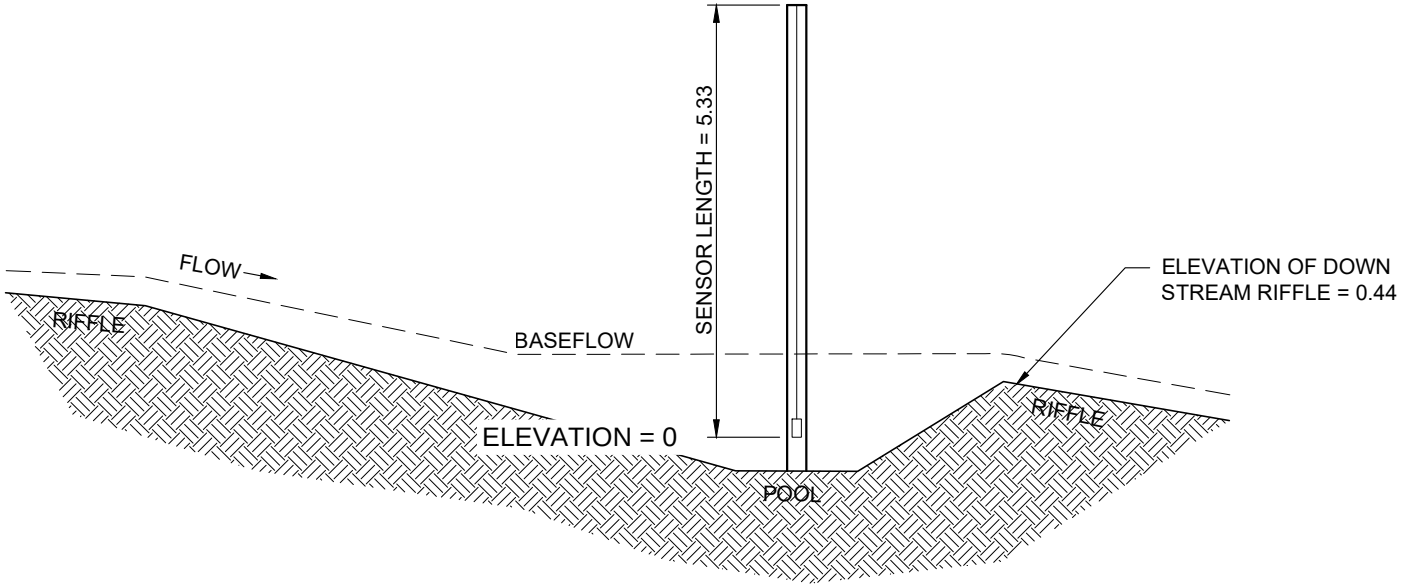
Appendix D:
Hydrologic Data

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

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

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

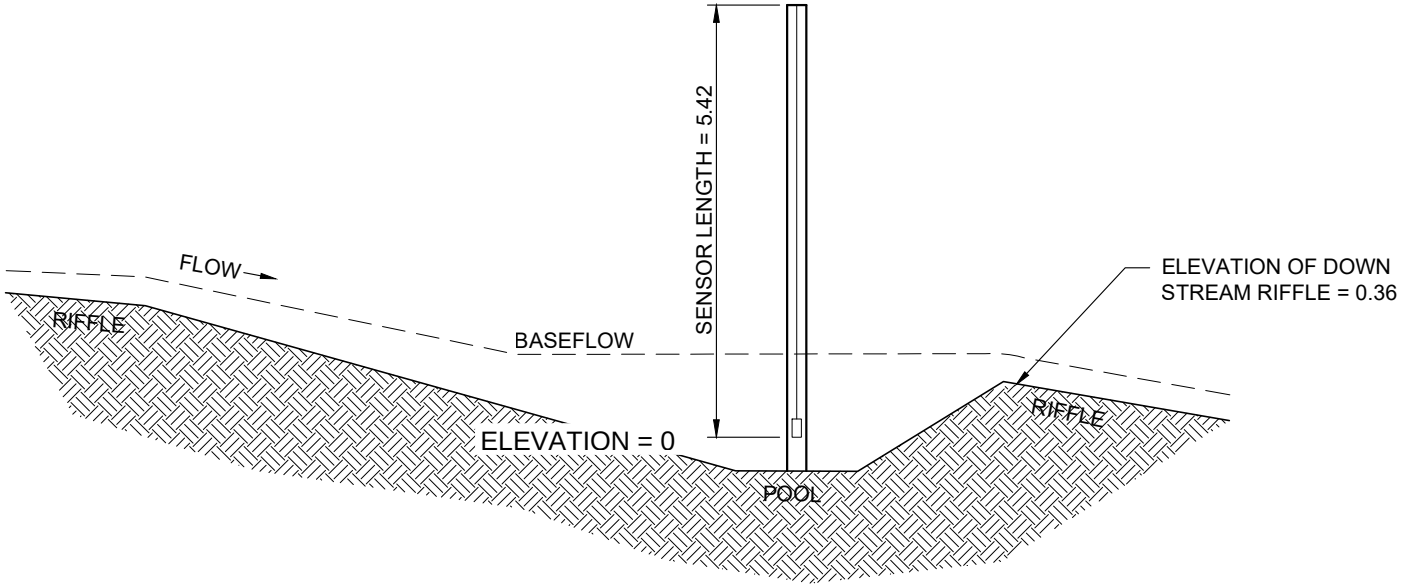
Verification of Bankfull Events: CG-3 (UT4-R2) Banner Branch Mitigation Project					
	Date of Collection	Date of Occurrence	Method	Photos/Notes	Measurement above bankfull (feet)
MY1	11/2/2021	6/4/2021	Pressure Transducer	Recorded bankfull flow	0.10
	11/2/2021	9/22/2021	Pressure Transducer	Recorded bankfull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



FLOW GAUGE FG-1 (UT1A)

Flow Depth = 0.44 feet

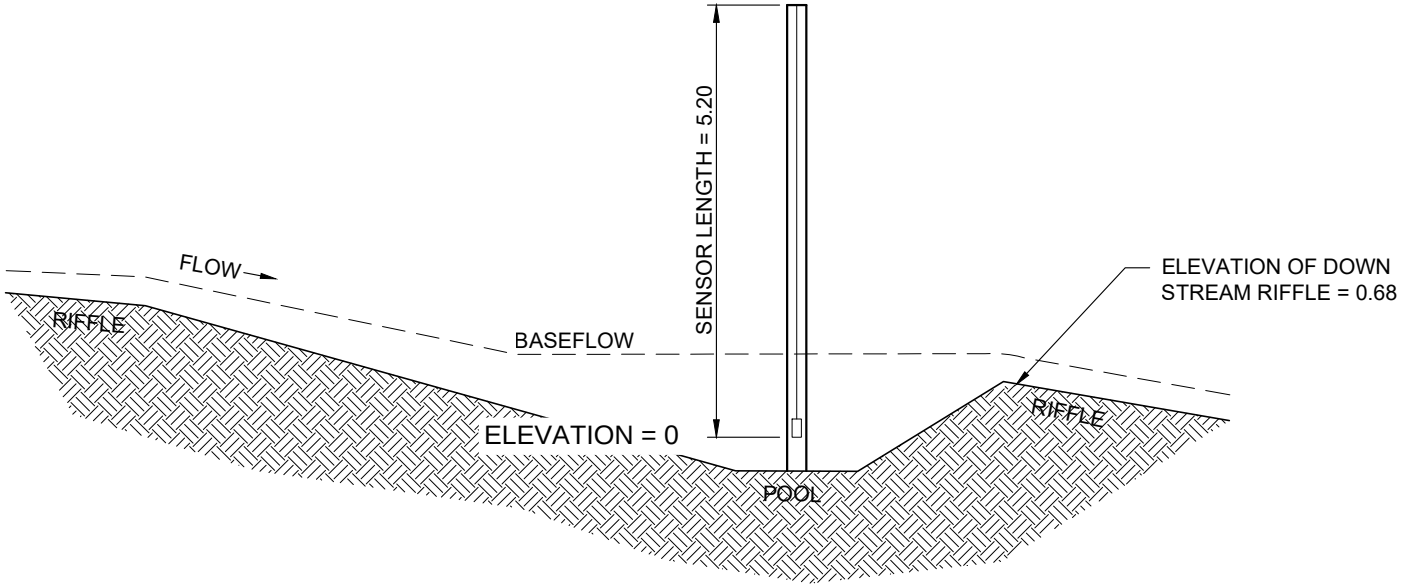
*All elevations relative to sensor depth



FLOW GAUGE FG-2 (UT1C)

Flow Depth = 0.36 feet

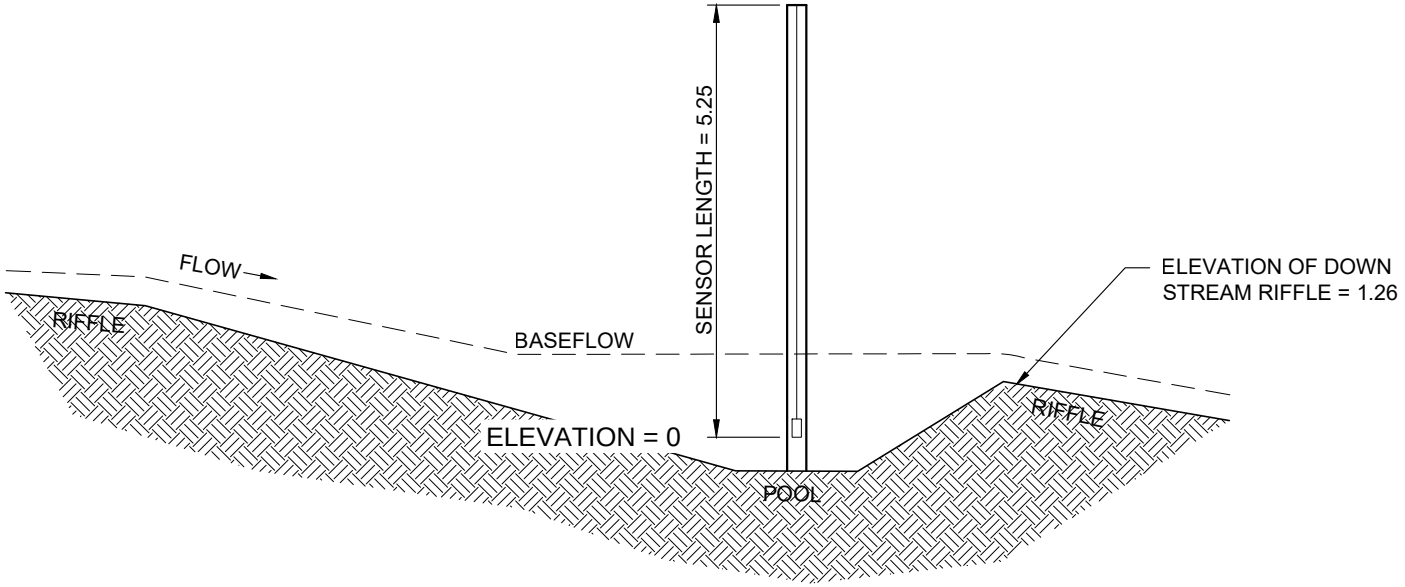
*All elevations relative to sensor depth



FLOW GAUGE FG-3 (UT2)

Flow Depth = 0.68 feet

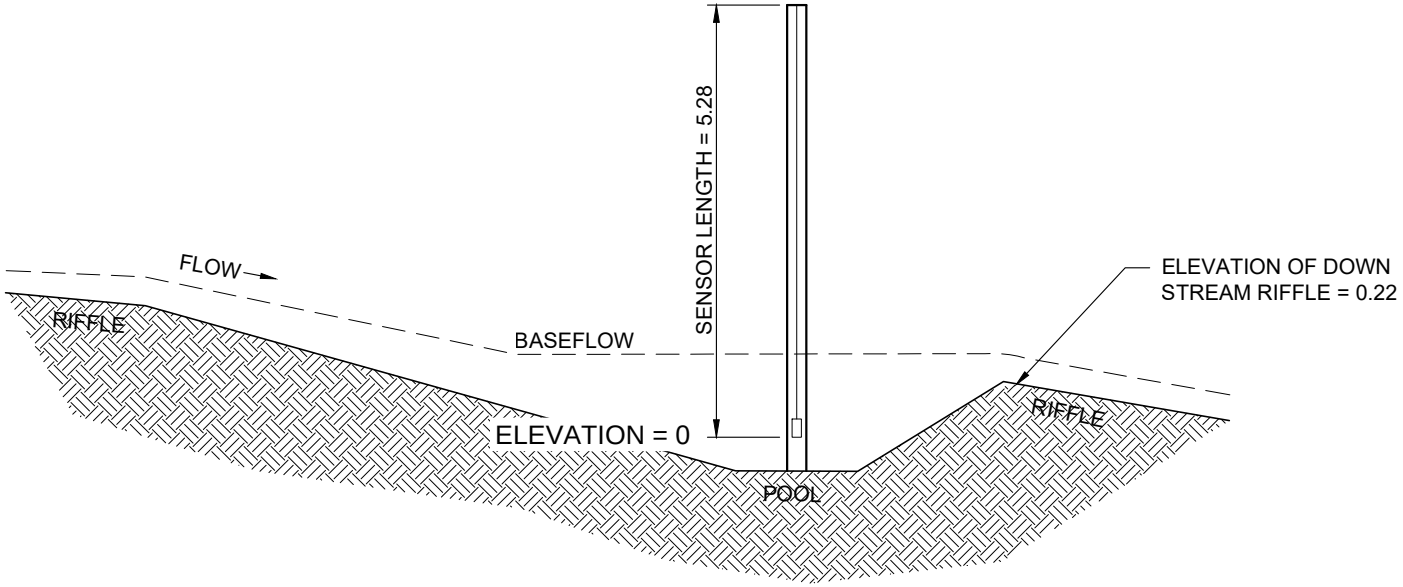
*All elevations relative to sensor depth



