MY3 FINAL MONITORING REPORT
Buffalo Creek Tributaries Mitigation Project
Johnston County
Neuse River Basin
CU 03020201

DMS Project # 100042
DMS Contract # 7422
DMS RFP # 16-007279
USACE Action ID Number: SAW-2018-00425
DWR Project # 2018-0199 V2
Calendar Year of Data Collection: 2023

Prepared for:

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

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

December 29, 2023

NC Department of Environmental Quality
Division of Mitigation Services
Attn: Emily Dunnigan, Project Manager
217 W. Jones Street, Suite 3000
Raleigh, NC 27609

RE: WLS Responses to NCDEQ DMS Review Comments for Task 9 Submittal, Draft Monitoring Year 3 Report for the Buffalo Creek Tributaries Mitigation Project, DMS Full-Delivery Project ID #100042, Contract #7422, Neuse River Basin, Cataloging Unit 03020201, Johnston County, NC

Dear Ms. Dunnigan:

Water & Land Solutions, LLC (WLS) is pleased to present the Final Monitoring Year 3 Report for the Buffalo Creek Tributaries Mitigation Project to the North Carolina Department of Environmental Quality (NCDEQ) Division of Mitigation Services (DMS). Per the DMS review comments, WLS has updated the Final Monitoring Year 3 Report and associated deliverables accordingly. We are providing the electronic deliverables via cloud link. The electronic deliverables are organized under the following folder structure as required under the digital submission requirements:

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

We are providing our written responses to DMS' review comments on the Monitoring Year 3 Report below. Each of the DMS review comments is copied below in **bold** text, followed by the appropriate response from WLS in regular text:

Report Comments:

1. **Figure 1c: Groundwater well 8 is missing from the CCPV; please update.** WLS Response: Groundwater well 8 has been added to the CCPV.
2. **Pg. 11, Section 4.3: Failure of groundwater well 1 to meet success criteria for all monitoring years is concerning. Consider adding additional gauges here in MY4 and elaborate on site conditions in the narrative. If failure of the gauge continues, WLS will need to identify the extent of the at-risk wetlands and discuss in next year's monitoring report.** WLS Response: WLS will be installing an additional groundwater well in W1 near GW-1 at the beginning of MY4. Additional verbiage has been added within the narrative describing the

on-site conditions of W1. After data from all groundwater gauges is collected and processed at the end of MY4, WLS will identify and address any at-risk wetlands in the MY4 report.

3. **Pg. 11, Section 4.4: Veg plot 1 is not meeting MY3, MY5, or MY7 criteria. Please consider conducting random transect surveys near plot 1 to determine if stem density is similar outside of the veg plot and if supplemental planting may be necessary.** WLS Response: Vegetation monitoring is not required in MY4, however, WLS will re-survey vegetation plot 1 in MY4. Overall plot average height is trending towards success, and low stem density is likely due to planting under existing canopy, wetness and dense herbaceous cover. No supplemental planting is planned at this time.
4. **Appendix A, Cross-section photos: XS-11 upstream and downstream photos are mixed up; please revise.** WLS Response: XS-11 photos have been corrected to match the correct reach view, and photo labels have been updated in the E-data folder.
5. **Appendix D: DMS encourages WLS to include gauge data for the entirety of the growing season in the final submission.** WLS Response: WLS has included all gauge data that has been collected in the final report (ending 9/5/23). For future monitoring reports, efforts will be made to include data as close to the end of the growing season as feasibly possible with monitoring schedules.
6. **Appendix D, Rainfall Table: Please update with rainfall through November if possible.** WLS Response: Rainfall data through November 2023 has been updated in the Appendix D Rainfall Table.
7. **Appendix F: Please include photos of the MY3 sampling station.** WLS Response: Photos in Appendix F have been updated with MY3 sampling station photos.

Electronic Comments:

1. **The submission is missing the added groundwater gauge; resubmit the groundwater gauge file with the added monitoring station.** WLS Response: An updated shapefile with all current gauges has been added to the E-data folder.

Please contact me if you have any questions or comments.

Sincerely,

Water & Land Solutions, LLC

Alyssa Davis

Alyssa Davis
Water & Land Solutions, LLC
7721 Six Forks Road, Suite 130
Raleigh, NC 27615
Office Phone: (919) 614-5111
Email: alyssa@waterlandsolutions.com

Table of Contents

LIST OF APPENDICES

1 Project Summary

1.1 Project Location and Description

The Buffalo Creek Tributaries 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 16-007279. The Project will provide stream and wetland mitigation credits in the Neuse River Basin (Cataloging Unit 03020201). The project site is in Johnston County, North Carolina between the Town of Wendell and the Community of Archer Lodge. The Project is in the Lower Buffalo Creek Priority Sub-watershed 030202011504, study area for the Neuse 01 Regional Watershed Plan Phase II, Final Report (RWP), and in the Targeted Local Watershed 03020201180050, of the Neuse River Basin.

The Project involved the restoration, enhancement, and preservation of eight stream reaches (MS-R1, MS-R2, R3 (upper), R3 (lower), R4, R5 (upper), R5 (lower), and R6) with designed totals of approximately 5,029 linear feet of streams. The Project also includes riparian wetland restoration (re-establishment) and enhancement of approximately 3.495 acres. The Project provides significant ecological improvements and functional uplift through stream and wetland restoration and will decrease nutrient and sediment loads within the watershed. See Section 2 for a detailed benefits summary and Table 1 for a summary of project assets. Figure 1a illustrates the project mitigation components.

Prior to construction, many of the existing streams were incised and degraded due to excess bank erosion and increased stormwater flows. Wetland hydrology was drained across the floodplain and areas mapped with hydric soils. The existing vegetation within the riparian corridor consists of mixed hardwood forest with some disturbed pine forest. Adjacent land use consists of agriculture, silviculture, and residential development.

Monitoring Year 3 (MY3) activities occurred during March and September 2023. This report presents the data for MY3. The Project meets the MY3 success criteria for stream hydrology, stream horizontal and vertical stability, and streambed condition and stability. Of the eight vegetation plots, two are not meeting interim success criteria. Seven of the eight groundwater gauges met success criteria for hydrology. Based on these results, the Project is on trajectory to meet interim and final success criteria. For more information on the chronology of the project history and activity, refer to Appendix E. Relevant project contact information is presented in Appendix E, and project background information is presented in Table 3.

1.2 Project Quantities and Credits

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

Table 1. Buffalo Creek Tributaries Mitigation Project (DMS# 100042) 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							
MS-R1	1543	1538	Warm	R (PI)	1.00000	1,543.000	Full channel restoration, planted buffer, permanent conservaiton easement
MS-R2	1351	1337	Warm	R (PI)	1.00000	1,351.000	Full channel restoration, planted buffer, permanent conservaiton easement
R3 (upper)	565	577	Warm	P	10.00000	56.500	Preservation of existing channel, permanent conservation easement
R3 (lower)	116	99	Warm	R (PI)	1.00000	116.000	Full channel restoration, planted buffer, permanent conservaiton easement
R4	459	499	Warm	EI	1.50000	306.000	Supplemental buffer planting, bank stabilization, permanent conservation easement
R5 (upper)	585	600	Warm	EI	1.50000	390.000	Supplemental buffer planting, bank stabilization, permanent conservation easement
R5 (lower)	158	171	Warm	R (PI)	1.00000	158.000	Full channel restoration, planted buffer, permanent conservaiton easement
R6	252	232	Warm	EI	1.50000	168.000	Supplemental buffer planting, bank stabilization, permanent conservation easement
Wetland							
W1	2.013	2.044	R	REE	1.00000	2.013	Planted buffer, hydrologic improvements, permanent conservation easement
W2	0.932	0.990	R	REE	1.00000	0.932	Planted buffer, hydrologic improvements, permanent conservation easement
W3	0.475	0.484	R	REE	1.00000	0.475	Planted buffer, hydrologic improvements, permanent conservation easement
WB	0.039	0.032	R	E	2.00000	0.020	Planted buffer, hydrologic improvements, permanent conservation easement
WC	0.004	0.004	R	E	2.00000	0.002	Planted buffer, hydrologic improvements, permanent conservation easement
WD	0.032	0.038	R	E	2.00000	0.016	Planted buffer, hydrologic improvements, permanent conservation easement

Project Credits

Restoration Level	Stream			Riparian Wetland	Non-Rip Wetland	Coastal Marsh
	Warm	Cool	Cold			
Restoration	3,168.000					
Re-establishment				3.420		
Rehabilitation						
Enhancement				0.038		
Enhancement I	864.000					
Enhancement II						
Creation						
Preservation	56.500					
Totals	**4,088.500**			**3.458**		

Total Stream Credit	**4,088.500**
Total Wetland Credit	**3.458**

Wetland Mitigation Category			Restoration Level	
CM	Coastal Marsh		HQP	High Quality Preservation
R	Riparian		P	Preservation
NR	Non-Riparian		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 (Figures 1a-c) present the Current Condition Plan View (CCPV).

WATER & LAND™ SOLUTIONS

NC Mitigation Services ENVIRONMENTAL QUALITY

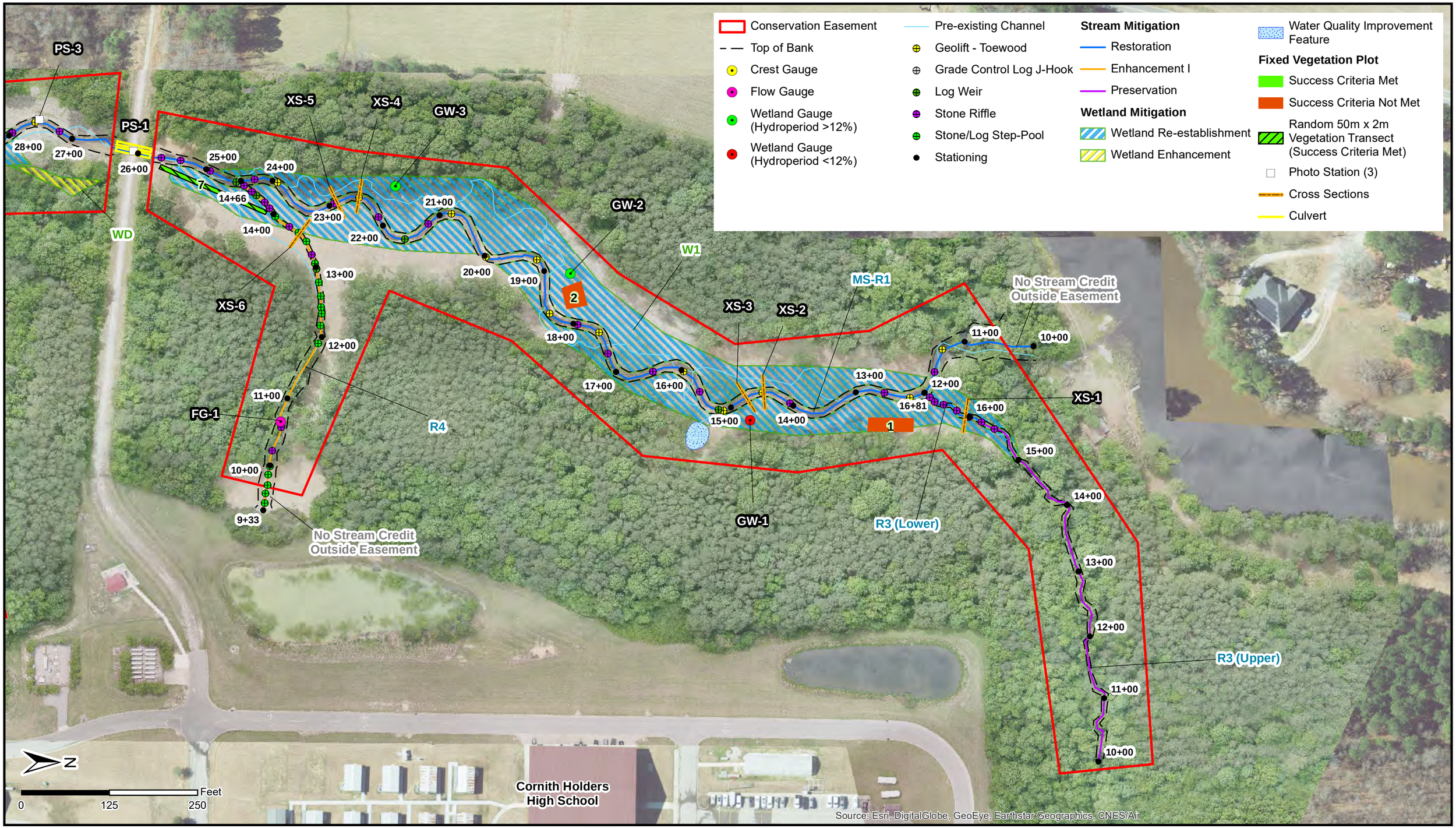
Buffalo Creek Tributaries Mitigation Project
Johnston County, North Carolina