FLOW GAUGE FG-4 (UT2A)

Flow Depth = 1.26 feet

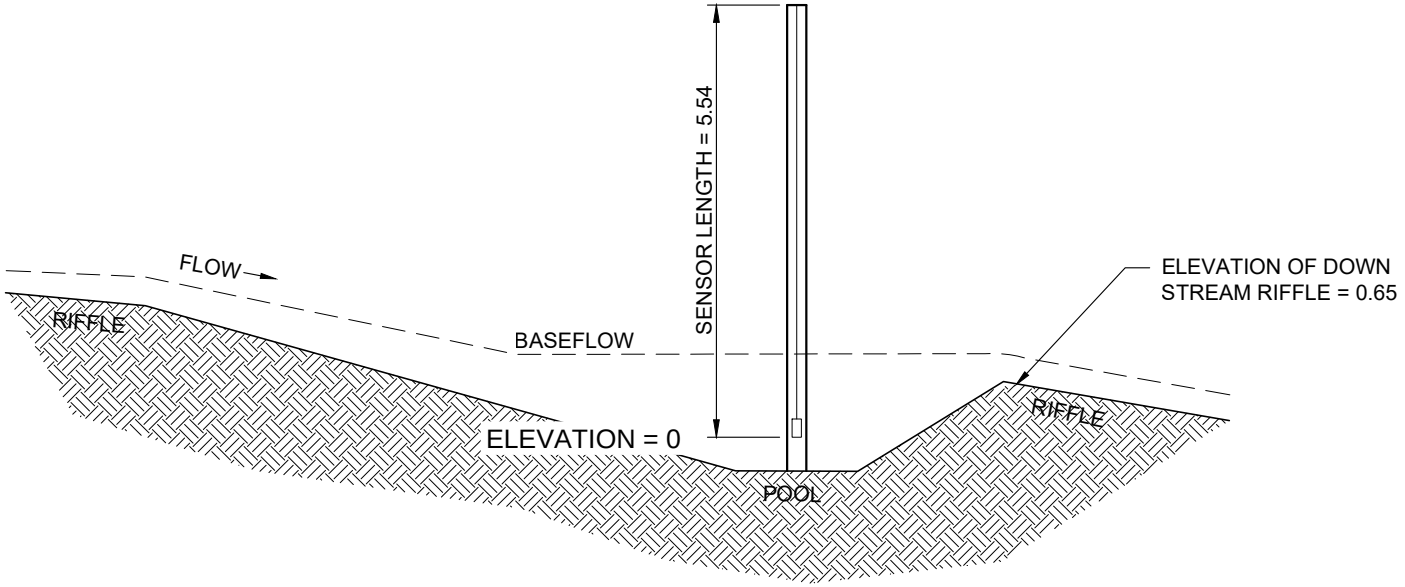
*All elevations relative to sensor depth



FLOW GAUGE FG-5 (UT3)

Flow Depth = 0.22 feet

*All elevations relative to sensor depth

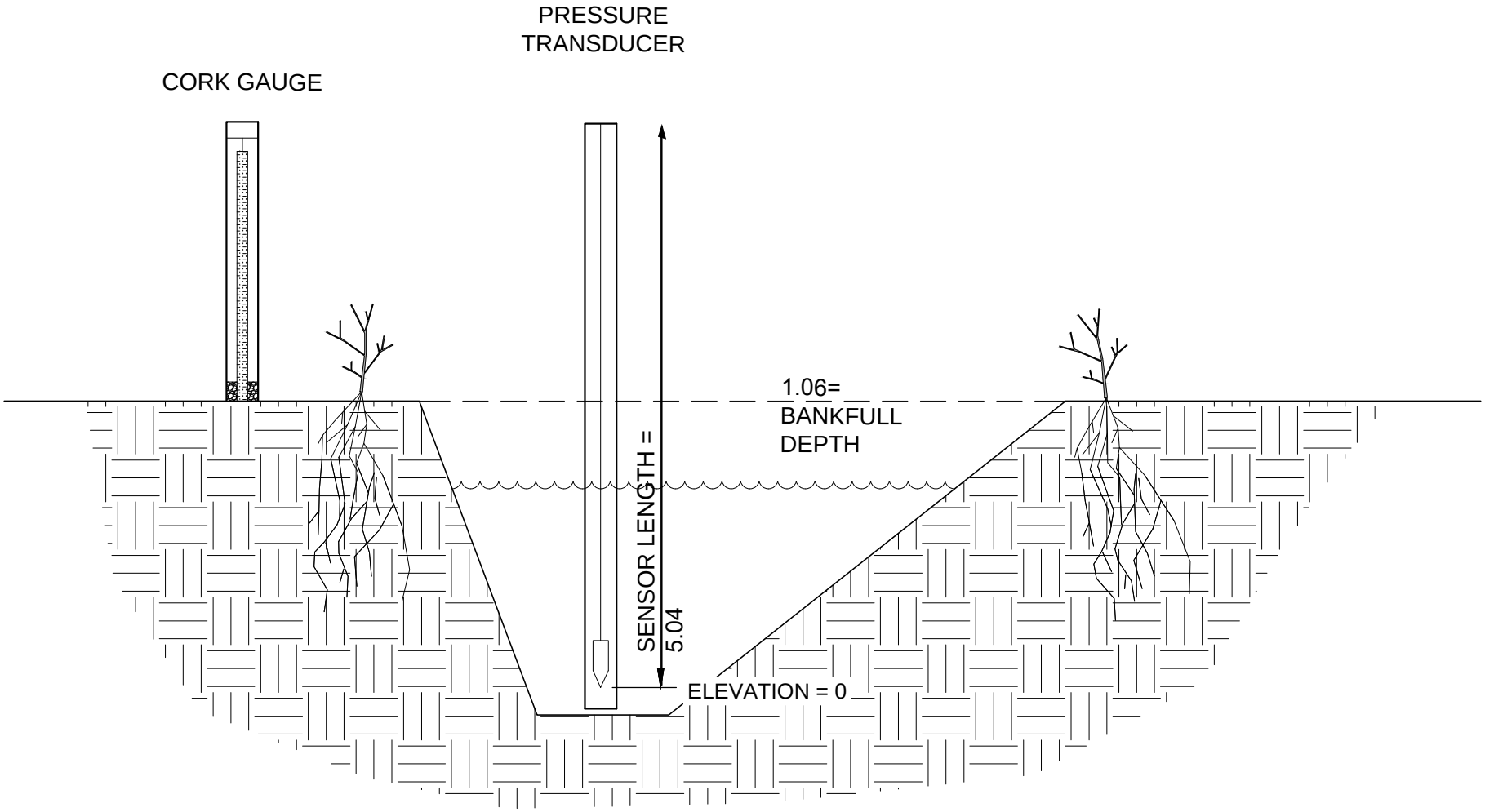


FLOW GAUGE FG-6 (UT4-R1)

Flow Depth = 0.65 feet

*All elevations relative to sensor depth

CROSS SECTIONAL VIEW OF STREAM

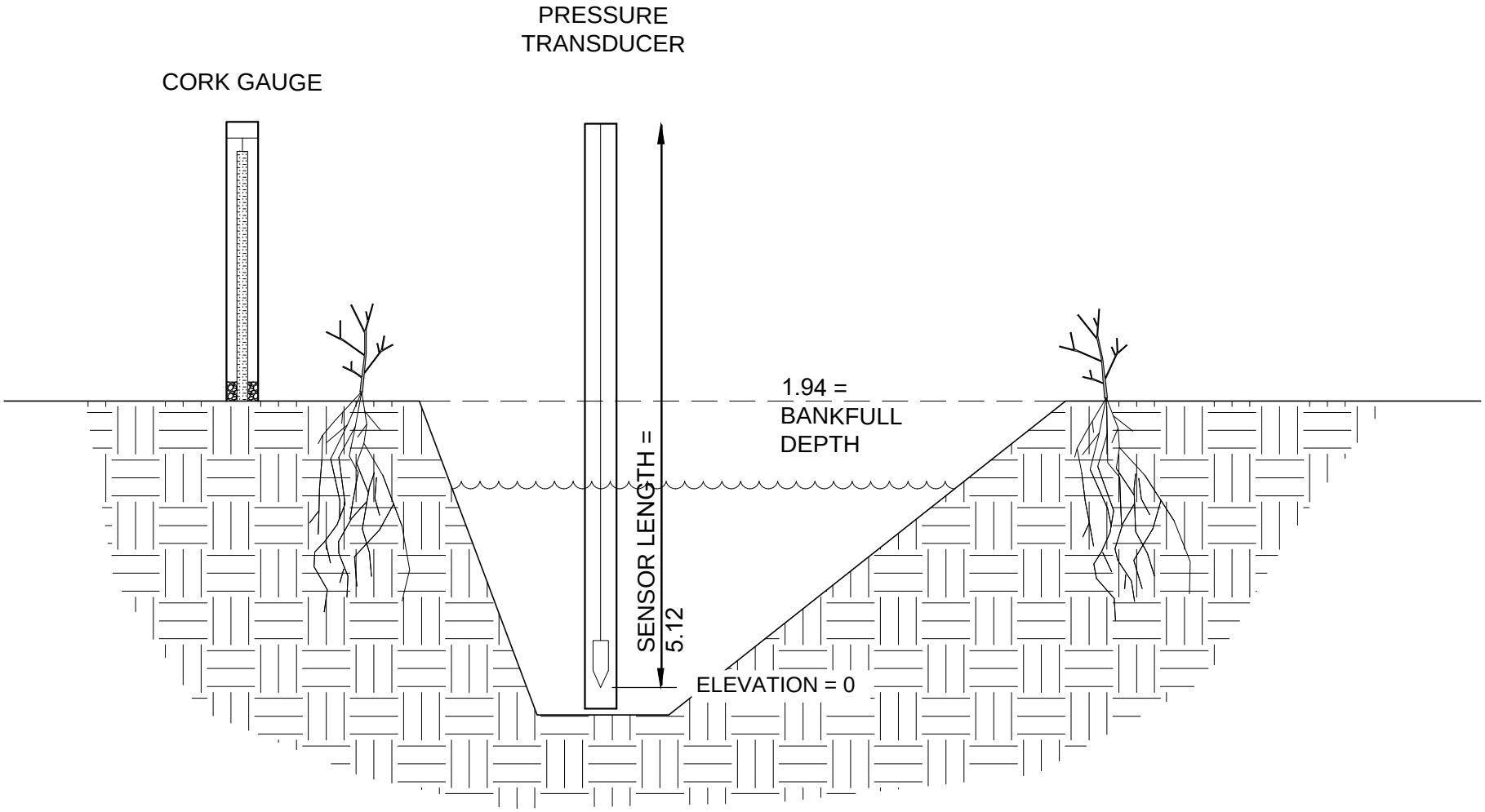


Crest Gauge CG-1 (UT2)