USACE Action ID Number:
SAW-2018-00425
October 2023
MY3

USACE
Current Conditions Plan View
Monitoring Year 3

NAD 1983 2011 State Plane
North Carolina FIPS 3200 FT US

FIGURE
1a



WATER & LAND™ SOLUTIONS

NC Mitigation Services ENVIRONMENTAL QUALITY

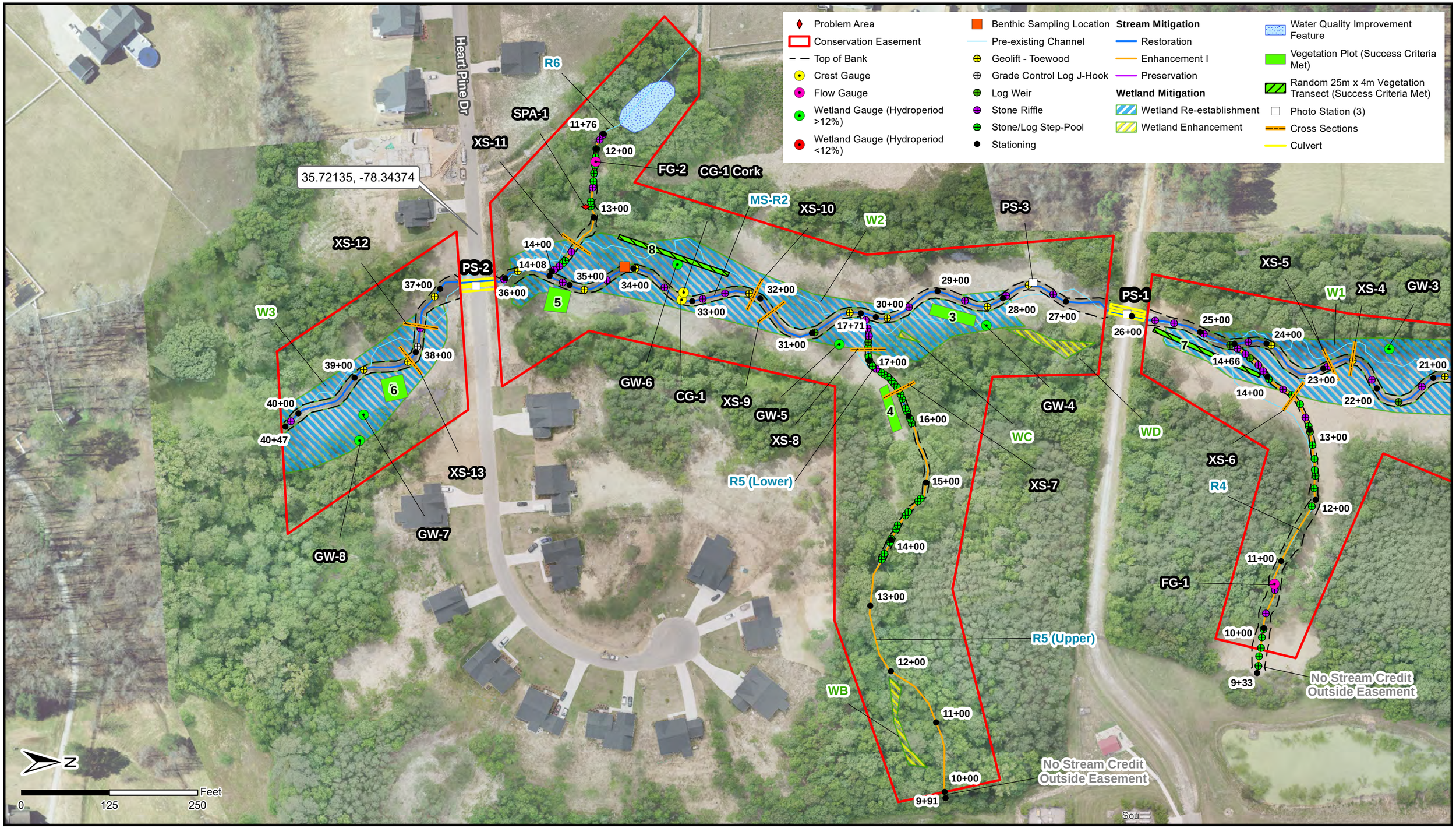
Buffalo Creek Tributaries Mitigation Project
Johnston County, North Carolina

USACE Action ID Number:
SAW-2018-00425
October 2023
MY3

USACE
Current Conditions Plan View
Monitoring Year 3

NAD 1983 2011 State Plane
North Carolina FIPS 3200 FT US

FIGURE
1b



WATER & LAND™ SOLUTIONS	NC Mitigation Services ENVIRONMENTAL QUALITY	**Buffalo Creek Tributaries Mitigation Project** **Johnston County, North Carolina**	USACE Action ID Number: SAW-2018-00425 October 2023 MY3	USACE Current Conditions Plan View Monitoring Year 3 NAD 1983 2011 State Plane North Carolina FIPS 3200 FT US	FIGURE 1 c

2 Goals, Performance Criteria, and Functional Improvements

2.1 Project Goals and Objectives

The Project will meet the goals and objectives described in the Buffalo Creek Tributaries Final Approved Mitigation Plan and will address general restoration goals and opportunities outlined in the DMS Neuse River Basin Watershed Restoration Priorities (RBRP). More specifically, three out of the four functional goals and objectives outlined in the Wake-Johnston Collaborative Local Watershed Plan (LWP) as well as the Neuse 01 RWP will be met by:

- Reducing sediment and nutrient inputs to the Buffalo Creek Watershed.
- Restoring, preserving, and protecting wetlands, streams, riparian buffers, and aquatic habitat.
- Implementing stream restoration in rural catchments together as "project clusters."

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

- Restore stream and floodplain interaction and geomorphically stable conditions by reconnecting historic flow paths and promoting more natural flood processes;
- Improve and protect water quality by reducing streambank erosion, nutrient and sediment inputs;
- Restore and protect riparian buffer functions and habitat connectivity in perpetuity by recording a permanent conservation easement; and
- Incorporate water quality improvement features 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	2 Flow gauges (R4 and R6).	2/2 Flow gauges documented a minimum of 30 consecutive days of flow.
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 12% of growing season.	1 Crest gauge/pressure transducer (MS-R2), 8 wetland groundwater gauges (W1,W2, and W3).	1/1 Crest gauge documented bankfull events. 7/8 wetland gauges met 12% criteria.
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.	13 Cross section surveys	13/13 cross sections BHR<1.2.
Establish Riparian Buffer Vegetation	Plant native species vegetation a minimum 50' 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 seven feet; and a minimum of 210 stems per acre at year seven with an average height of ten feet.	Tree data for 6 permanent veg Plots and 2 Random veg transects (species & height), visual assessment	6/8 met requirements - 2023

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.

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.

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 riffles within 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 in 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 13 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: Streambed material should not significantly change over time, and any significant changes (e.g., aggradation, degradation, embeddedness) will be noted after streambank vegetation becomes established and a minimum of two bankfull flows or greater have been documented. If significant changes are observed within stable riffles and pools, additional sediment transport analyses may be required.

Jurisdictional Stream Flow: Monitoring of stream flow will be conducted to demonstrate that the restored stream systems classified as intermittent exhibit surface flow for a minimum of 30 consecutive days throughout some portion of the year during years with normal rainfall conditions. Stream flow monitoring will be accomplished with pressure transducers installed in pools and correlating sensor depth to the downstream top of riffle elevation (see appendix D for installation diagrams). 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.

2.2.2 Wetlands

Wetland Hydrology: The performance standard for wetland hydrology will be 12 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 12 percent (27 days) of the 227-day growing season (March 21st through November 3rd) based on the WETS data table for Johnston 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, installed at the Odell's House Mitigation Project, and the Clayton (CLAY) Research Weather Station, approximately nine miles southeast 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.

Wetland hydrology will be monitored to document success in wetland restoration and enhancement areas where hydrology was affected. This will be accomplished with automatic pressure transducer gauges (located in groundwater wells) that record daily (twice per day) groundwater levels. The pressure transducer gauges are HOBO Water Level (13ft) Loggers made by Onset. Seven gauges will be installed within the wetland crediting areas. One automatic pressure transducer will be installed above ground for use as a barometric reference. One rain gauge will be installed at the adjacent Odell's House Mitigation Project site (0.3 miles southeast of the project) to document rainfall at the project. Gauges are downloaded quarterly and wetland hydroperiods are calculated during the growing season. Gauge installation will follow current regulatory guidance. Gauge data is downloaded using a HOBO Onset Waterproof Shuttle Data Transporter. Visual observations of primary and secondary wetland hydrology indicators will also be recorded during quarterly site visits.

2.2.3 Vegetation

Vegetation monitoring will occur in the fall each required monitoring year, prior to leaf drop. Plots will be monitored in years 0, 1, 2, 3, 5, and 7. Vegetative success for the Project during the intermediate monitoring years will be based on 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 seven 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 ten 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 six permanent vegetation plots (10m x 10m or 20m x 5m) and two random vegetation transects (50m x 2m). 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 and density of planted species. Data will be processed using the DMS ShinyApp. For each plot, the origin will be marked with a PVC pole and the other three corners marked with rebar. 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, and general streambed conditions. Permanent photo points will be at the cross-sections and culvert crossings.

3 Project Attributes

3.1 Design Approach

The Project stream design approach included a combination of Stream Restoration, Enhancement Level I, and Preservation activities (Table 1). A Priority Level I restoration approach was incorporated with the design of both a single-thread meandering channel along the main stem (MS-R1 and MS-R2) and step-pool channels (R3, R4, R5 and R6). All non-vegetated or disturbed areas within the conservation easement were planted with native species vegetation, and any areas of invasive species were removed and/or treated.

3.2 Project Attributes

See Table 3 below for Project attributes.