Bankfull Event Depth = 1.06

*All elevations relative to sensor depth

CROSS SECTIONAL VIEW OF STREAM

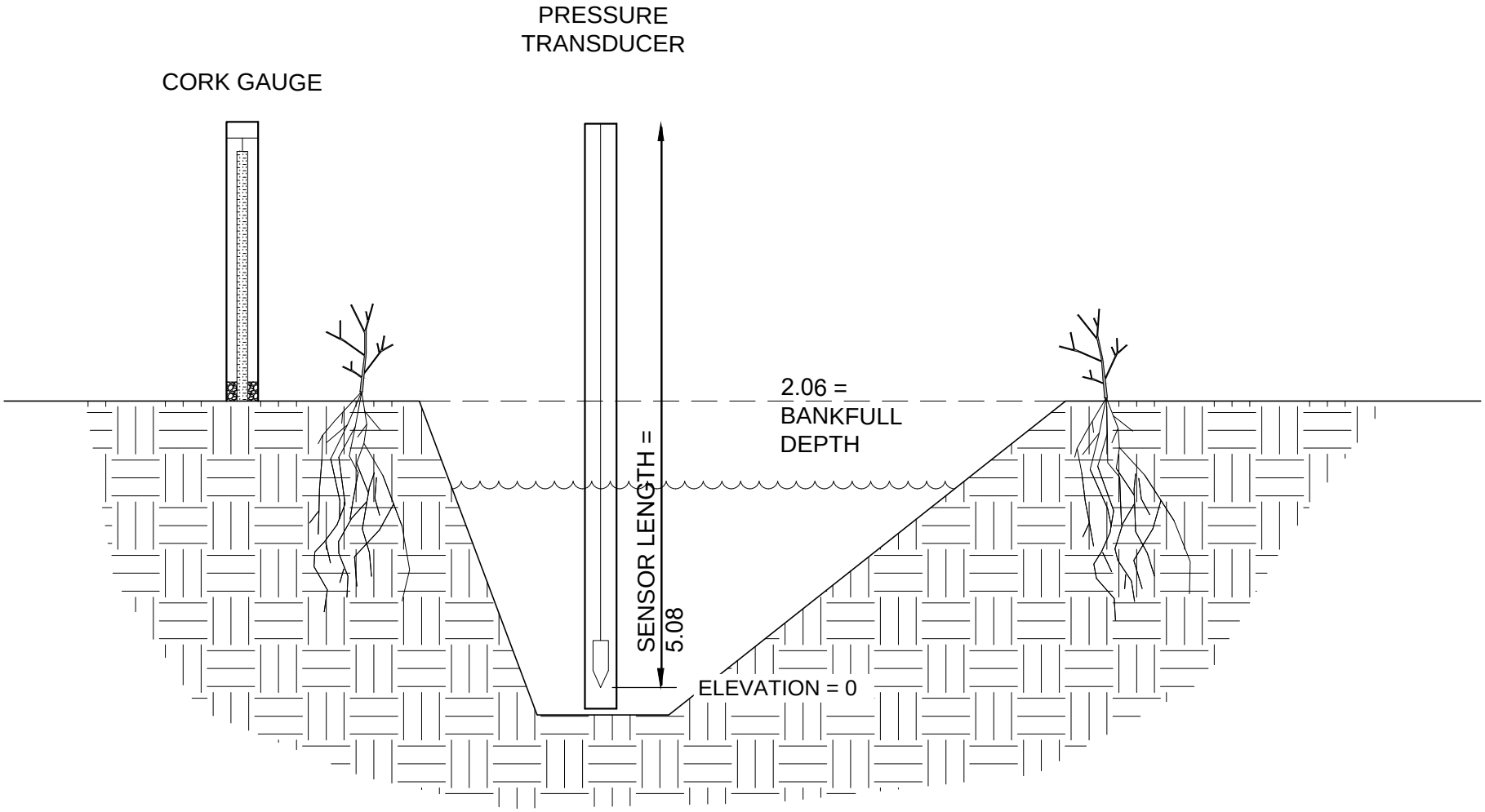


Crest Gauge CG-2 (BB-R2)

Bankfull Event Depth = 1.94

*All elevations relative to sensor depth

CROSS SECTIONAL VIEW OF STREAM

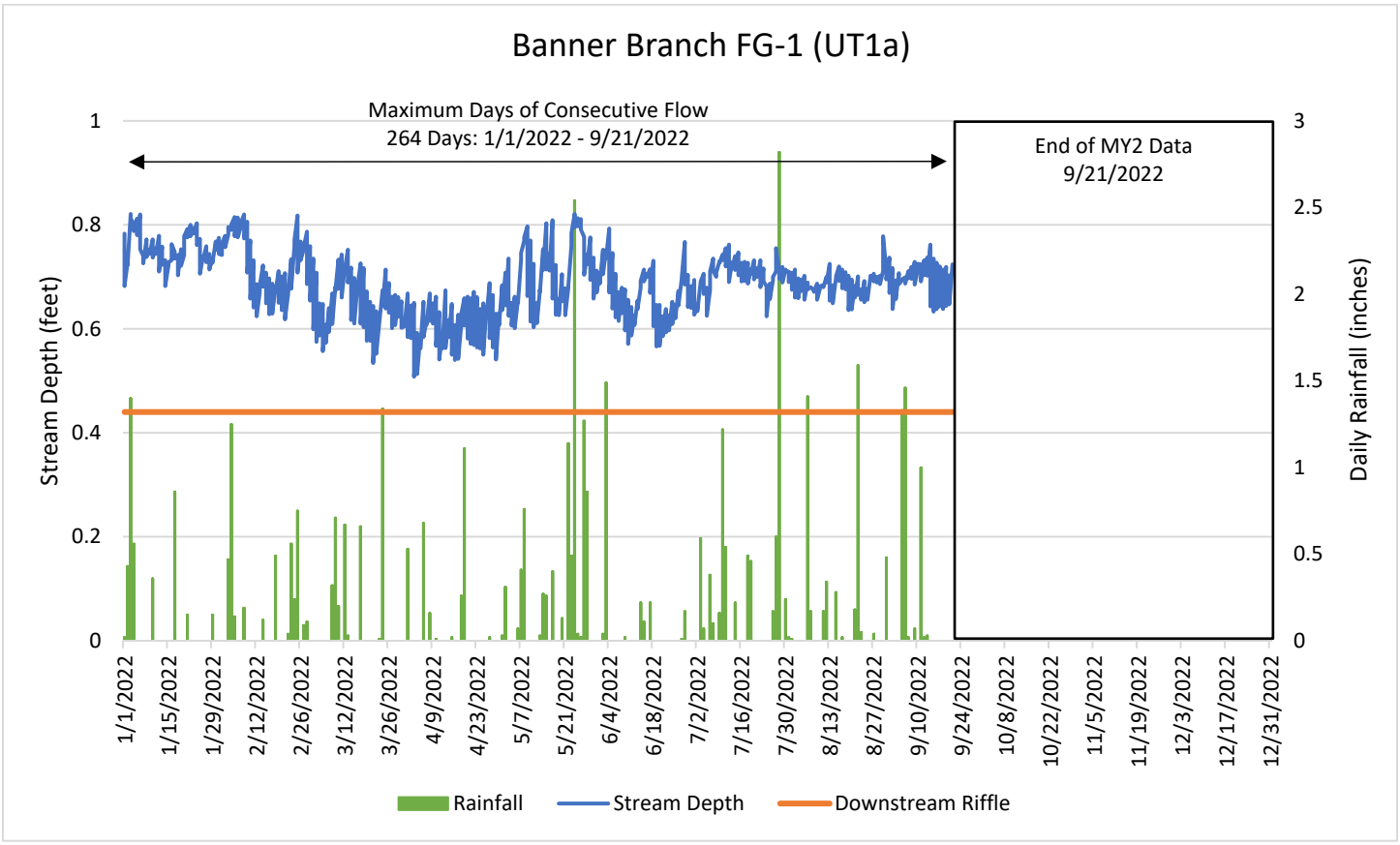


Crest Gauge CG-3 (UT4-R2)

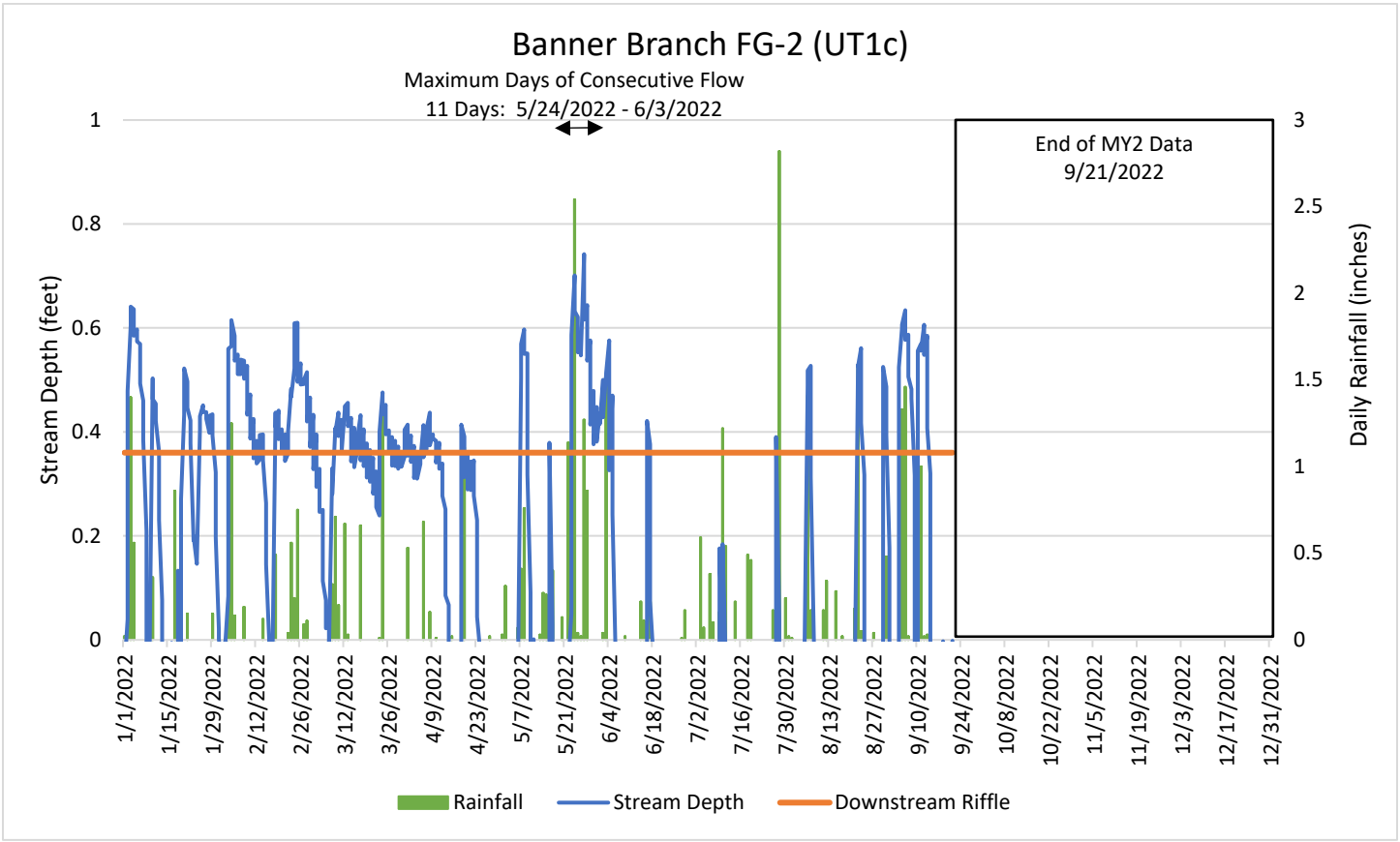
Bankfull Event Depth = 2.06

*All elevations relative to sensor depth

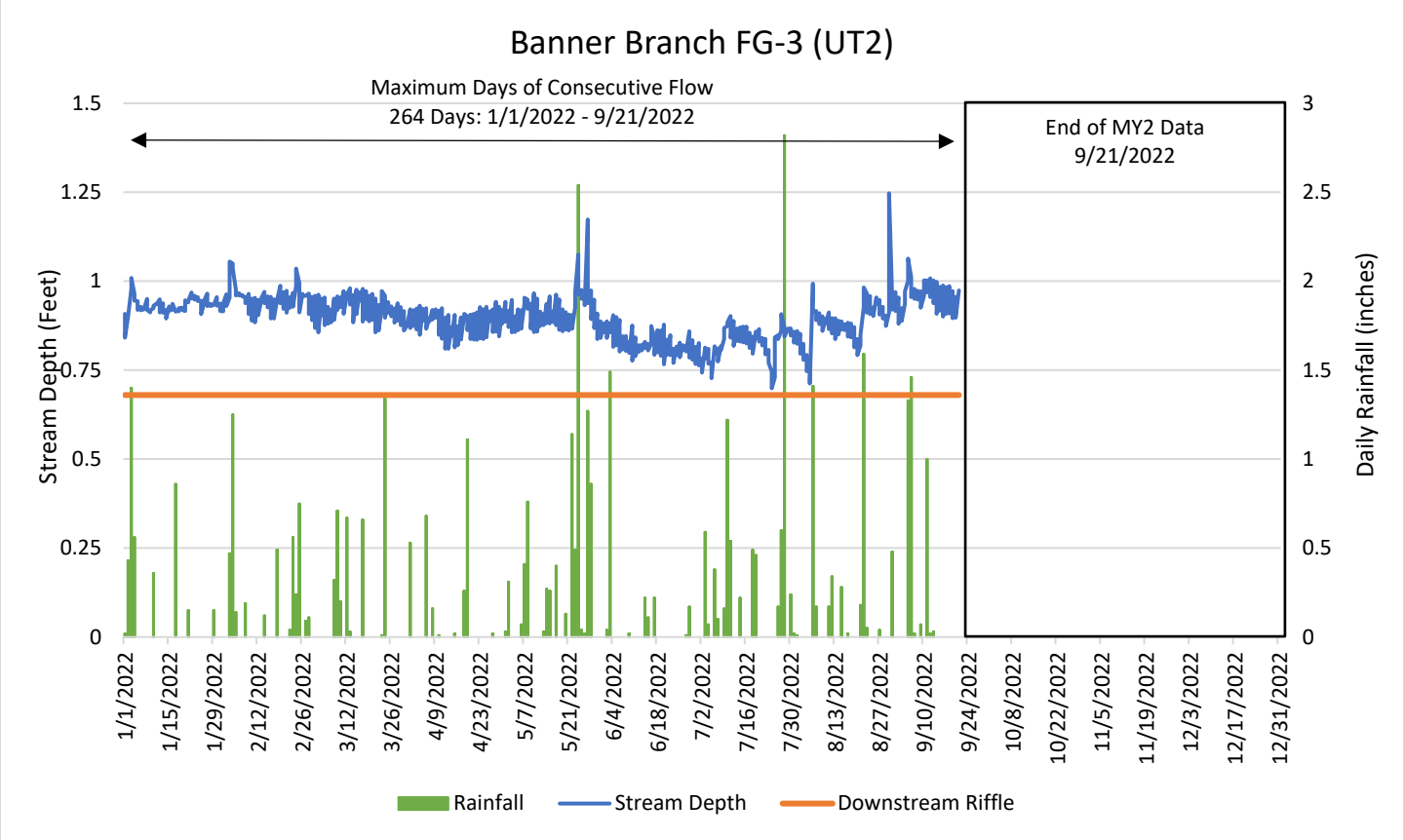
Flow Gauge Graphs



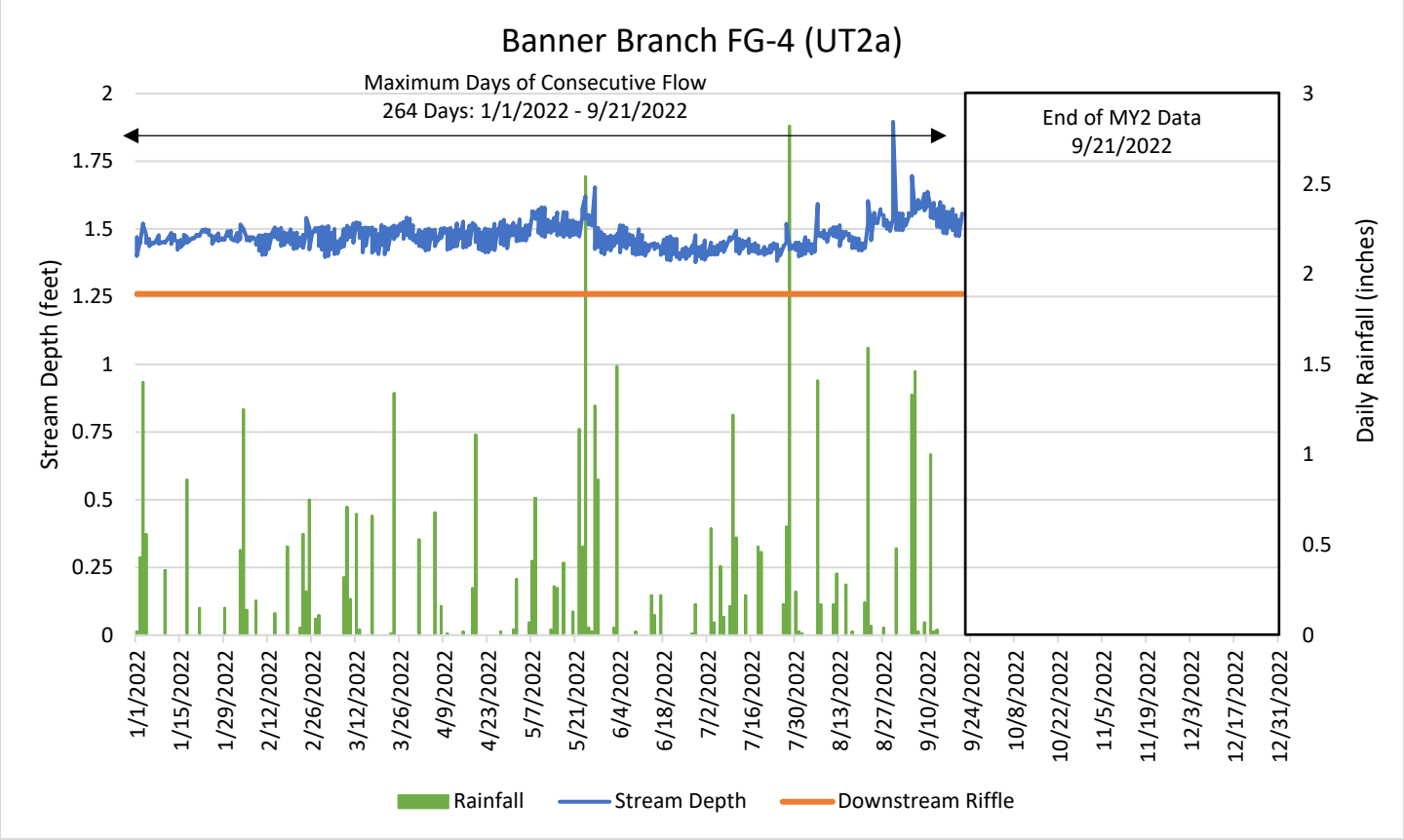
***FG-1:** 264 days of cumulative flow, 0 days of no flow



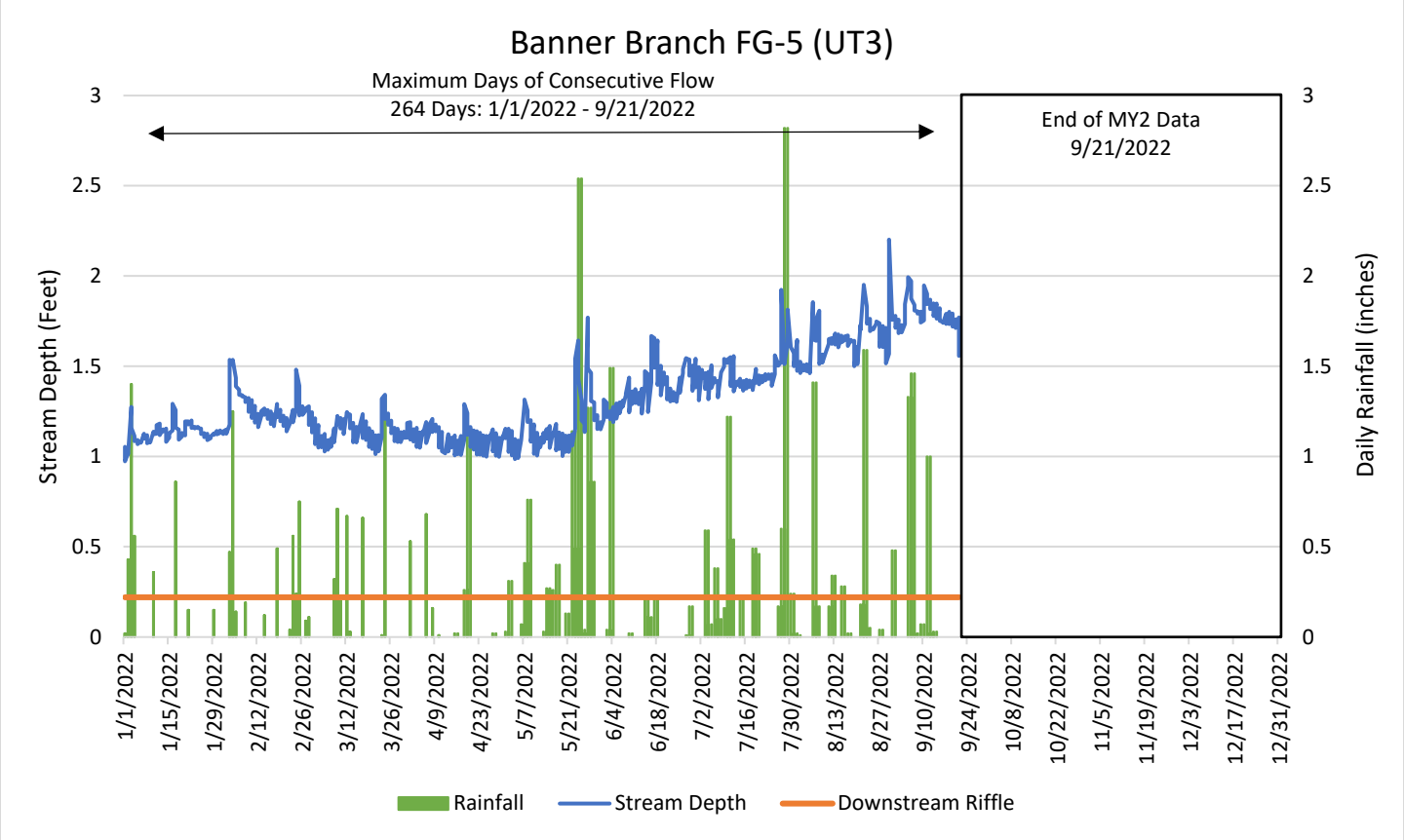
***FG-2:** 64 days of cumulative flow, 200 days of cumulative no flow



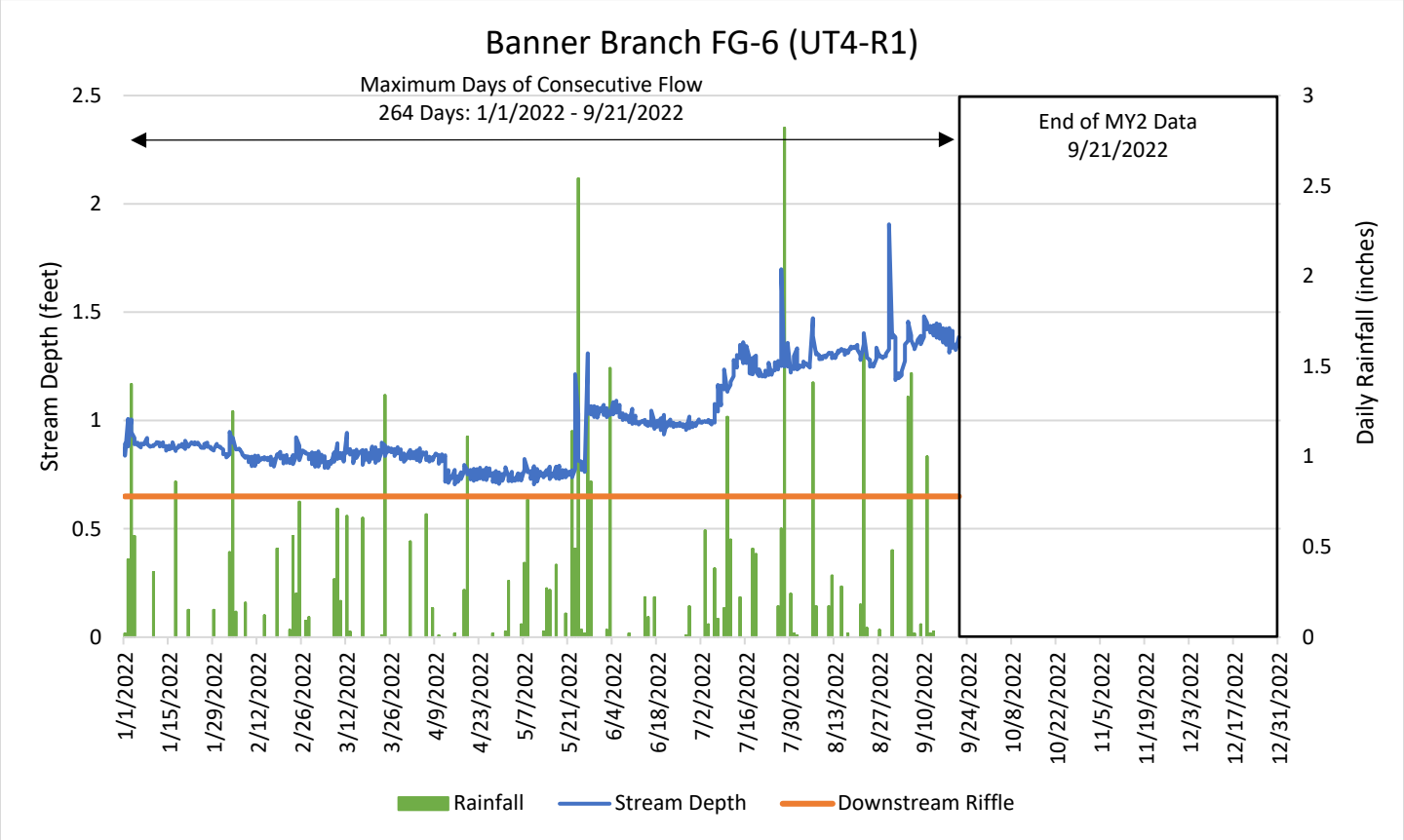
***FG-3:** 264 days of cumulative flow, 0 days of no flow