Table 3. Project Attribute Table						
Project Name	Buffalo Creek Tributaries Mitigation Project					
County	Johnston					
Project Area (acres)	17.1					
Project Coordinates (latitude and longitude decimal degrees)	35.72275, -78.34285					
Project Watershed Summary Information						
Physiographic Province	Piedmont					
River Basin	Neuse					
USGS Hydrologic Unit 8-digit	3020201					
DWR Sub-basin	03-04-06					
Project Drainage Area (acres)	543 acres					
Project Drainage Area Percentage of Impervious Area	13%					
Land Use Classification	2.01.03, 2.01.01, 3.02 (20% cultivated crops, 9% grass/herbaceous, 48% mixed forest)					
Reach Summary Information						
Parameters	**MS-R1**	**MS-R2**	**R3 (upper and lower)**	**R4**	**R5 (upper and lower)**	**R6**
Pre-project length (feet)	1,803	1,475	701	469	766	208
Post-project (feet)	1,538	1,337	676	499	771	232
Valley confinement (Confined, moderately confined, unconfined)	moderately confined	moderately confined	unconfined	unconfined	unconfined	unconfined
Drainage area (acres)	442	543	24	30	19	25
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Int/Perennial[1]	Ephemeral[2]	Perennial	Intermittent
NCDWR Water Quality Classification	C, NSW	C, NSW	C, NSW	C, NSW	C, NSW	C, NSW
Dominant Stream Classification (existing)	G4c	G4c/Incised E4	C5b (upper), G5 (lower)	G5c/C5	Incised E5 (upper), G5c (lower)	B5a
Dominant Stream Classification (proposed)	C4	C4	B4	B4	B4	B4
Dominant Evolutionary class (Simon) if applicable	III/IV	III	III	IV/V	I/III	I
Wetland Summary Information						
Parameters	**W1**	**W2**	**W3**	**WB**	**WC**	**WD**
Pre-project (acres)	N/A	N/A	N/A	0.039	0.004	0.032
Post-project (acres)	2.044	0.990	0.484	0.032	0.004	0.038
Wetland Type (non-riparian, riparian)	Riparian	Riparian	Riparian	Riparian	Riparian	Riparian
Mapped Soil Series	Wt: Wedhadkee loam	Wt: Wedhadkee loam	Wt: Wedhadkee loam	Ly: Lynchburg sandy loam	Wt: Wedhadkee loam	Wt: Wedhadkee loam
Soil Hydric Status	Hydric A	Hydric A	Hydric A	N/A	Hydric A	Hydric A

Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	Yes	Yes	404 Permit
Water of the United States - Section 401	Yes	Yes	401 Permit
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

Note 1: Indicates that the lower section of the reach was classified as perennial and upper stream reach was classified as intermittent.
Note 2: Reach R4 is shown as a blue line stream on the USGS topographic map. The historic flow path has been piped from an existing stormwater BMP towards Reach R5 and diverted away from its natural stream valley.

4 Monitoring Year 3 Assessment and Results

The dates of Year 3 monitoring activities are detailed in Appendix E. All Year 3 monitoring data is presented in this report and in the appendices. The Project is on track for meeting stream, wetland, and vegetation interim success criteria. All monitoring device locations are depicted on the CCPV (Figure 1a-c).

4.1 Morphological Assessment

Morphological data for MY3 was collected in March 2023. Refer to Appendices A and C for summary data tables, morphological plots, and stream photographs.

4.1.1 Stream Horizontal Pattern & Longitudinal Profile

The MY3 visual observations of stream horizontal pattern and longitudinal profiles closely match the design parameters and did not show any significant deviation from as-built conditions. The 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.

One stream problem area (SPA-1) was noted during the spring site visit in MY3. One log step was noted to be piping on R6 at approximate station 12+90. The streambanks are stable above and below the structure, and the issue is isolated to one log step. WLS will continue to monitor this area in MY4. No remedial action is proposed at this time.

4.1.2 Stream Horizontal Dimension

The MY3 channel dimensions generally match the design parameters and are within acceptable and stable ranges of tolerance. Thirteen cross-sections are located in restoration and enhancement reaches across the project. Of the thirteen cross-sections, nine are located in riffles and four are located in pools. All thirteen cross-sections show little change in bankfull area, and all bank height ratios are less than 1.2. It is expected over time that some pools may accumulate fine sediment and organic matter, however, this is not an indicator of channel instability. Maximum riffle depths are also expected to fluctuate slightly throughout the monitoring period as the channels adjust to new flow regimes.

4.2 Stream Hydrology

4.2.1 Stream Flow

Two pressure transducers (flow gauges) were installed in March and April 2021 on reaches R4 and R6 to document baseflow conditions. The flow gauge locations are within the upper one-third of the project reaches as shown on the CCPV. Both flow gauges exhibited flow for a minimum of 30 days in MY3. Additionally, to determine if rainfall amounts are normal for the given year, precipitation data was obtained from a rain gauge installed at Odell's House Mitigation Project (DMS #100041) less than a mile south of the Project site. Rainfall was normal during MY3 data collection.

Flow Gauge Data

Flow Gauge Name	Flow Gauge Location	Longest Period of Consecutive Flow	Total Days of Cumulative Flow	Total Days of Cumulative No Flow	Longest Period of Consecutive No Flow
FG-1	R4	67 days 1/1/2023 – 3/8/2023	166 days	82 days	28 Days
FG-2	R6	165 days 1/1/2023 – 6/14/2023	194 days	54 days	21 Days

4.2.2 Bankfull Events

One crest gauge was installed in March 2021 to document bankfull events. WLS installed a conventional cork crest gauge, along with a pressure transducer to document flood status on MS-R2. During MY3, 8 bankfull events were recorded on the pressure transducer crest gauge with a maximum event of 1.375 feet above bankfull on July 13, 2023.

4.3 Wetlands

Seven wetland groundwater wells were installed in March and April 2021 to monitor wetland hydrology. Wetland groundwater well locations are shown on the CCPV. One additional groundwater well was installed prior to MY3 located in W3. During MY3, seven of the eight groundwater wells met the twelve percent wetland hydrology criteria. GW-1 did not meet hydrology criteria and had a hydroperiod of 6.14%. Two of the three groundwater wells in W1 were successful and have a mean average above 12% for the three years of monitoring. W1 general on-site conditions are favorable, with visual wetland vegetation and hydrology indicators throughout the delineated area. WLS will install an additional groundwater well in W1 near GW-1 at the beginning of MY4. WLS will continue to monitor all wetland gauges for success in MY4.

4.4 Vegetation

Monitoring of the six permanent vegetation plots and two random transects was completed during September 2023. Vegetation data and photos can be found in Appendix B. The MY3 average planted density is 379 stems per acre, which exceeds the interim measure of vegetative success of at least 320 planted stems per acre at the end of the third monitoring year. Six of the eight vegetation plots meet the interim success requirements, and the eight plots have a range of 202 - 607 stems per acre. Vegetation plot 1 is below MY3 success criteria by 3 stems, the low stem count is likely due to planting under existing canopy, wetness and dense herbaceous cover. Vegetation plot 2 is one stem below MY3 success criteria, the low stem count is likely due to dense herbaceous cover. Volunteer recruitment is expected to continue in both areas of VP1 and VP2, no remedial action is proposed currently. Although vegetation monitoring is not required in MY4, WLS will re-survey VP1 to closely monitor average stem density. Volunteer ironwood (*Carpinus caroliniana*), tulip poplar (*Liriodendron tulipifera*), and hazel alder (*Alnus serrulata*) were noted within the project during monitoring year 3 throughout the easement.

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

An area of concern was noted during a DMS site visit on July 2nd, 2021, of overland flow occurring along MS-R1 from an offsite BMP. This area is stable with dense herbaceous vegetation preventing soil erosion, and there are no impacts to the floodplain or the stream (see photos in Appendix A).

During MY1, there were two encroachments (~0.014 acres) observed near the southernmost culvert crossing on MS-R2. Both were sodded/planted grassy areas adjacent to new home construction. To prevent further encroachment, the homeowners were contacted, and the easement line was more clearly marked. Encroachment planting occurred on January 6th, 2022. During MY3, no further encroachments have occurred in these areas, and herbaceous and tree cover are doing well. These encroachments are resolved and WLS will continue to monitor the easement in these areas in MY4. No additional encroachments were noted during MY3.

Small populations of Chinese privet (*Ligustrum sinense*) were noted within the easement during MY1 and MY2. Larger privet was cut mechanically with a brush cutter, and smaller privet were treated with foliar spray. See the table below for treatment information. The site will be monitored closely, and any invasive plant species will be treated as needed. WLS staff made one visit to the site during MY3 to control resprouts. No significant populations of invasive species are present in the project area. Any further treatments will be documented and included in subsequent monitoring reports.

Invasive Species Herbicide Treatments

Monitoring Year	Invasive Targeted	Invasive Treatment	Date Treatment Conducted	Herbicide Used
1	Privet	Foliar	6/2/2021	Garlon 3A (3%)
2	Privet	Foliar	4/20/2022	Rodeo (3%)
3	Privet	Foliar	6/8/2023	Rodeo (3%)

4.5 Macrobenthic Sampling

One macrobenthic sampling location was surveyed prior to restoration activities on June 5th, 2020, on MS-R2. Prior to restoration, the site scored “Fair” with a biotic index score of 6.83. This area was re-surveyed in MY3 on March 29, 2023. MS-R2 scored “Poor” and had a biotic index score of 8.00. Benthic data and photographs are located in Appendix F. It is expected to see a lower score during the initial years of monitoring while macrobenthic invertebrates repopulate within the site. There are no performance metrics for macrobenthic scoring.

Appendix A:
Visual Assessment Data

Visual Stream Morphology Stability Assessment Table
Vegetation Condition Assessment Table
Photos: Cross-Section Photos
Photos: Stream Photo Points (Culvert Crossings, MS-R2)
Photos: Encroachment Areas and Additional Photos

Visual Stream Stability Assessment Table						
Reach	MS-R1					
Assessed Stream Length	1,538					
Assessed Bank Length	3,072					
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.	21	21		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)	15	15		100%

Visual Stream Stability Assessment Table						
Reach	MS-R2					
Assessed Stream Length	1,337					
Assessed Bank Length	2,674					
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.	19	19		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)	13	13		100%

Visual Stream Stability Assessment Table						
Reach	R3					
Assessed Stream Length	676					
Assessed Bank Length	1,352					
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)	2	2		100%

Visual Stream Stability Assessment Table						
Reach	R4					
Assessed Stream Length	499					
Assessed Bank Length	998					
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.	36	36		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)	9	9		100%

Visual Stream Stability Assessment Table						
Reach		R5				
Assessed Stream Length		771				
Assessed Bank Length		1,542				
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.	31	31		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)	13	13		100%

Visual Stream Stability Assessment Table						
Reach	R6					
Assessed Stream Length	232					
Assessed Bank Length	464					
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	27		96%
	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 Vegetation Condition Assessment Table				
Planted acreage	**6.3**			
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.	0.10acres	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	**17.1**			
Vegetation Category	**Definitions**	**Mapping Threshold**	**Combined Acreage**	**% of Easement Acreage**
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Species included in summation above should be identified in report summary.	0.10 acres	0.00	0.0%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	Black with Green stripes	0.0000	

R3 Lower, XS-1, Upstream (MY-00)

R3 Lower, XS-1, Upstream (MY-03)

R3 Lower, XS-1, Downstream (MY-00)

R3 Lower, XS-1, Downstream (MY-03)

R3 Lower, XS-1, Left Bank (MY-00)

R3 Lower, XS-1, Left Bank (MY-03)

R3 Lower, XS-1, Right Bank (MY-00)

R3 Lower, XS-1, Right Bank (MY-03)

MS-R1, XS-2, Upstream (MY-00)

MS-R1, XS-2, Upstream (MY-03)

MS-R1, XS-2, Downstream (MY-00)

MS-R1, XS-2, Downstream (MY-03)

MS-R1, XS-2, Left Bank (MY-00)

MS-R1, XS-2, Left Bank (MY-03)

MS-R1, XS-2, Right Bank (MY-00)

MS-R1, XS-2, Right Bank (MY-03)

MS-R1, XS-3, Upstream (MY-00)

MS-R1, XS-3, Upstream (MY-03)

MS-R1, XS-3, Downstream (MY-00)

MS-R1, XS-3, Downstream (MY-03)

MS-R1, XS-3, Left Bank (MY-00)

MS-R1, XS-3, Left Bank (MY-03)

MS-R1, XS-3, Right Bank (MY-00)

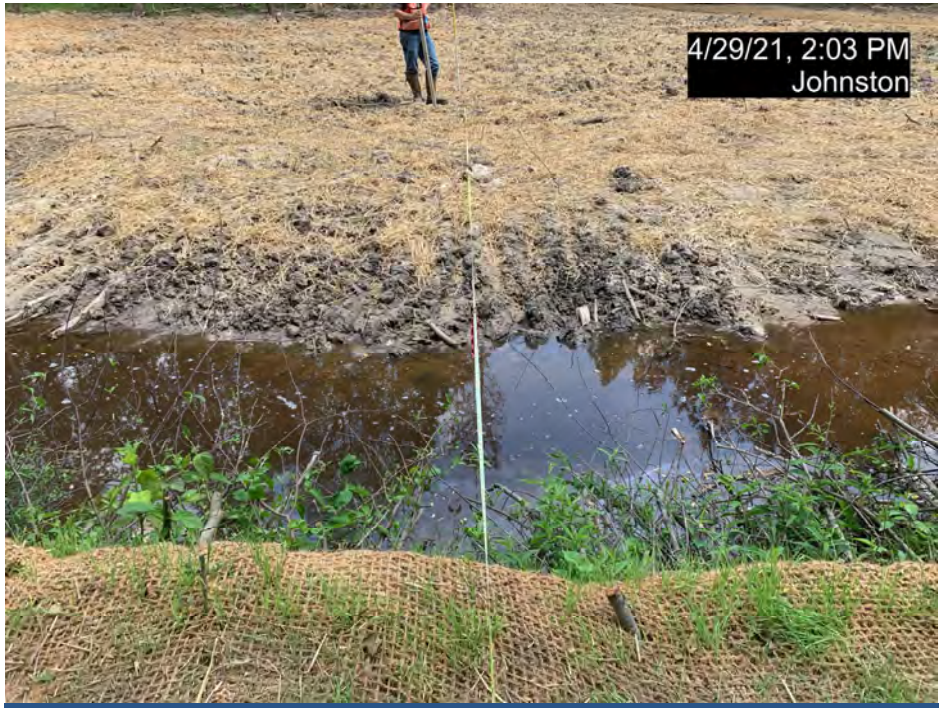
MS-R1, XS-3, Right Bank (MY-03)

MS-R1, XS-4, Upstream (MY-00)

MS-R1, XS-4, Upstream (MY-03)

MS-R1, XS-4, Downstream (MY-00)

MS-R1, XS-4, Downstream (MY-03)



MS-R1, XS-4, Left Bank (MY-00)

MS-R1, XS-4, Left Bank (MY-03)

MS-R1, XS-4, Right Bank (MY-00)

MS-R1, XS-4, Right Bank (MY-03)

MS-R1, XS-5, Upstream (MY-00)

MS-R1, XS-5, Upstream (MY-03)

MS-R1, XS-5, Downstream (MY-00)

MS-R1, XS-5, Downstream (MY-03)

MS-R1, XS-5, Left Bank (MY-00)

MS-R1, XS-5, Left Bank (MY-03)

MS-R1, XS-5, Right Bank (MY-00)

MS-R1, XS-5, Right Bank (MY-03)

R4, XS-6, Upstream (MY-00)

R4, XS-6, Upstream (MY-03)

R4, XS-6, Downstream (MY-00)

R4, XS-6, Downstream (MY-03)

R4, XS-6, Left Bank (MY-00)

R4, XS-6, Left Bank (MY-03)

R4, XS-6, Right Bank (MY-00)

R4, XS-6, Right Bank (MY-03)

R5 Lower, XS-7, Upstream (MY-00)

R5 Lower, XS-7, Upstream (MY-03)

R5 Lower, XS-7, Downstream (MY-00)

R5 Lower, XS-7, Downstream (MY-03)

R5 Lower, XS-7, Left Bank (MY-00)

R5 Lower, XS-7, Left Bank (MY-03)

R5 Lower, XS-7, Right Bank (MY-00)

R5 Lower, XS-7, Right Bank (MY-03)

R5 Lower, XS-8, Upstream (MY-00)

R5 Lower, XS-8, Upstream (MY-03)

R5 Lower, XS-8, Downstream (MY-00)

R5 Lower, XS-8, Downstream (MY-03)

R5 Lower, XS-8, Left Bank (MY-00)

R5 Lower, XS-8, Left Bank (MY-03)

R5 Lower, XS-8, Right Bank (MY-00)

R5 Lower, XS-8, Right Bank (MY-03)

MS-R2, XS-9, Upstream (MY-00)

MS-R2, XS-9, Upstream (MY-03)

MS-R2, XS-9, Downstream (MY-00)

MS-R2, XS-9, Downstream (MY-03)

MS-R2, XS-9, Left Bank (MY-00)

MS-R2, XS-9, Left Bank (MY-03)

MS-R2, XS-9, Right Bank (MY-00)

MS-R2, XS-9, Right Bank (MY-03)

MS-R2, XS-10, Upstream (MY-00)

MS-R2, XS-10, Upstream (MY-03)

MS-R2, XS-10, Downstream (MY-00)

MS-R2, XS-10, Downstream (MY-03)

MS-R2, XS-10, Left Bank (MY-00)

MS-R2, XS-10, Left Bank (MY-03)

MS-R2, XS-10, Right Bank (MY-00)

MS-R2, XS-10, Right Bank (MY-03)

R6, XS-11, Upstream (MY-00)

R6, XS-11, Upstream (MY-03)

R6, XS-11, Downstream (MY-00)

R6, XS-11, Downstream (MY-03)

R6, XS-11, Left Bank (MY-00)

R6, XS-11, Left Bank (MY-03)

R6, XS-11, Right Bank (MY-00)

R6, XS-11, Right Bank (MY-03)

MS-R2, XS-12, Upstream (MY-00)

MS-R2, XS-12, Upstream (MY-03)

MS-R2, XS-12, Downstream (MY-00)

MS-R2, XS-12, Downstream (MY-03)

MS-R2, XS-12, Left Bank (MY-00)

MS-R2, XS-12, Left Bank (MY-03)

MS-R2, XS-12, Right Bank (MY-00)

MS-R2, XS-12, Right Bank (MY-03)

MS-R2, XS-13, Upstream (MY-00)

MS-R2, XS-13, Upstream (MY-03)

MS-R2, XS-13, Downstream (MY-00)

MS-R2, XS-13, Downstream (MY-03)

MS-R2, XS-13, Left Bank (MY-00)

MS-R2, XS-13, Left Bank (MY-03)

MS-R2, XS-13, Right Bank (MY-00)

MS-R2, XS-13, Right Bank (MY-03)

PS-1 – MS-R1 Culvert Crossing, Upstream (MY-00)

PS-1 – MS-R1 Culvert Crossing, Upstream (MY-03)

PS-1 – MS-R1 Culvert Crossing, Downstream (MY-00)

PS-1 – MS-R1 Culvert Crossing, Downstream (MY-03)

PS-2 – MS-R2 Culvert Crossing, Upstream (MY-00)

PS-2 – MS-R2 Culvert Crossing, Upstream (MY-03)

PS-2 – MS-R2 Culvert Crossing, Downstream (MY-00)

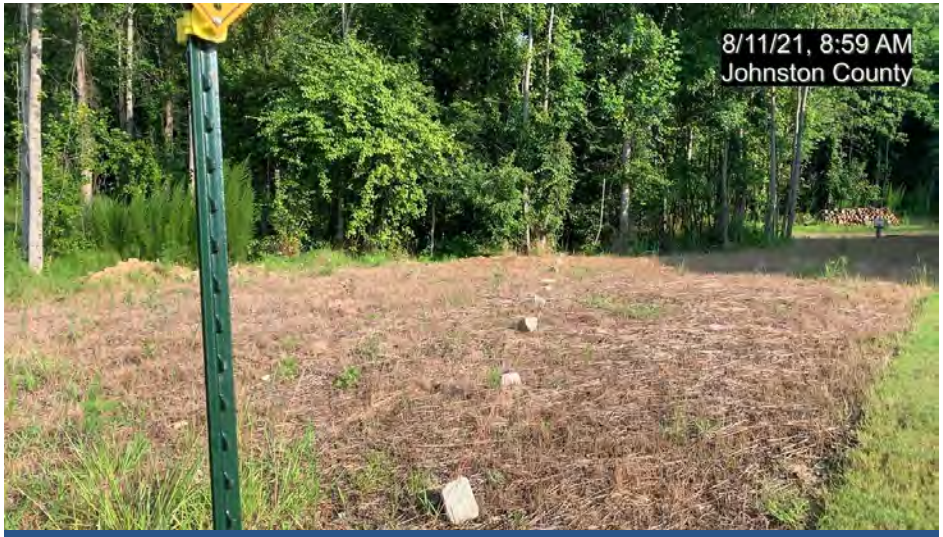
PS-2 – MS-R2 Culvert Crossing, Downstream (MY-03)

PS-3 – MS-R2, Upstream (MY-01)

PS-3 – MS-R2, Upstream (MY-03)

PS-3 – MS-R2, Downstream (MY-01)

PS-3 – MS-R2, Downstream (MY-03)



Encroachment Area 1, MS-R2, Upstream of Culvert (MY-01)

Encroachment Area 1, MS-R2, Upstream of Culvert (MY-03)

Encroachment Area 2, MS-R2, Downstream of Culvert (MY-01)

Encroachment Area 2, MS-R2, Downstream of Culvert (MY-03)

Encroachment Area 3, R6, East of BMP (MY-02)

MS-R1, STA 15+00, BMP Overflow, Right Floodplain (MY-03)

MS-R1, STA 15+00, BMP Overflow, Right Floodplain (MY-03)

SPA-1, R6, STA 12+90, Upstream (MY-03)

Appendix B:
Vegetation Plot Data

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

Buffalo Creek Mitigation Project Final Planting List				
Species	**Common Name**	**Stems**	**% Planted**	**Mitigation Plan %**
Fraxinus pennsylvanica	Green Ash	132	3.00%	3%
Betula nigra	River birch	440	10.00%	10%
Tilia americana	Basswood	440	10.00%	10%
Quercus alba	White oak	440	10.00%	10%
Platanus occidentalis	American sycamore	440	10.00%	10%
Nyssa sylvatica	Black gum	440	10.00%	10%
Liriodendron tulipifera	Tulip Poplar	440	10.00%	10%
Quercus rubra	Northern red oak	440	10.00%	10%
Diospyros virginiana	Persimmon	176	4.00%	4%
Carpinus caroliniana	Ironwood	176	4.00%	4%
Hamemelis virginiana	Witch hazel	176	4.00%	4%
Asimina triloba	Pawpaw	176	4.00%	4%
Lindera benzoin	Spicebush	176	4.00%	4%
Alnus serulatta	Tag Alder	132	3.00%	3%
Corylus americana	Hazelnut	176	4.00%	4%
Total		**4,400**	**100%**	

* There were no changes of the Final Plant list from the Mitigation Plan

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	202	3	5	0	283	2	7	0	607	3	8	0
Monitoring Year 2	283	1	4	0	486	1	7	0	810	2	8	0
Monitoring Year 1	607	2	8	0	526	2	10	0	648	2	9	0
Monitoring Year 0	688	2	8	0	607	1	12	0	688	2	9	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	445	6	7	0	364	3	7	0	405	4	6	0
Monitoring Year 2	648	3	8	0	486	2	9	0	648	2	9	0
Monitoring Year 1	526	3	8	0	526	2	9	0	526	2	7	0
Monitoring Year 0	607	2	9	0	648	2	10	0	769	2	9	0
	Veg Plot Group 1 R				Veg Plot Group 2 R							
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives				
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	324	2	5	0	405	5	6	0				
Monitoring Year 2	324	2	3	0	526	2	4	0				
Monitoring Year 1	364	1	7	0	364	2	8	0				
Monitoring Year 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.