***FG-4:** 264 days of cumulative flow, 0 days of no flow

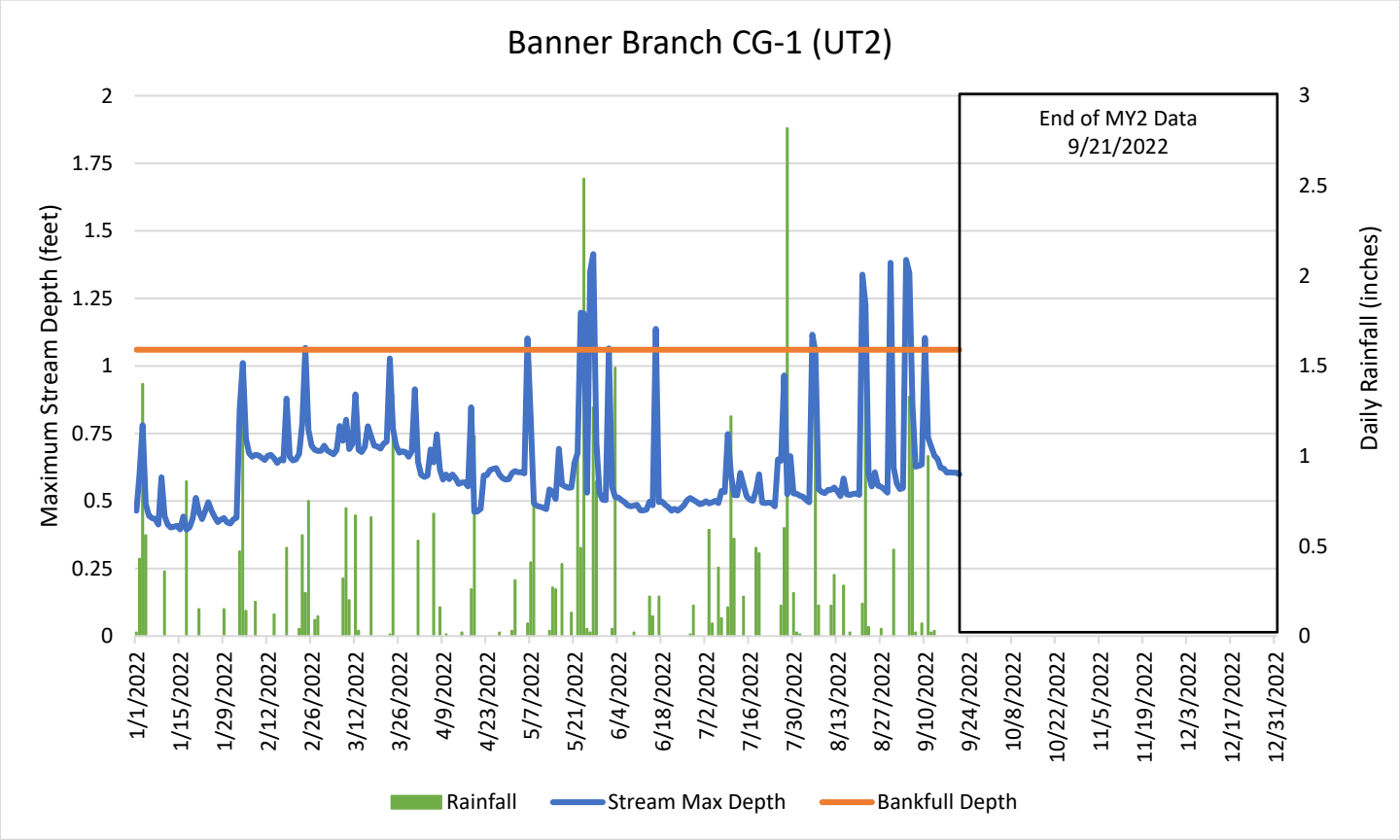


***FG-5:** 264 days of cumulative flow, 0 days of no flow

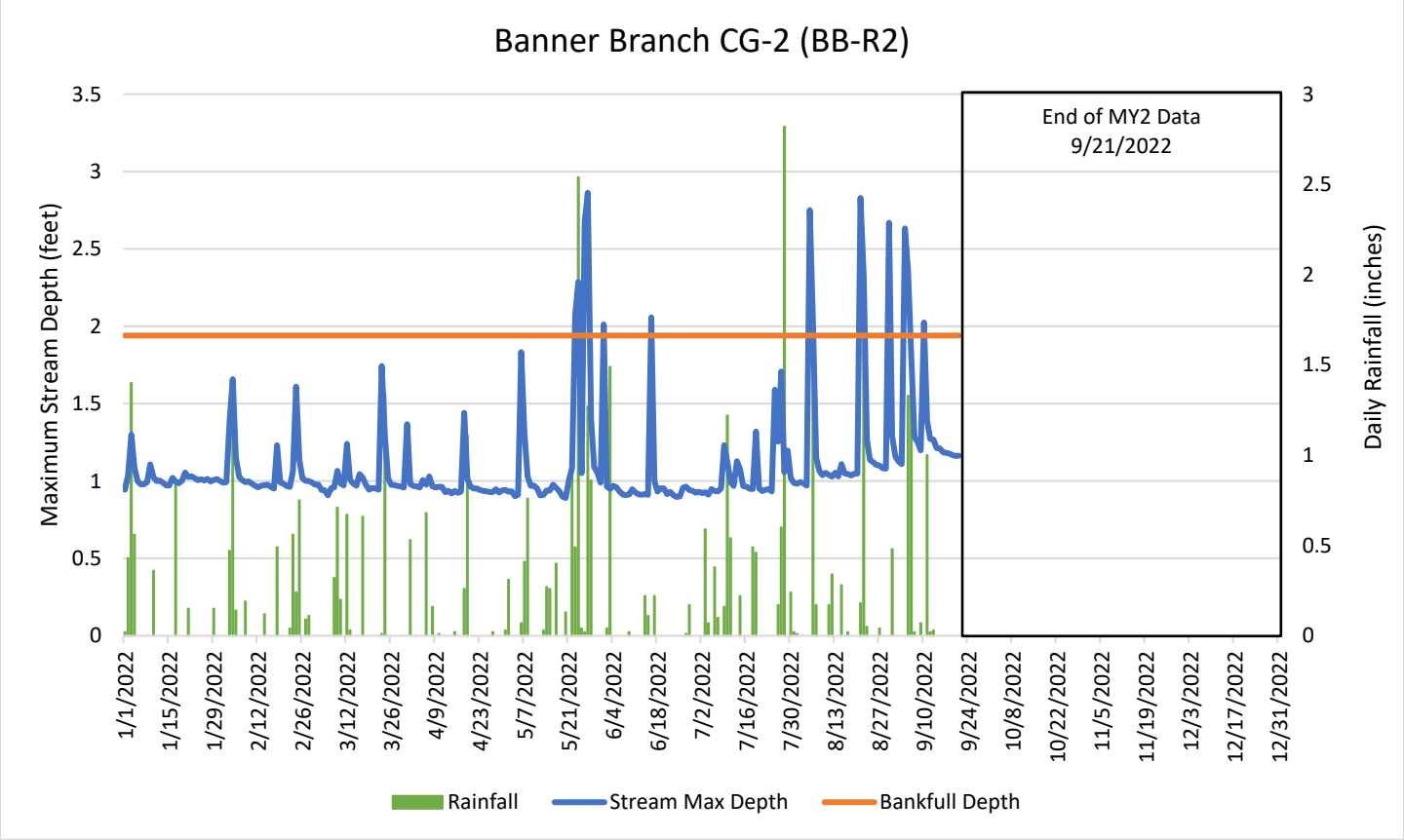


***FG-6:** 264 days of cumulative flow, 0 days of no flow

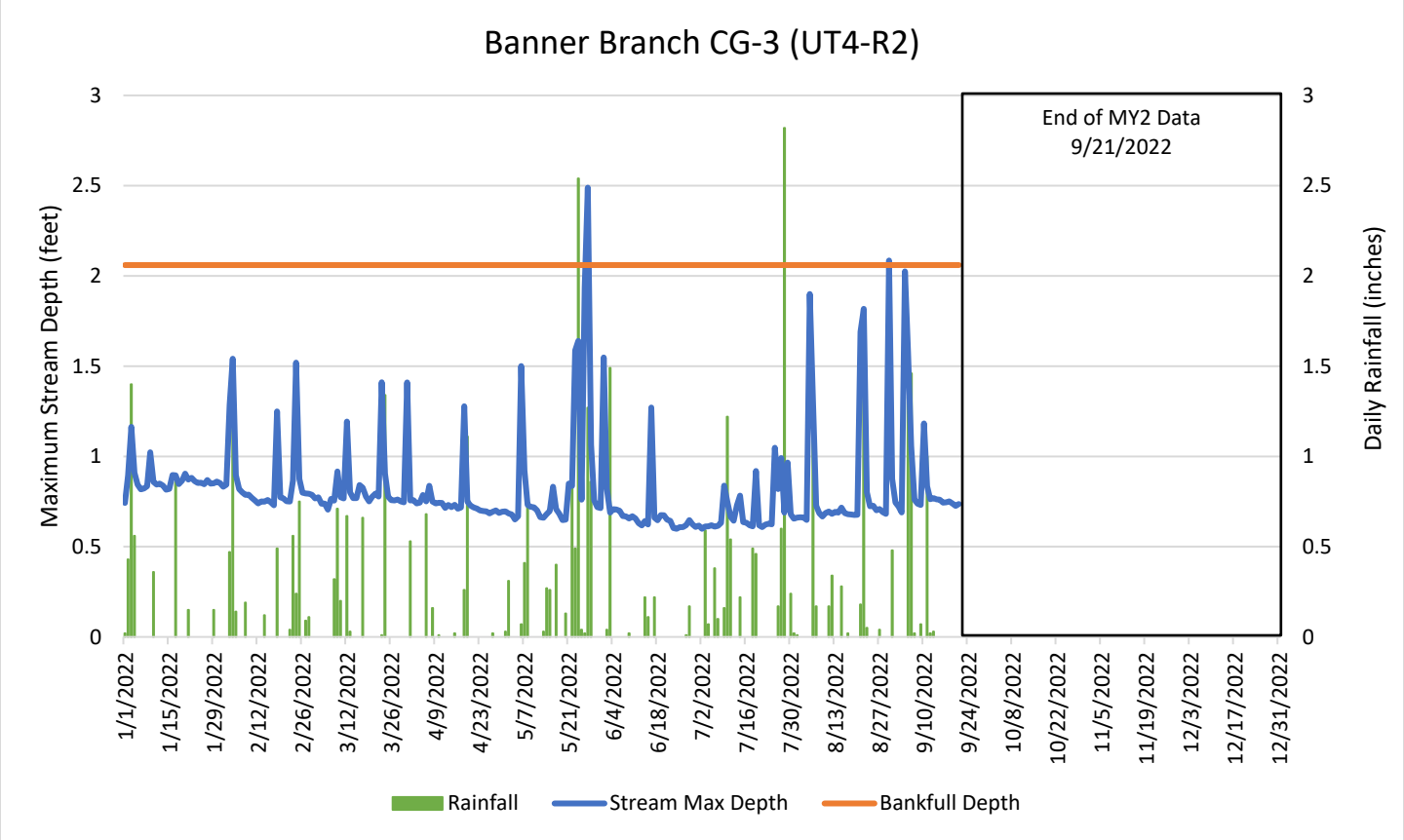
Crest Gauge Graphs



***CG-1:** 5 overbank events with a maximum of 0.354' above bankfull



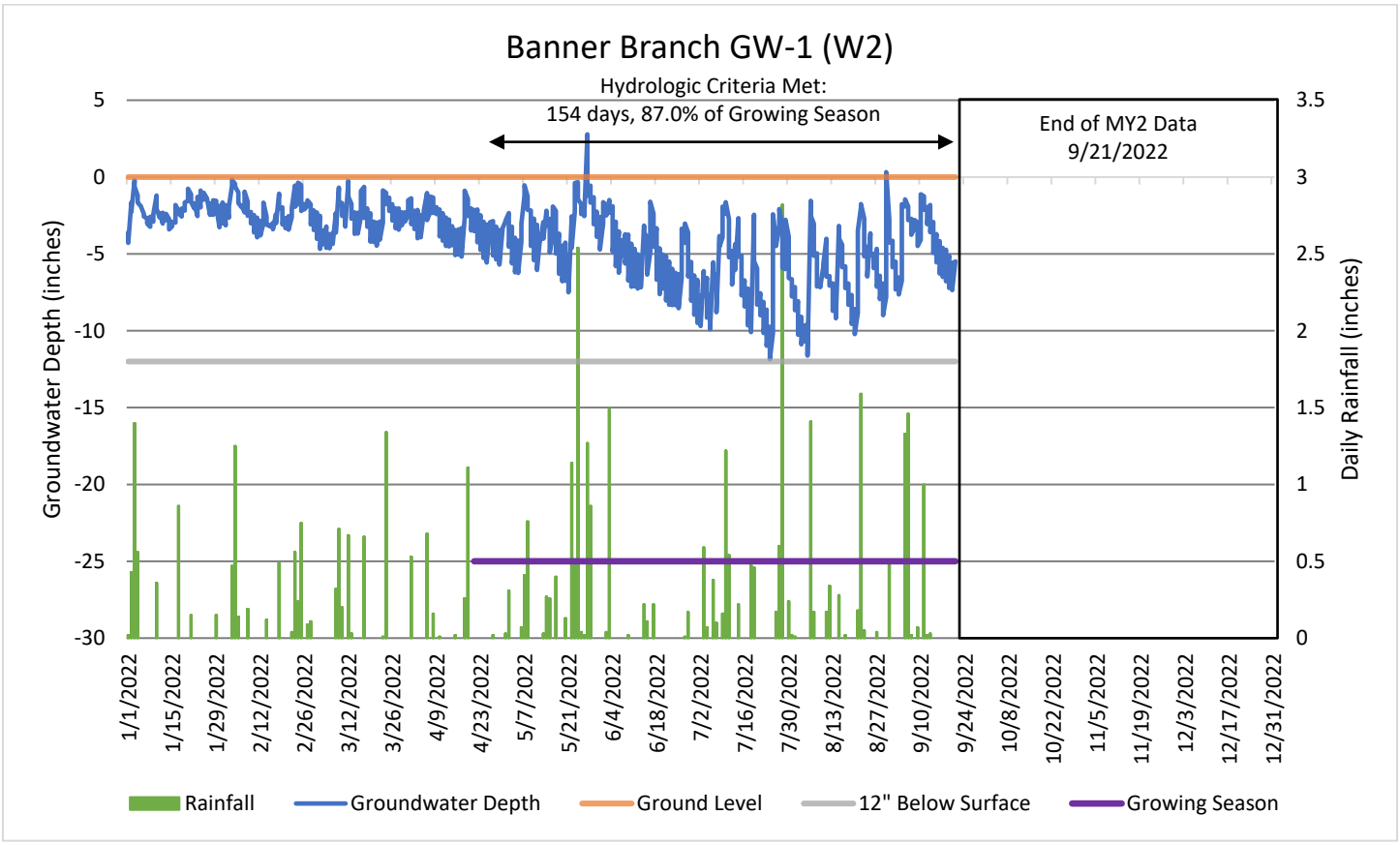
***CG-2:** 7 overbank events with a maximum of 0.923' above bankfull