Vegetation Plot Counts and Densities Table

Planted Acreage	6.34
Date of Initial Plant	2021-03-03
Date(s) of Supplemental Plant(s)	1/6/2022
Date(s) Mowing	NA
Date of Current Survey	2023-09-05
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 R	Veg Plot 8 R
					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							3	3				1
	Asimina triloba	pawpaw	Tree	FAC							1	1						
	Betula nigra	river birch	Tree	FACW			1	1	1	1	1	1	1	1	1	1	1	
	Carpinus caroliniana	American hornbeam	Tree	FAC			1	1		1	1	1			1	1		
	Cornus amomum	silky dogwood	Shrub	FACW		1												
	Corylus americana	American hazelnut	Shrub	FACU					1	1			1	1				
	Diospyros virginiana	common persimmon	Tree	FAC	1	1	1	1										1
	Fraxinus pennsylvanica	green ash	Tree	FACW			1	1			3	3			1	1	1	
	Hamamelis virginiana	American witchhazel	Tree	FACU		1			1	1			1	1				1
	Lindera benzoin	northern spicebush	Tree	FACW			1	1										
	Liriodendron tulipifera	tuliptree	Tree	FACU				1			1	1	1	1			4	3
	Nyssa sylvatica	blackgum	Tree	FAC				1	2	2			1	1			1	1
	Platanus occidentalis	American sycamore	Tree	FACW					7	7	2	2	1	1	3	3		3
	Quercus alba	white oak	Tree	FACU					1	1					1	1	1	
	Quercus rubra	northern red oak	Tree	FACU	1	1			1	1	2	2			3	3		
Sum	Performance Standard				3	5	5	7	14	15	11	11	9	9	10	10	8	10
Post Mitigation Plan Species	*Acer rubrum*	*red maple*	*Tree*	*FAC*				*1*										
Sum	Proposed Standard				3	5	5	7	14	15	11	11	9	9	10	10	8	10
Mitigation Plan Performance Standard	Current Year Stem Count					5		7		15		11		9		10	8	10
	Stems/Acre					202		283		607		445		364		405	324	405
	Species Count					5		7		8		7		7		6	5	6
	Dominant Species Composition (%)					20		12		47		27		33		30	50	30
	Average Plot Height (ft.)					3		2		3		6		3		4	2	5
	% Invasives					0		0		0		0		0		0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count					5		7		15		11		9		10	8	10
	Stems/Acre					202		283		607		445		364		405	324	405
	Species Count					5		7		8		7		7		6	5	6
	Dominant Species Composition (%)					20		12		47		27		33		30	50	30
	Average Plot Height (ft.)					3		2		3		6		3		4	2	5
	% Invasives					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.

Fixed Veg Plot 1 (MY-00)

Fixed Veg Plot 1 (MY-03)

Fixed Veg Plot 2 (MY-00)

Fixed Veg Plot 2 (MY-03)

Fixed Veg Plot 3 (MY-00)

Fixed Veg Plot 3 (MY-03)

Fixed Veg Plot 4 (MY-00)

Fixed Veg Plot 4 (MY-03)

Fixed Veg Plot 5 (MY-00)

Fixed Veg Plot 5 (MY-03)

Fixed Veg Plot 6 (MY-00)

Fixed Veg Plot 6 (MY-03)

Random Veg Plot 7, Facing North (MY-03)

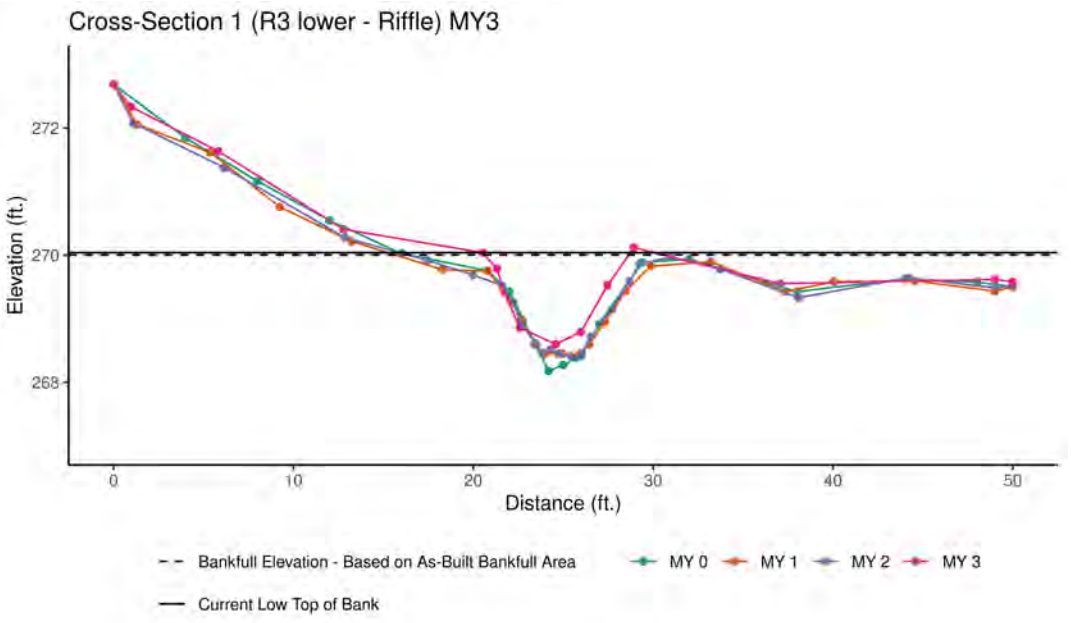
Random Veg Plot 7, Facing South (MY-03)

Random Veg Plot 8, Facing North (MY-03)

Random Veg Plot 8, Facing South (MY-03)

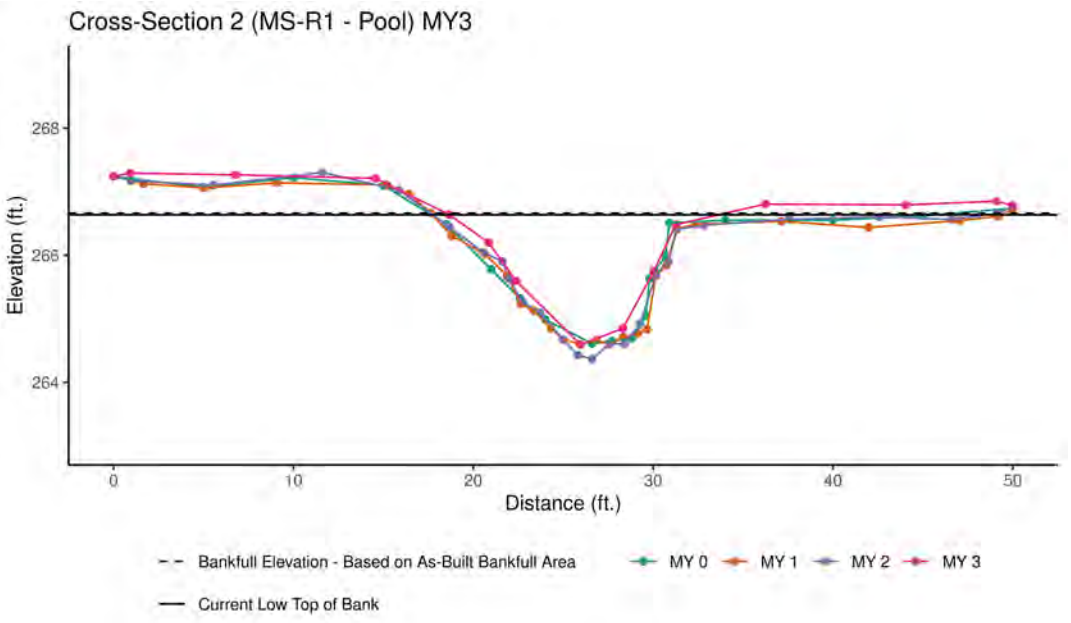
Appendix C:
Stream Geomorphology Data

MY2 Cross-Sections with Annual Overlays
Baseline Stream Data Summary Tables
Cross-Section Morphology Data



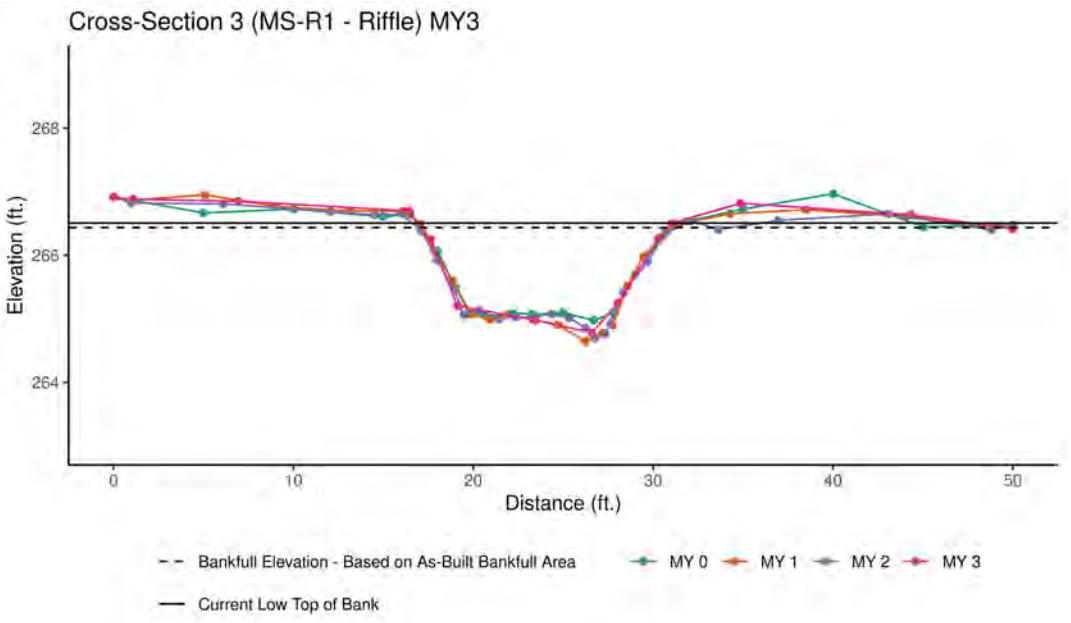
Distance	Elevation	Features
0	272.686	TLP
0.954987434	272.334	
5.831199705	271.634	
12.79170747	270.407	
20.512	270.04	TLB, BKF
21.3178042	269.785	
21.72236732	269.423	
22.58695475	268.859	
24.57804339	268.599	THW
25.97426228	268.789	
27.46419591	269.524	
28.93500537	270.119	TRB
37.02674105	269.552	
49.00786538	269.619	
50	269.578	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	269.76	269.75	269.76	270.00				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.00	0.95	1.03				
Thalweg Elevation	268.18	268.45	268.38	268.60				
LTOB Elevation	269.76	269.75	269.69	270.04				
LTOB Max Depth	1.58	1.301	1.308	1.441				
LTOB Cross Sectional Area	6.88	6.88	6.26	7.19				



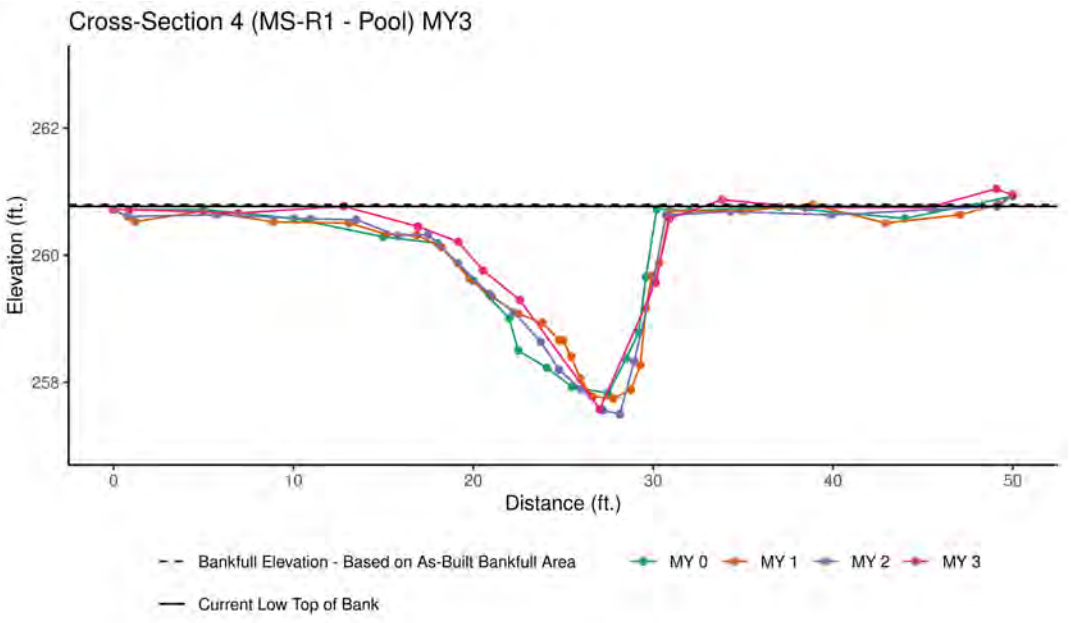
Distance	Elevation	Features
0	267.239	TLP
0.906824128	267.29	
6.793587123	267.264	
14.55419544	267.209	
18.66812355	266.635	TLB, BKF
20.85639454	266.196	
22.39015536	265.593	
25.96927833	264.593	THW
28.324	264.849	
30.0354823	265.746	
31.25416972	266.48	
36.22945245	266.804	TRB
44.06551052	266.791	
49.05303702	266.849	
50	266.781	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	266.51	266.46	266.47	266.66				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.01	0.97	0.99				
Thalweg Elevation	264.61	264.59	264.37	264.59				
LTOB Elevation	266.51	266.48	266.41	266.64				
LTOB Max Depth	1.9	1.891	2.04	2.042				
LTOB Cross Sectional Area	15.13	15.47	14.28	14.75				



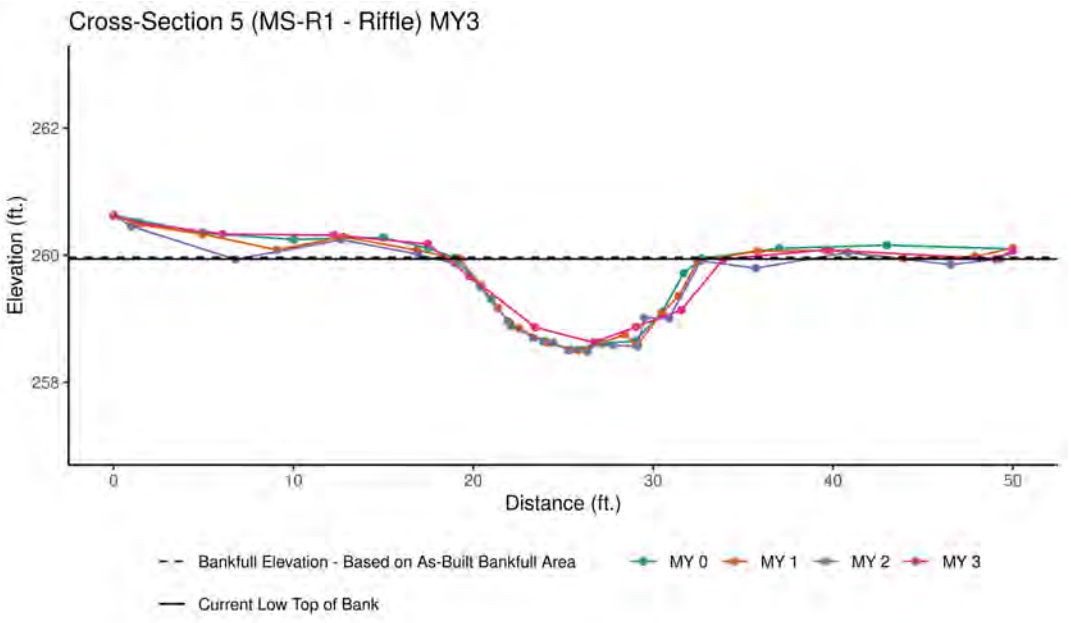
Distance	Elevation	Features
0	266.915	TLP
1.083849159	266.879	
6.955232922	266.848	
16.42257337	266.696	TLB
17.63624472	266.239	
19.12853141	265.204	
23.4313876	264.979	
26.59117809	264.778	THW
28.04641674	265.246	
30.28824567	266.249	
31.054	266.505	TRB, BKF
34.85954231	266.816	
44.36909673	266.633	
50	266.413	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	266.54	266.41	266.50	266.43				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.03	1.02	1.04				
Thalweg Elevation	265.08	264.64	265.02	264.78				
LTOB Elevation	266.54	266.46	266.54	266.51				
LTOB Max Depth	1.46	1.82	1.518	1.727				
LTOB Cross Sectional Area	15.47	16.23	16.01	16.45				



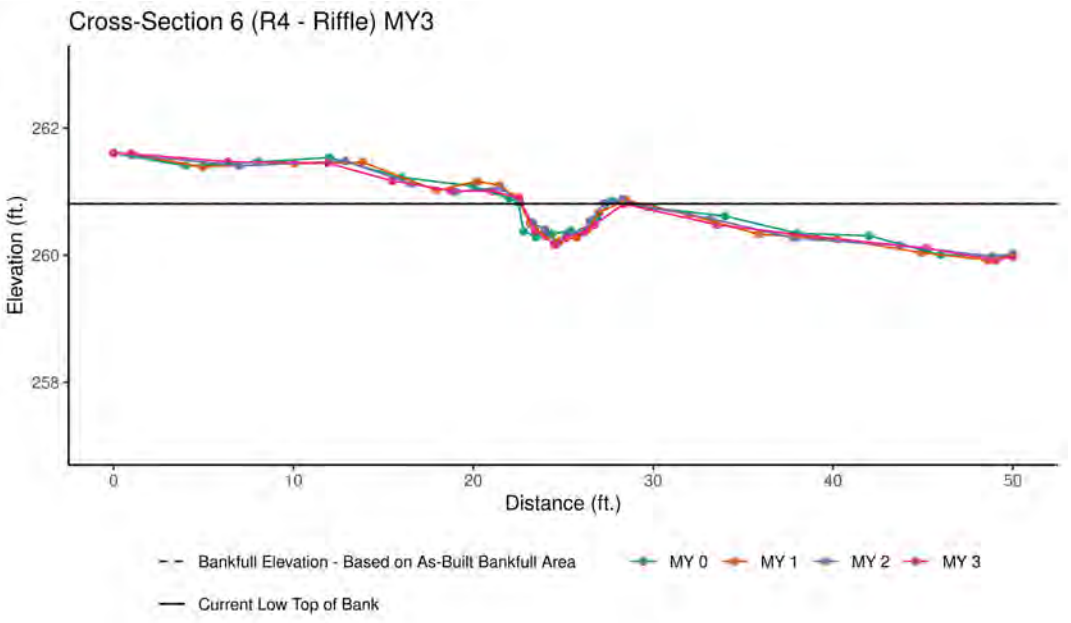
Distance	Elevation	Features
0	260.718	TLP
0.87370075	260.717	
6.911582308	260.661	
12.80169551	260.768	TLB, BKF
16.93017758	260.45	
19.15010154	260.213	
20.54599302	259.759	
22.58726655	259.294	
27.03227969	257.576	THW
30.13313143	259.57	
30.91887042	260.577	
33.82828292	260.873	TRB
38.43453011	260.747	
45.29788168	260.748	
49.08300172	261.045	
50	260.944	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	260.58	260.64	260.59	260.79				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.95	0.99	0.99				
Thalweg Elevation	257.83	257.75	257.50	257.58				
LTOB Elevation	260.58	260.50	260.56	260.77				
LTOB Max Depth	2.75	2.758	3.06	3.192				
LTOB Cross Sectional Area	23.69	21.24	23.06	23.15				



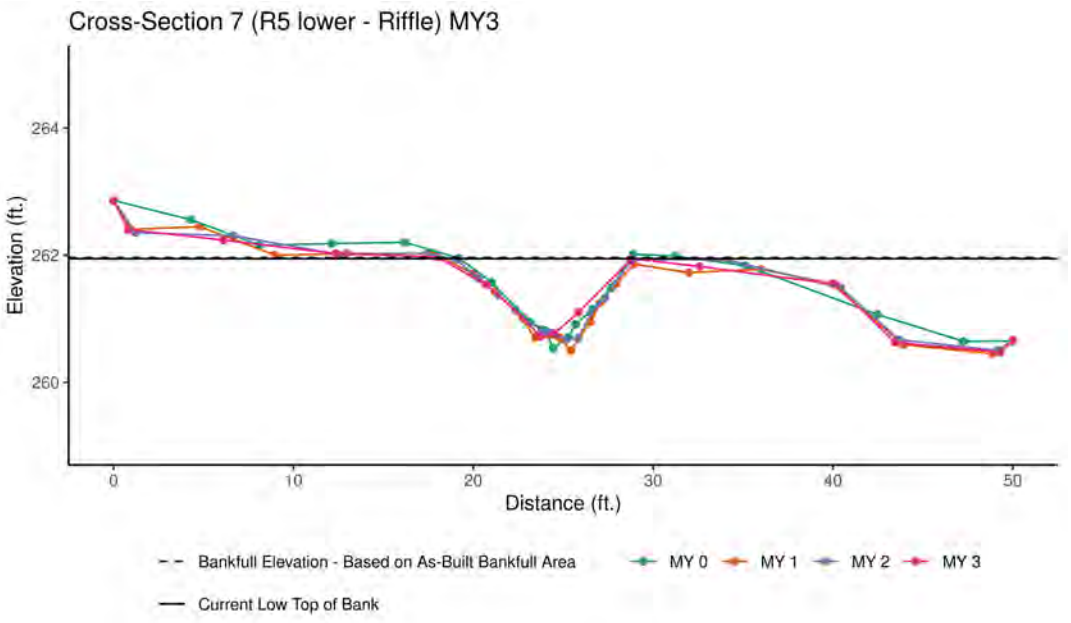
Distance	Elevation	Features
0	260.627	TLP
1.440228107	260.507	
6.041330731	260.332	
12.23651037	260.314	
12.24144076	260.316	
17.45564301	260.176	TLB
19.80099101	259.669	
23.44107943	258.865	
26.70878882	258.627	THW
29.05452078	258.874	
31.56369386	259.136	
33.90621338	259.939	TRB, BKF
39.59946804	260.084	
49.02026851	259.94	
50	260.074	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	259.95	259.94	259.90	259.96				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.00	0.97	0.98				
Thalweg Elevation	258.52	258.50	258.49	258.63				
LTOB Elevation	259.95	259.94	259.87	259.94				
LTOB Max Depth	1.43	1.433	1.38	1.312				
LTOB Cross Sectional Area	12.96	12.95	12.47	12.58				