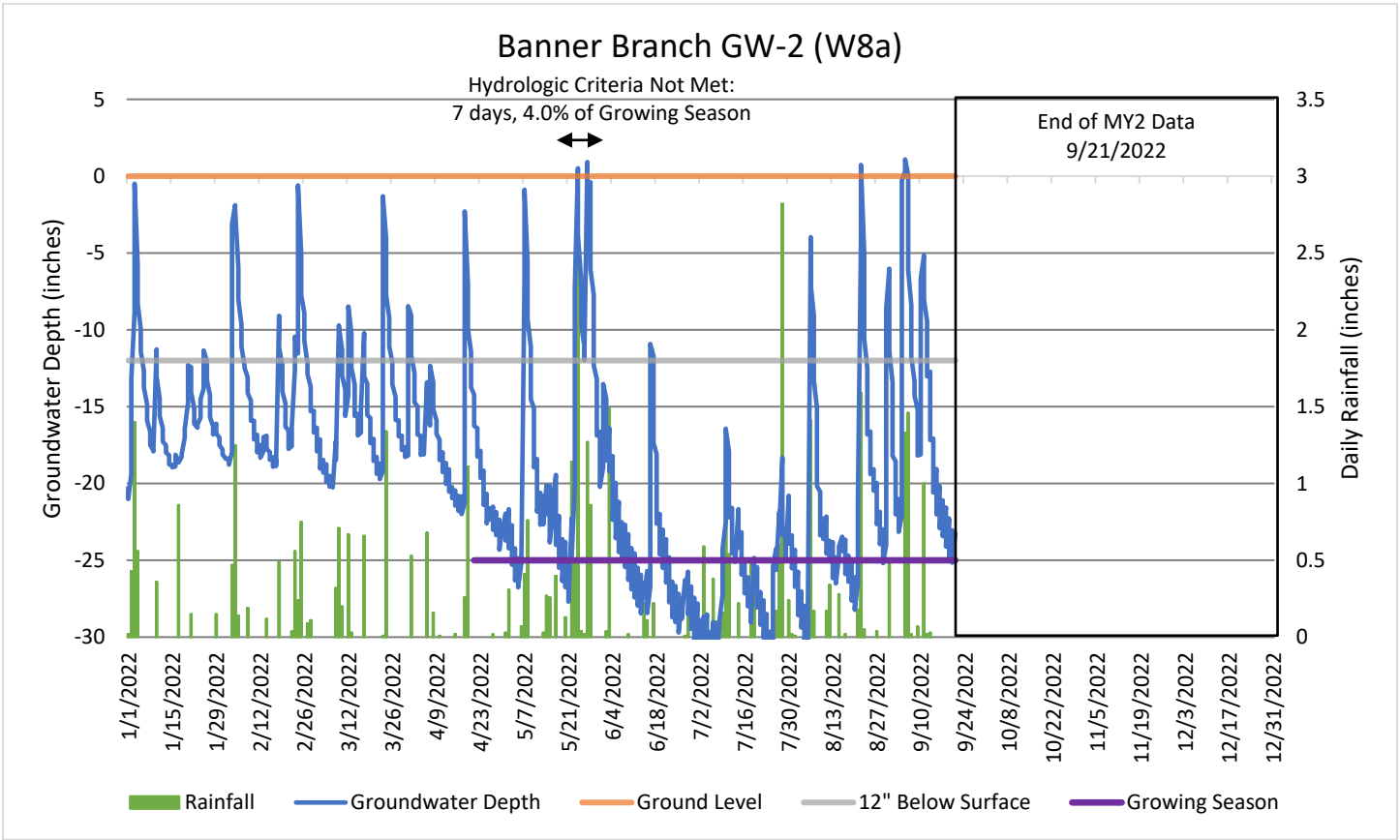


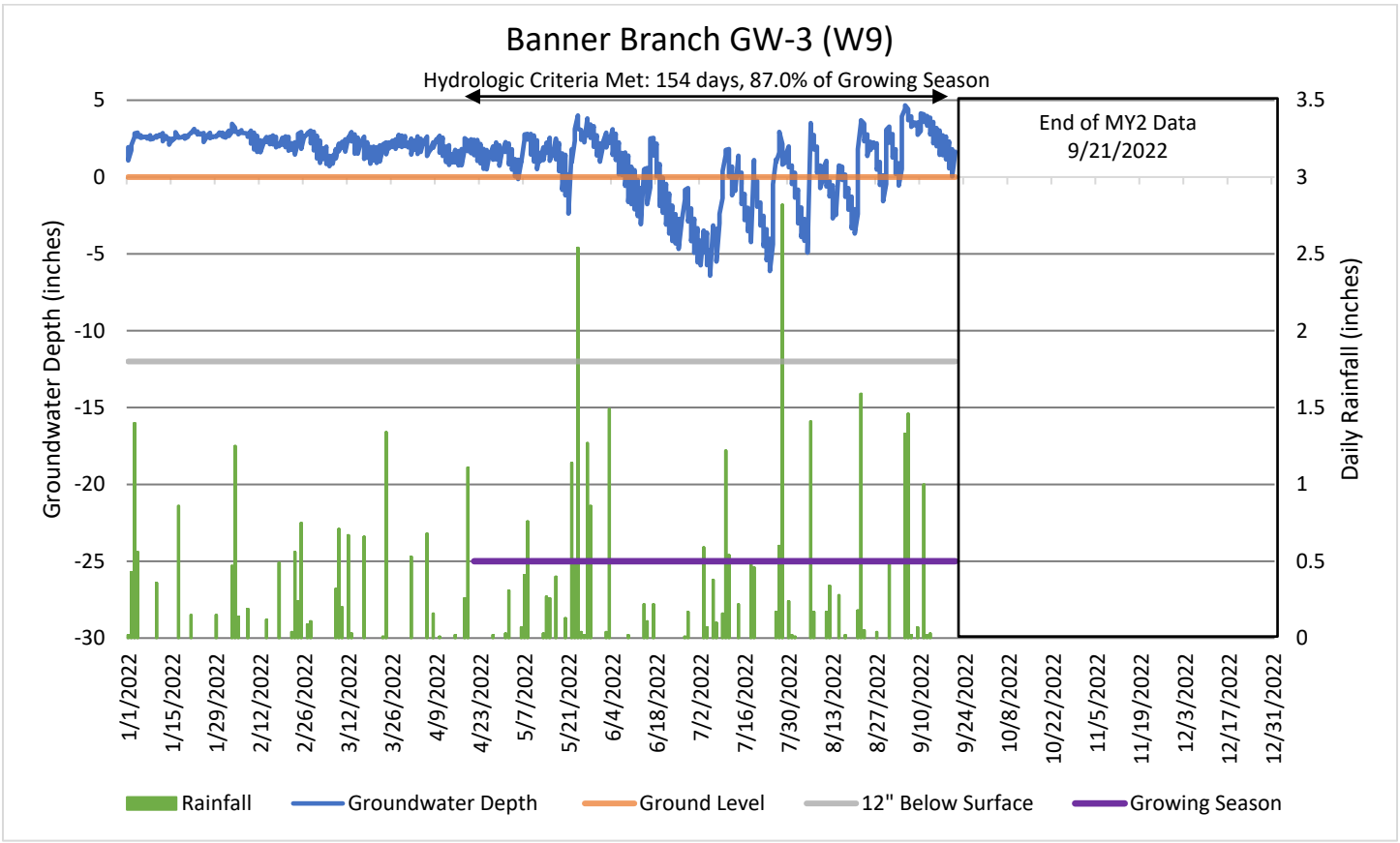
***CG-3:** 2 overbank events with a maximum of 0.429' above bankfull

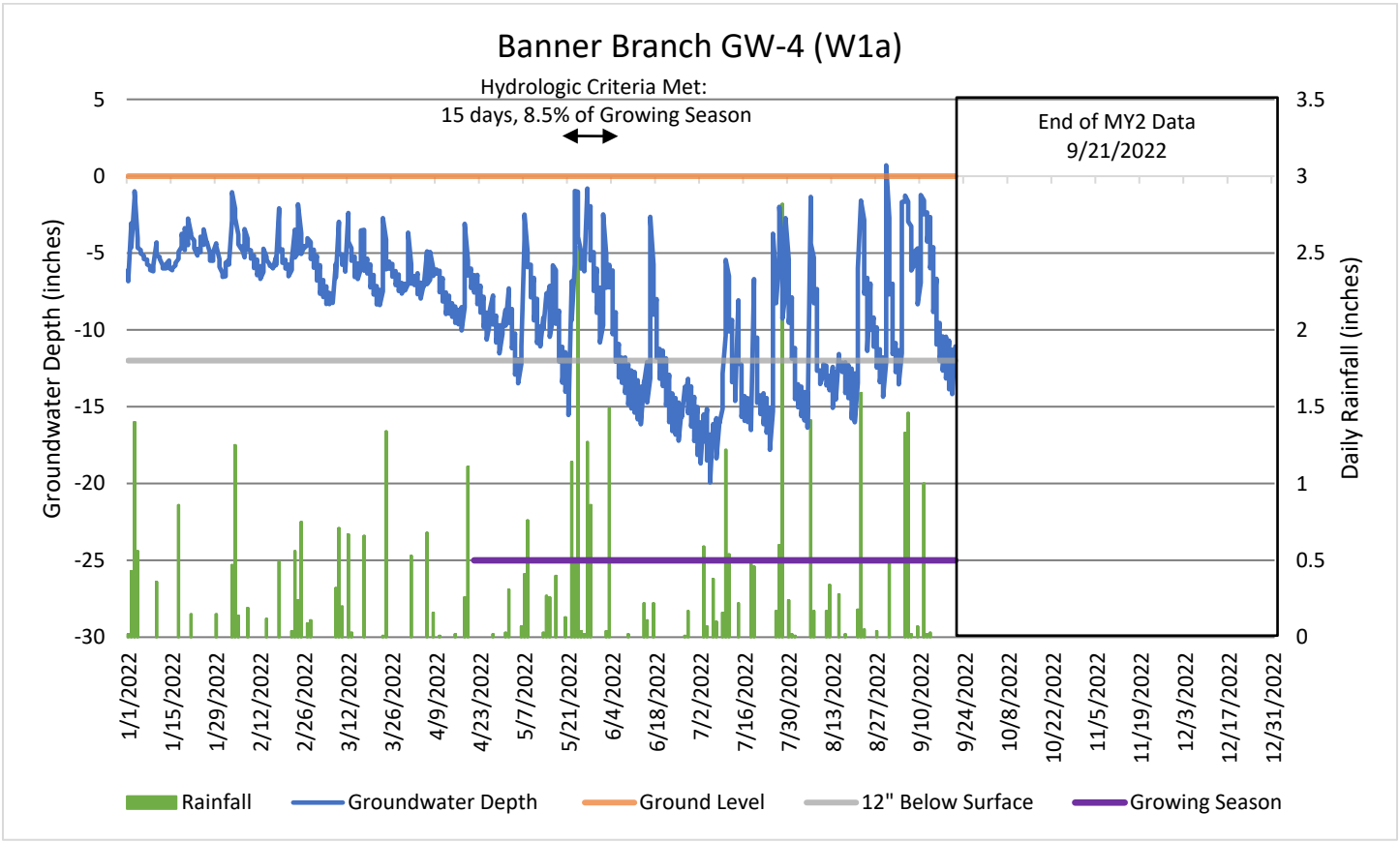
Max Consecutive Hydroperiod Saturation within 12 Inches of Soil Surface (Percent of Growing Season 4/21-10/16) CRONOS Station: Danbury									
Monitoring Gauge Name	MY1 2021	MY2 2022	MY3 2023	MY4 2024	MY4 2025	MY5 2026	MY6 2027	MY7 2028	Mean
Wetland Gauge 1	71.8%	87.0%							79.4%
Wetland Gauge 2	1.7%	4.0%							2.9%
Wetland Gauge 3	100.0%	87.0%							93.5%
Wetland Gauge 4	40.1%	8.5%							24.3%
Wetland Gauge 5	40.7%	8.5%							24.6%
Wetland Gauge 6	100.0%	37.3%							68.7%
Wetland Gauge 7	100.0%	87.0%							93.5%
Wetland Gauge 8	14.1%	15.8%							15.0%
Wetland Gauge 9	14.7%	17.5%							16.1%