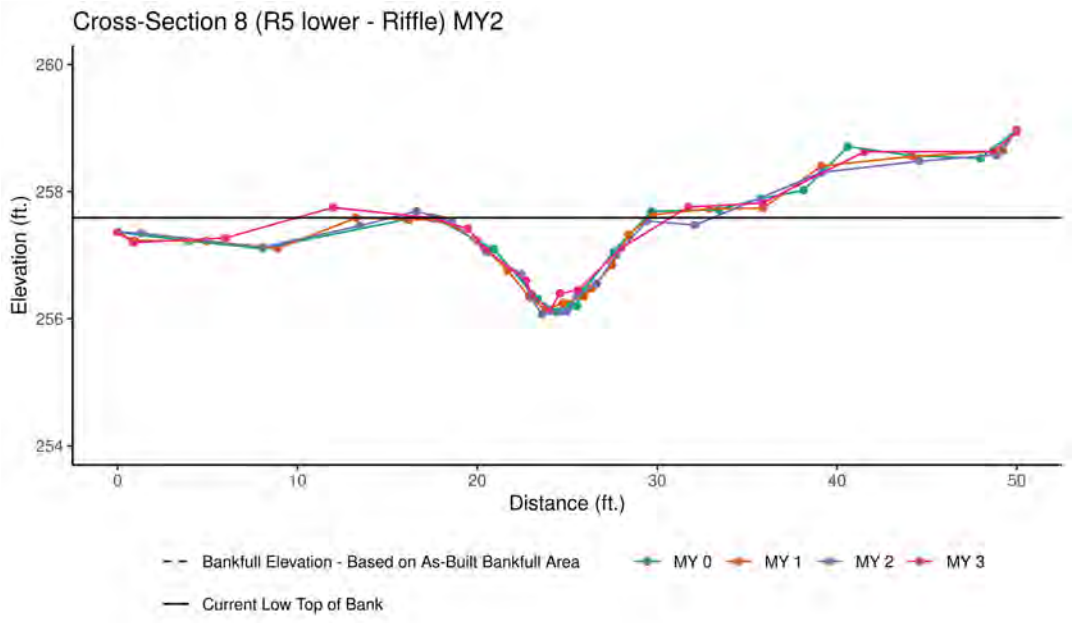
Distance	Elevation	Features
0	261.605	TLP
0.98480658	261.595	
6.352087688	261.47	
11.88742192	261.451	
15.49331227	261.168	
18.76593046	261.013	
21.06016821	261.005	
22.55117312	260.897	TLB
23.43241387	260.389	
24.50142333	260.172	THW
25.16889416	260.272	
26.17091301	260.375	
26.73074821	260.478	
28.37496828	260.807	TRB, BKF
33.5710111	260.477	
39.0612727	260.29	
45.21626975	260.11	
49.02545887	259.917	
50	259.977	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	260.86	260.84	260.89	260.81				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.05	0.97	0.99				
Thalweg Elevation	260.34	260.22	260.18	260.17				
LTOB Elevation	260.86	260.87	260.88	260.81				
LTOB Max Depth	0.52	0.648	0.701	0.635				
LTOB Cross Sectional Area	2.10	2.26	1.99	2.07				



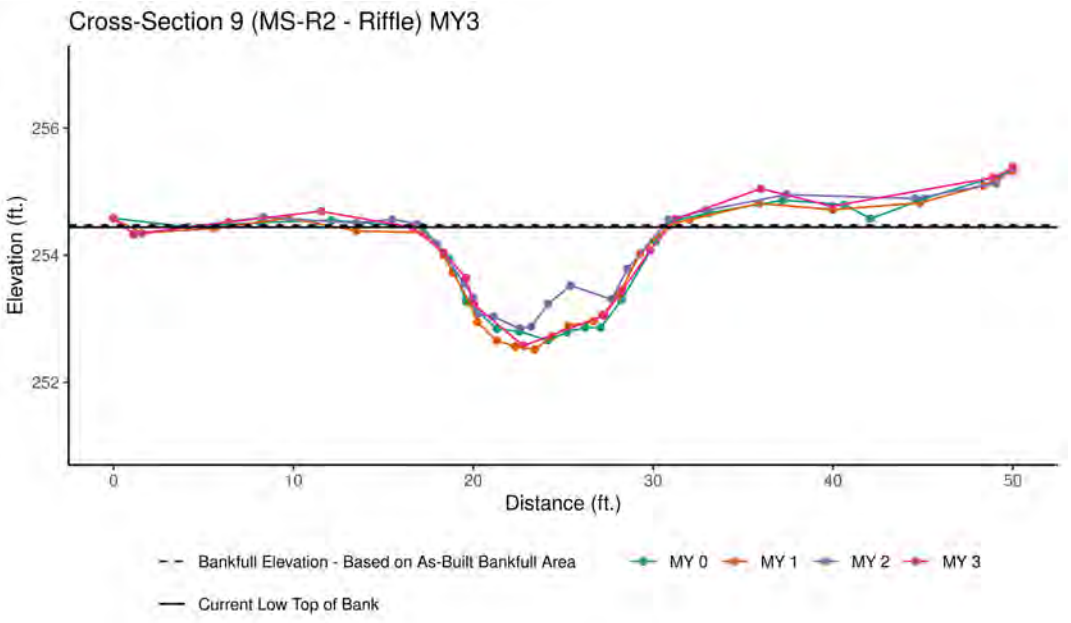
Distance	Elevation	Features
0	262.86	TLP
0.794660305	262.402	
6.097618716	262.238	
12.35568768	262.024	
17.97549012	261.972	TLB
20.73662624	261.537	
22.73394229	261.026	
23.70771758	260.72	THW
24.51	260.765	
25.83475372	261.1	
28.80349897	261.945	TRB, BKF
32.5810591	261.822	
40.09359731	261.544	
43.451	260.629	
49.3	260.475	
50	260.657	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	261.95	261.85	261.90	261.96				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.01	1.01	0.99				
Thalweg Elevation	260.54	260.50	260.68	260.72				
LTOB Elevation	261.95	261.86	261.92	261.95				
LTOB Max Depth	1.413	1.363	1.243	1.225				
LTOB Cross Sectional Area	6.62	6.70	6.79	6.46				



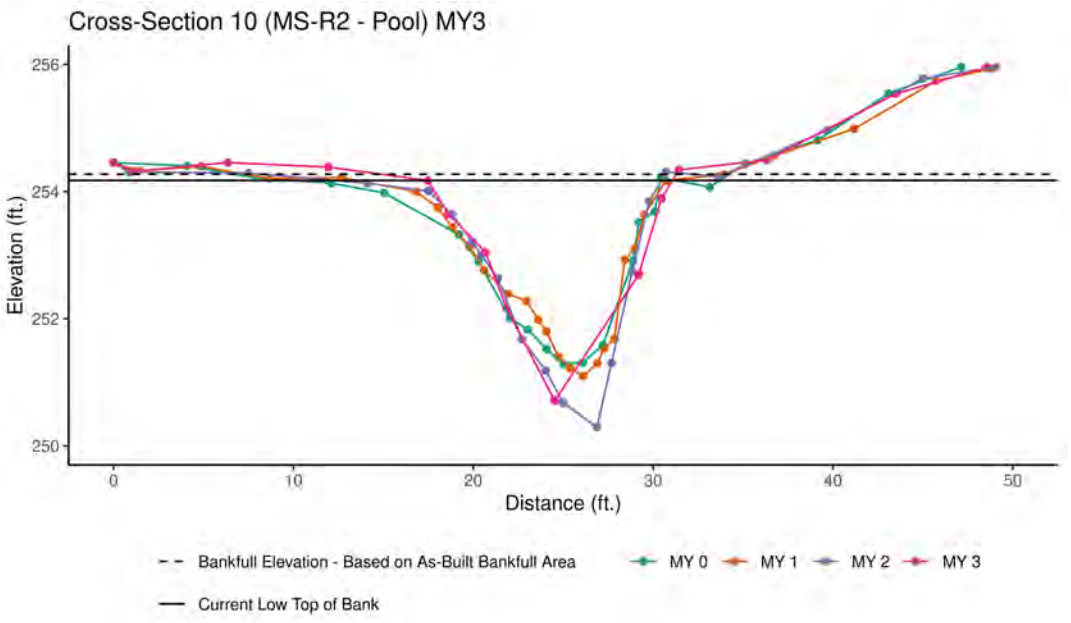
Distance	Elevation	Features
0	257.362	TLP
0.882020408	257.199	
5.982373191	257.27	
11.96893082	257.749	
17.40265037	257.589	TLB, BKF
19.47175231	257.417	
20.38473382	257.113	
22.69922241	256.598	
23.02470139	256.382	
24.04837261	256.13	THW
24.59032983	256.4	
25.59247741	256.448	
27.9798356	257.108	
31.7342702	257.757	TRB
35.86212661	257.819	
41.52409202	258.627	
48.70098093	258.631	
50	258.941	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	257.59	257.54	257.54	257.59				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.02	0.99	1.00				
Thalweg Elevation	256.11	256.14	256.07	256.13				
LTOB Elevation	257.59	257.56	257.53	257.59				
LTOB Max Depth	1.479	1.428	1.456	1.459				
LTOB Cross Sectional Area	8.35	8.61	8.22	8.38				



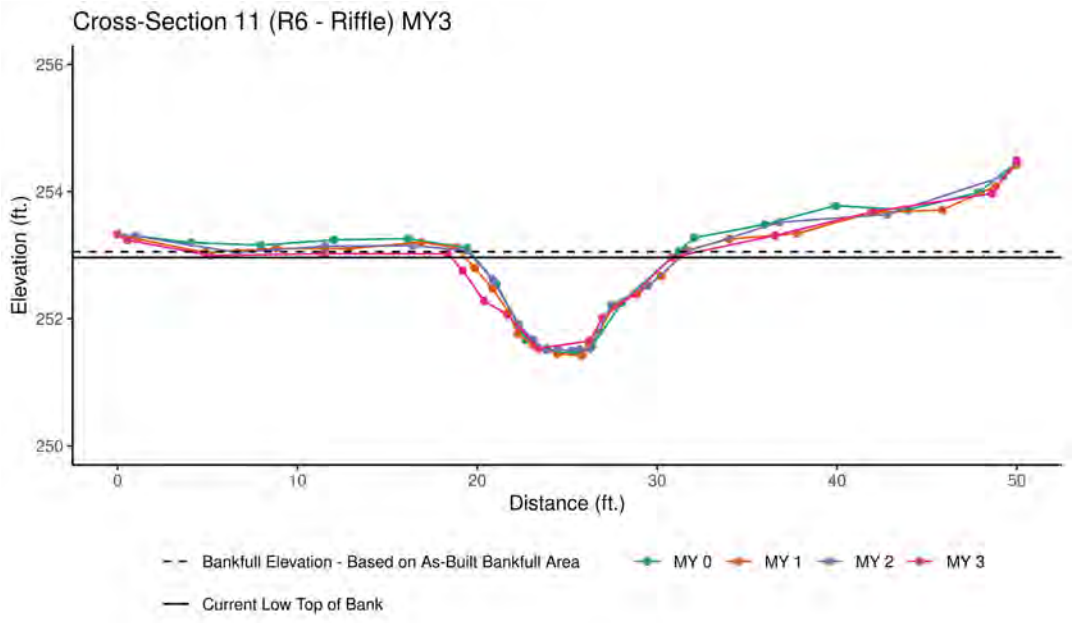
Distance	Elevation	Features
0	254.58	TLP
1.098194883	254.333	
6.381539391	254.52	
11.51488276	254.69	
16.61566818	254.439	TLB, BKF
18.34454003	254.042	
19.58403023	253.644	
20.06333375	253.214	
22.79397508	252.574	THW
27.28445735	253.053	
28.29300977	253.448	
29.83480995	254.074	
31.22804304	254.566	TRB
35.99838903	255.046	
39.95177529	254.77	
48.9199698	255.222	
50	255.384	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	254.44	254.43	254.67	254.47				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.96	0.94	0.98				
Thalweg Elevation	252.66	252.52	252.85	252.57				
LTOB Elevation	254.44	254.36	254.56	254.44				
LTOB Max Depth	1.776	1.838	1.713	1.865				
LTOB Cross Sectional Area	15.98	15.00	14.29	15.52				