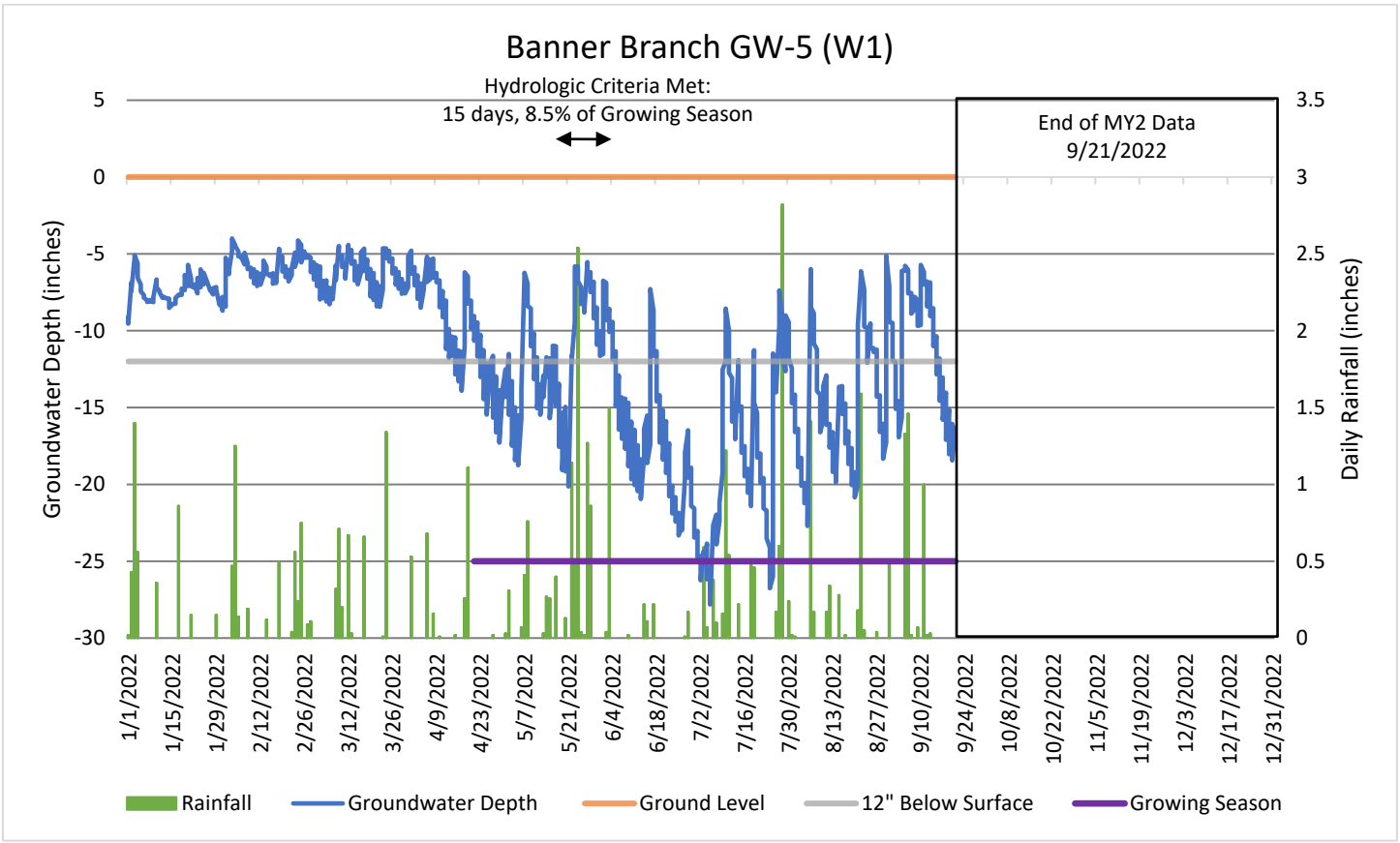
Groundwater Gauge Graphs

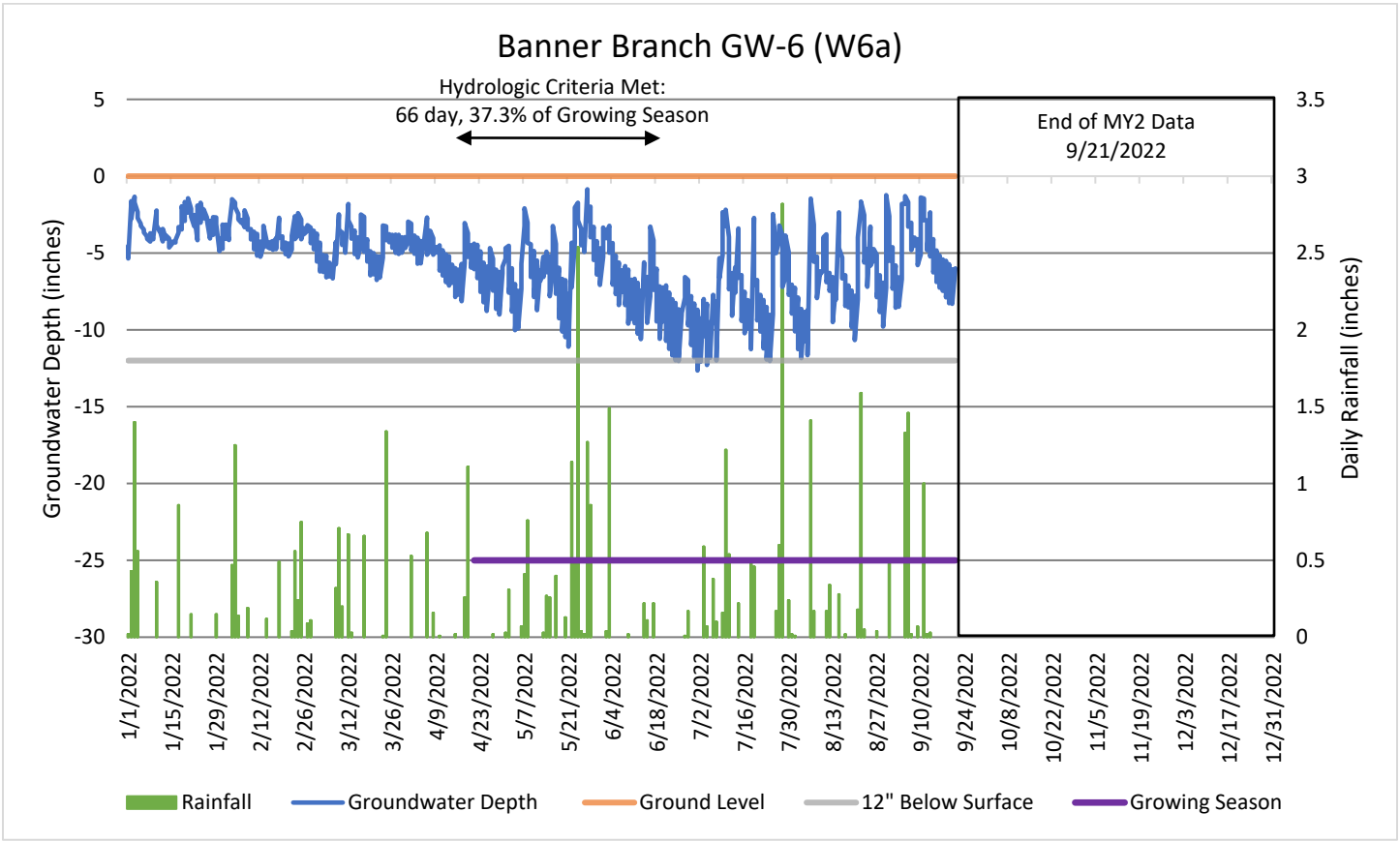


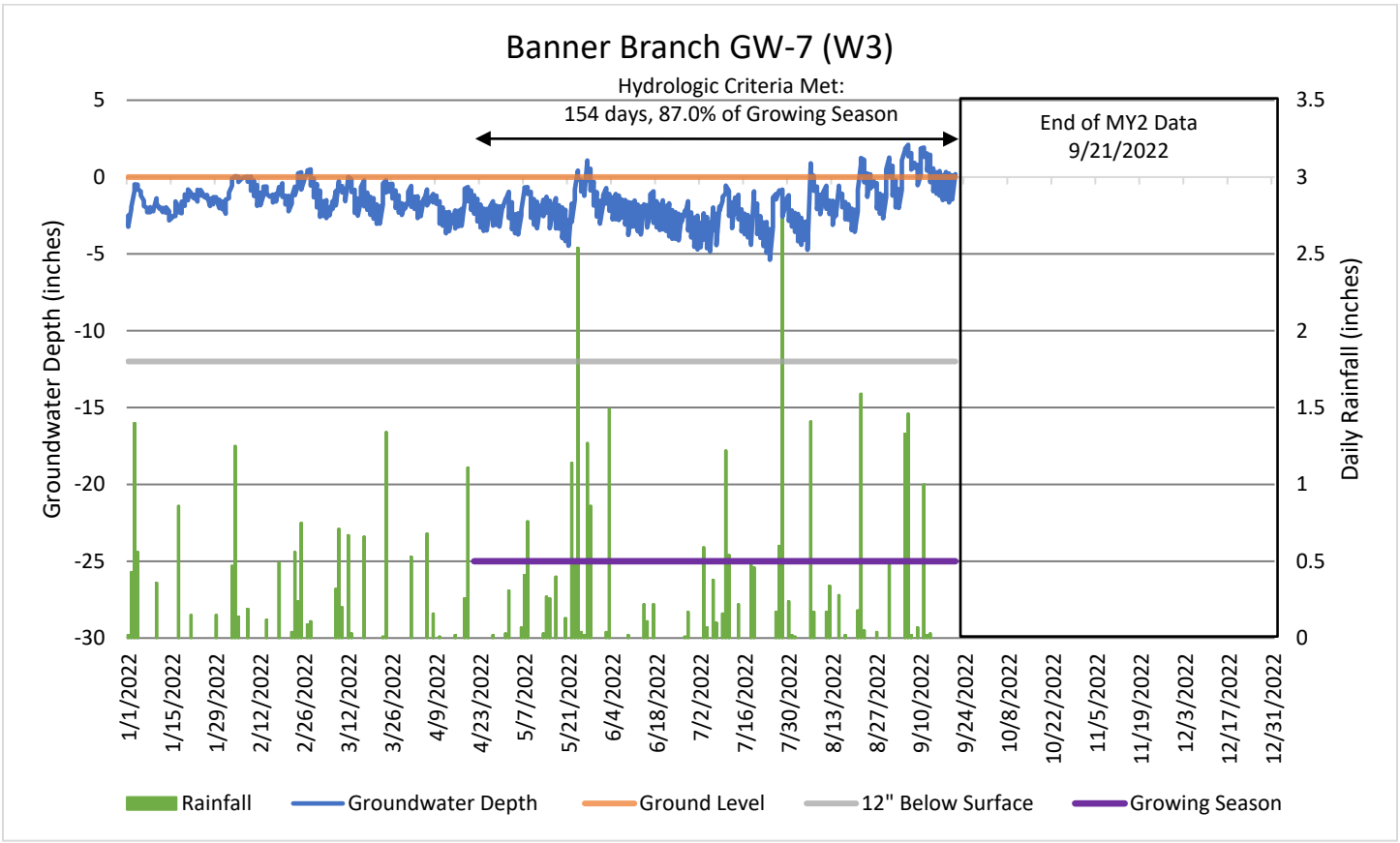


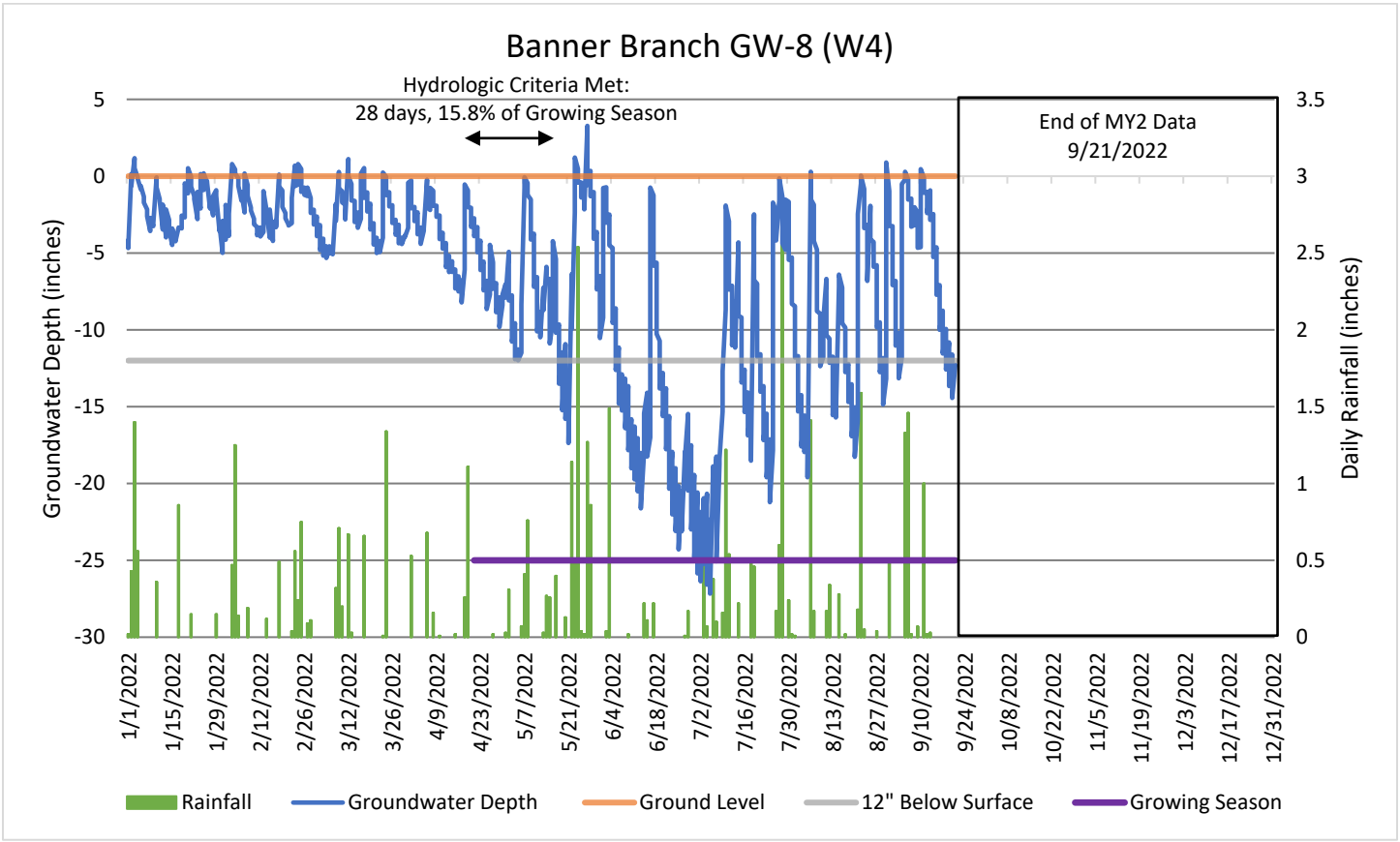

Banner Branch GW-3 (W9)
Hydrologic Criteria Met: 154 days, 87.0% of Growing Season
End of MY2 Data
9/21/2022
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2022
1/15/2022
1/29/2022
2/12/2022
2/26/2022
3/12/2022
3/26/2022
4/9/2022
4/23/2022
5/7/2022
5/21/2022
6/4/2022
6/18/2022
7/2/2022
7/16/2022
7/30/2022
8/13/2022
8/27/2022
9/10/2022
9/24/2022
10/8/2022
10/22/2022
11/5/2022
11/19/2022
12/3/2022
12/17/2022
12/31/2022
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season

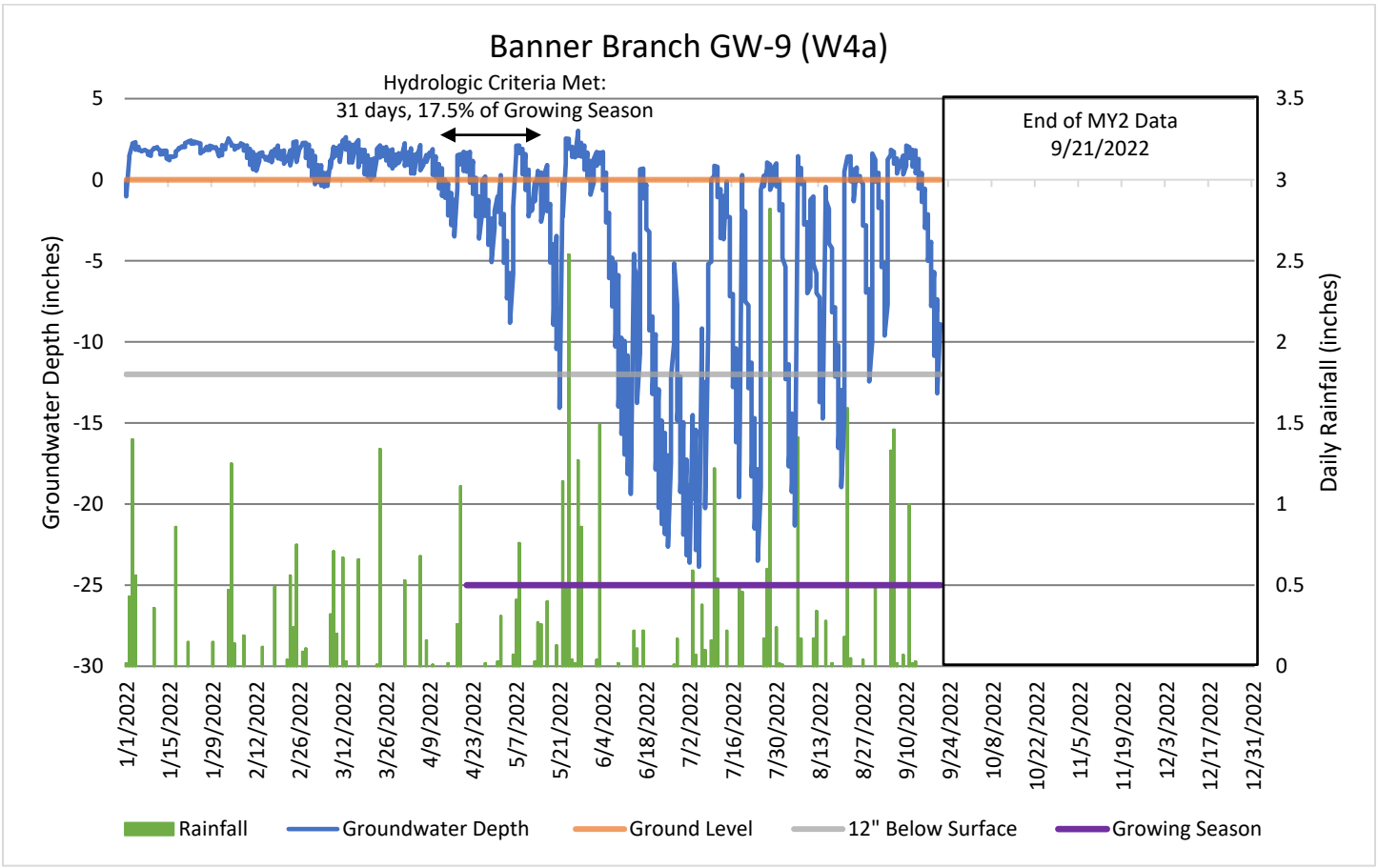

Banner Branch GW-4 (W1a)
Hydrologic Criteria Met:
15 days, 8.5% of Growing Season
End of MY2 Data
9/21/2022
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2022
1/15/2022
1/29/2022
2/12/2022
2/26/2022
3/12/2022
3/26/2022
4/9/2022
4/23/2022
5/7/2022
5/21/2022
6/4/2022
6/18/2022
7/2/2022
7/16/2022
7/30/2022
8/13/2022
8/27/2022
9/10/2022
9/24/2022
10/8/2022
10/22/2022
11/5/2022
11/19/2022
12/3/2022
12/17/2022
12/31/2022
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season

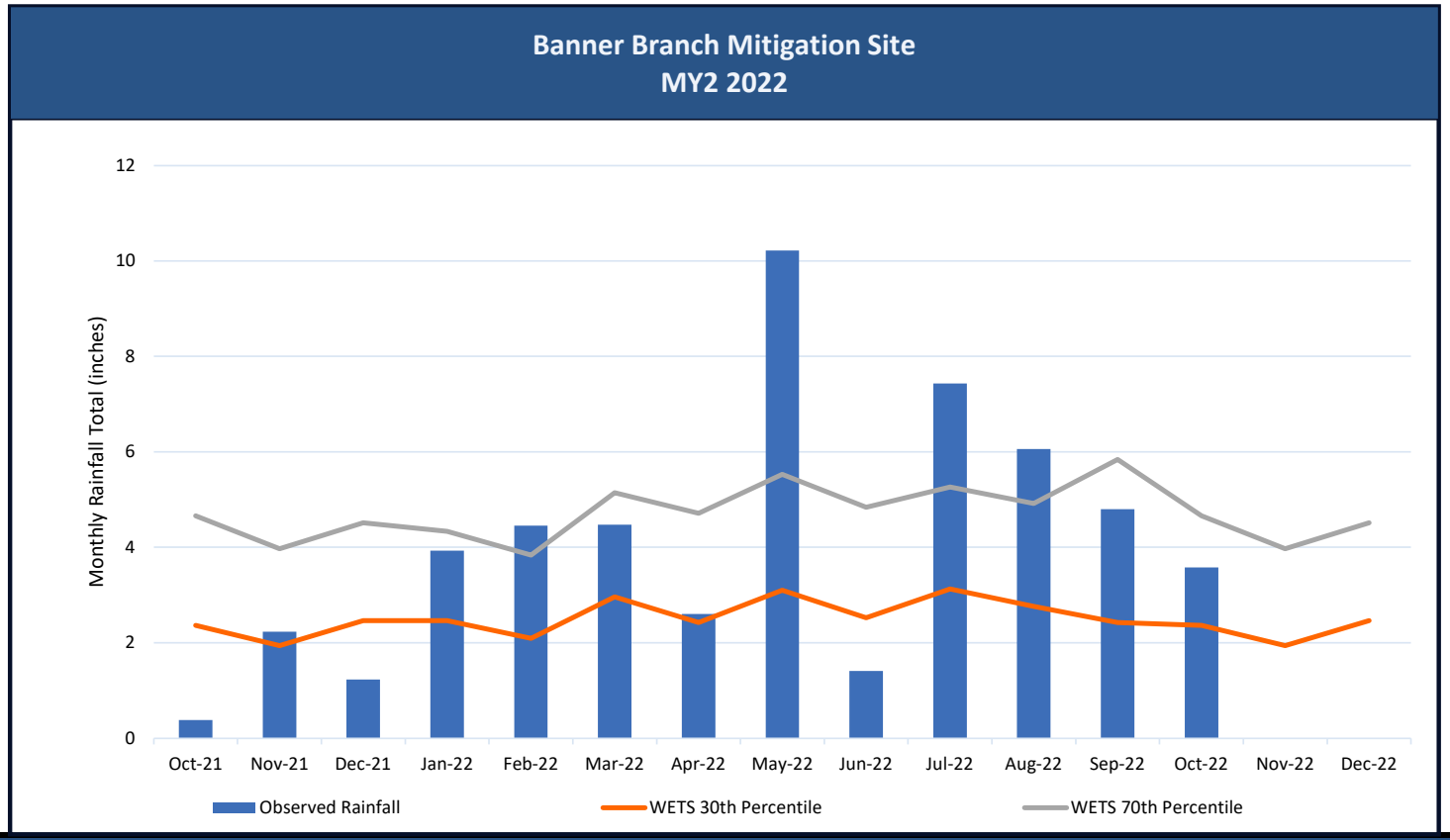

Banner Branch GW-5 (W1)
Hydrologic Criteria Met:
15 days, 8.5% of Growing Season
End of MY2 Data
9/21/2022
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2022
1/15/2022
1/29/2022
2/12/2022
2/26/2022
3/12/2022
3/26/2022
4/9/2022
4/23/2022
5/7/2022
5/21/2022
6/4/2022
6/18/2022
7/2/2022
7/16/2022
7/30/2022
8/13/2022
8/27/2022
9/10/2022
9/24/2022
10/8/2022
10/22/2022
11/5/2022
11/19/2022
12/3/2022
12/17/2022
12/31/2022
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Banner Branch GW-6 (W6a)
Hydrologic Criteria Met:
66 day, 37.3% of Growing Season
End of MY2 Data
9/21/2022
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
1/1/2022
1/15/2022
1/29/2022
2/12/2022
2/26/2022
3/12/2022
3/26/2022
4/9/2022
4/23/2022
5/7/2022
5/21/2022
6/4/2022
6/18/2022
7/2/2022
7/16/2022
7/30/2022
8/13/2022
8/27/2022
9/10/2022
9/24/2022
10/8/2022
10/22/2022
11/5/2022
11/19/2022
12/3/2022
12/17/2022
12/31/2022
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Banner Branch GW-7 (W3)
Hydrologic Criteria Met:
154 days, 87.0% of Growing Season
End of MY2 Data
9/21/2022
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
1/1/2022
1/15/2022
1/29/2022
2/12/2022
2/26/2022
3/12/2022
3/26/2022
4/9/2022
4/23/2022
5/7/2022
5/21/2022
6/4/2022
6/18/2022
7/2/2022
7/16/2022
7/30/2022
8/13/2022
8/27/2022
9/10/2022
9/24/2022
10/8/2022
10/22/2022
11/5/2022
11/19/2022
12/3/2022
12/17/2022
12/31/2022
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Banner Branch GW-8 (W4)
Hydrologic Criteria Met:
28 days, 15.8% of Growing Season
End of MY2 Data
9/21/2022
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
1/1/2022
1/15/2022
1/29/2022
2/12/2022
2/26/2022
3/12/2022
3/26/2022
4/9/2022
4/23/2022
5/7/2022
5/21/2022
6/4/2022
6/18/2022
7/2/2022
7/16/2022
7/30/2022
8/13/2022
8/27/2022
9/10/2022
9/24/2022
10/8/2022
10/22/2022
11/5/2022
11/19/2022
12/3/2022
12/17/2022
12/31/2022
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Banner Branch GW-9 (W4a)
Hydrologic Criteria Met:
31 days, 17.5% of Growing Season
End of MY2 Data
9/21/2022
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
1/1/2022
1/15/2022
1/29/2022
2/12/2022
2/26/2022
3/12/2022
3/26/2022
4/9/2022
4/23/2022
5/7/2022
5/21/2022
6/4/2022
6/18/2022
7/2/2022
7/16/2022
7/30/2022
8/13/2022
8/27/2022
9/10/2022
9/24/2022
10/8/2022
10/22/2022
11/5/2022
11/19/2022
12/3/2022
12/17/2022
12/31/2022
Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season



Banner Branch Mitigation Project Monthly Rainfall Summary															
	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22
Observed Rainfall	0.38	2.23	1.23	3.93	4.45	4.47	2.60	10.22	1.41	7.43	6.06	4.80	3.58	**	**
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	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

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