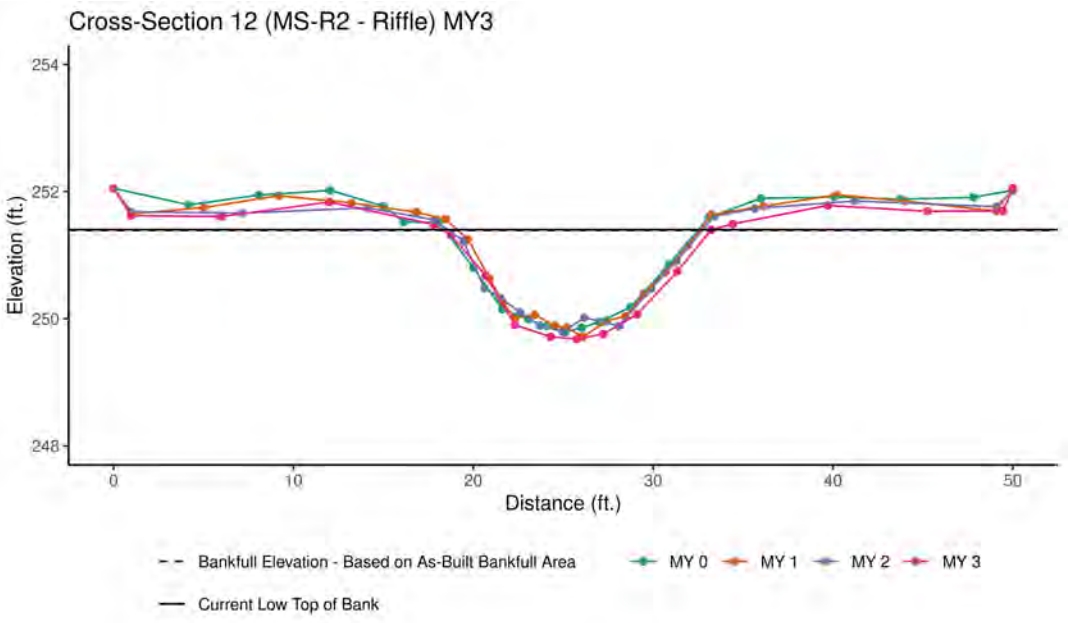
Distance	Elevation	Features
0	254.46	TLP
1.033705954	254.316	
6.332753351	254.457	
11.94612774	254.385	
17.47839792	254.175	TLB, BKF
18.61421524	253.645	
20.67821146	253.049	
21.835131	252.178	
24.51036226	250.719	THW
24.53890317	250.714	
29.19796591	252.695	
30.46541439	253.892	
31.43207597	254.342	TRB
36.33260476	254.499	
43.50130399	255.539	
48.54742132	255.958	
50	256.241	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	254.21	254.34	254.14	254.27				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	0.95	0.96	0.97				
Thalweg Elevation	251.29	251.10	250.29	250.72				
LTOB Elevation	254.21	254.17	254.01	254.18				
LTOB Max Depth	2.923	3.072	3.715	3.456				
LTOB Cross Sectional Area	25.22	22.39	23.52	23.88				



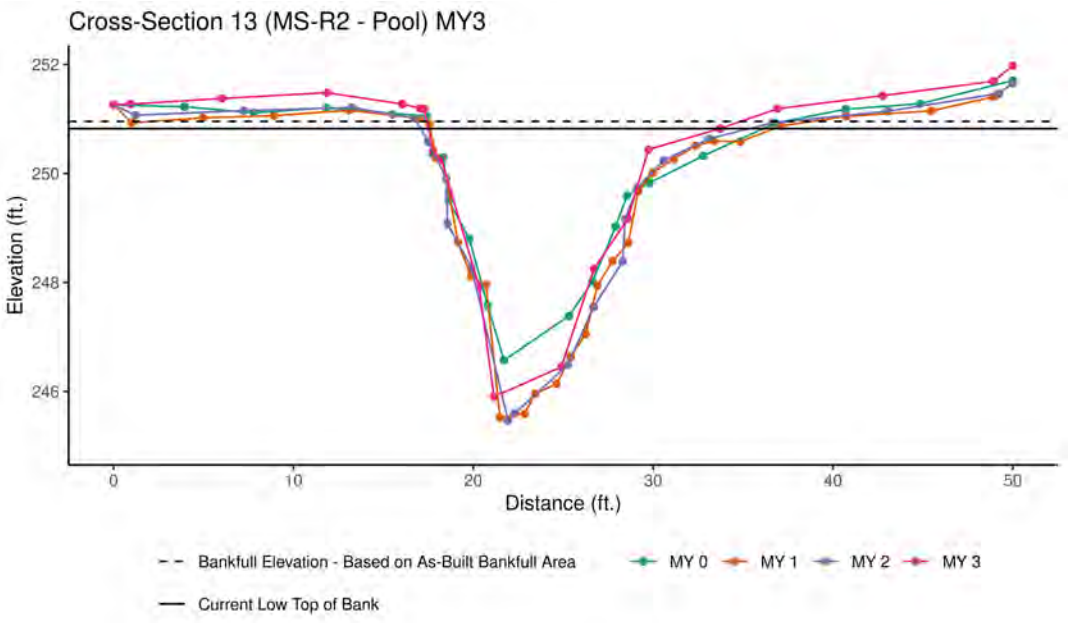
Distance	Elevation	Features
0	253.33	TLP
0.543894291	253.239	
5.151936044	252.995	
11.43324998	253.021	
18.36718928	253.02	TLB, BKF
19.19087851	252.758	
20.38184763	252.279	
21.6835789	252.062	
23.39838841	251.534	THW
26.22383969	251.648	
26.9591796	252.013	
28.74437431	252.392	
30.80377884	252.963	TRB
36.54719441	253.311	
42.12507745	253.693	
48.62682672	253.97	
50	254.493	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	253.11	253.05	253.13	253.05				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.01	0.96	0.94				
Thalweg Elevation	251.46	251.42	251.53	251.53				
LTOB Elevation	253.11	253.07	253.07	252.96				
LTOB Max Depth	1.651	1.656	1.533	1.429				
LTOB Cross Sectional Area	11.39	11.65	10.59	10.28				



Distance	Elevation	Features
0	252.05	TLP
0.971853898	251.621	
5.971770675	251.607	
11.97973627	251.836	
17.77952376	251.485	TLB
18.76292336	251.313	
20.69449415	250.682	
22.30505559	249.903	
24.31151984	249.716	
25.76638822	249.681	THW
27.22076731	249.759	
29.10114764	250.066	
31.34078278	250.745	
33.23880798	251.401	TRB, BKF
34.42921933	251.491	
39.71295513	251.782	
45.24125485	251.691	
49.46263206	251.696	
50	252.054	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	251.51	251.55	251.51	251.39				
Bank Height Ratio - Based on As-Built Bankfull Area	1.00	1.01	1.02	1.01				
Thalweg Elevation	249.79	249.72	249.80	249.68				
LTOB Elevation	251.51	251.57	251.55	251.40				
LTOB Max Depth	1.729	1.852	1.758	1.72				
LTOB Cross Sectional Area	16.19	16.47	16.84	16.35				



Distance	Elevation	Features
0	251.26	TLP
0.918313672	251.271	
6.016576103	251.376	
11.87705338	251.482	
16.04552352	251.273	
17.03575798	251.196	TLB
17.26643223	251.185	
17.7650539	250.414	
18.2388274	250.249	
20.32559975	247.92	
21.15051115	245.902	THW
24.88938523	246.447	
26.71201445	248.249	
28.5932321	249.169	
29.74028705	250.439	
33.72	250.823	TRB, BKF
36.93110214	251.189	
42.75604702	251.428	
48.92489715	251.692	
50	251.977	TRP

	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation - Based on As-Built Bankfull Area	251.18	250.68	250.68	250.96				
Bank Height Ratio - Based on As-Built Bankfull Area	0.96	1.06	1.05	0.97				
Thalweg Elevation	247.57	245.52	245.47	245.90				
LTOB Elevation	251.05	251.01	250.93	250.82				
LTOB Max Depth	3.48	5.49	5.459	4.921				
LTOB Cross Sectional Area	35.73	45.44	43.28	36.76				

Baseline Stream Data Summary (Data Collected May 2021)
Buffalo Creek Tributaries Mitigation Project: MS-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)		10.6			1.0		14.0		15.1	2.0
Floodprone Width (ft)		12.5			1.0	65.0	80.0		80.0	2.0
Bankfull Mean Depth (ft)		1.6			1.0		1.2		1.1	2.0
Bankfull Max Depth (ft)		1.8			1.0		1.5		1.6	2.0
Bankfull Cross Sectional Area (ft^2)		17.2			1.0		16.5		16.2	2.0
Width/Depth Ratio		6.6			1.0		11.9		14.1	2.0
Entrenchment Ratio		1.2			1.0	4.6	5.7		3.3	2.0
Bank Height Ratio		2.6			1.0		1.0		1.0	2.0
Max part size (mm) mobilized at bankfull	84					79		87		
Rosgen Classification	G4c					C4		C4		
Bankfull Discharge (cfs)	70.0					70.0		70.0		
Sinuosity (ft)	1.36					1.22		1.19		
Water Surface Slope (Channel) (ft/ft)	0.0058					0.0065		0.0078		
Other										

Baseline Stream Data Summary
Buffalo Creek Tributaries Mitigation Project: R3 (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)		7.1			1.0		5.5		8.3	1.0
Floodprone Width (ft)		22.0			1.0	20.0	25.0		43.0	1.0
Bankfull Mean Depth (ft)		0.5			1.0		0.4		0.8	1.0
Bankfull Max Depth (ft)		0.8			1.0		0.5		1.6	1.0
Bankfull Cross Sectional Area (ft^2)		3.7			1.0		2.1		6.9	1.0
Width/Depth Ratio		13.6			1.0		14.2		10.0	1.0
Entrenchment Ratio		3.1			1.0	3.6	4.6		5.2	1.0
Bank Height Ratio		1.0			1.0		1.0		1.0	1.0
Max part size (mm) mobilized at bankfull	156					125		168		
Rosgen Classification	G5					B4		B4		
Bankfull Discharge (cfs)	12.0					12.0		12.0		
Sinuosity (ft)	1.12					1.13		1.14		
Water Surface Slope (Channel) (ft/ft)	0.0362					0.0363		0.0289		
Other										

Baseline Stream Data Summary
Buffalo Creek Tributaries Mitigation Project: MS-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)		10.2			1.0		14.5		14.7	2.0
Floodprone Width (ft)		51.9			1.0	60.0	90.0		90.0	2.0
Bankfull Mean Depth (ft)		1.6			1.0		1.2		1.1	2.0
Bankfull Max Depth (ft)		2.3			1.0		1.6		1.7	2.0
Bankfull Cross Sectional Area (ft^2)		16.1			1.0		18.0		16.1	2.0
Width/Depth Ratio		6.4			1.0		11.7		13.4	2.0
Entrenchment Ratio		5.1			1.0	4.1	6.2		3.4	2.0
Bank Height Ratio		1.6			1.0		1.0		1.0	2.0
Max part size (mm) mobilized at bankfull	69					69		71		
Rosgen Classification	G4c/Incised E4					C4		C4		
Bankfull Discharge (cfs)	75.0					75.0		75.0		
Sinuosity (ft)	1.26					1.11		1.11		
Water Surface Slope (Channel) (ft/ft)	0.0045					0.0052		0.0059		
Other										

Baseline Stream Data Summary
Buffalo Creek Tributaries Mitigation Project: R4

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)					0.0		5.5		5.4	1.0
Floodprone Width (ft)					0.0	10.0	15.0		35.0	1.0
Bankfull Mean Depth (ft)					0.0		0.4		0.4	1.0
Bankfull Max Depth (ft)					0.0		0.6		0.9	1.0
Bankfull Cross Sectional Area (ft^2)					0.0		2.3		2.2	1.0
Width/Depth Ratio					0.0		12.9		13.6	1.0
Entrenchment Ratio					0.0	1.8	2.7		9.2	1.0
Bank Height Ratio					0.0		1.0		1.0	1.0
Max part size (mm) mobilized at bankfull						138		120		
Rosgen Classification	G5c/C5					B4		B4		
Bankfull Discharge (cfs)	10.0					10.0		10.0		
Sinuosity (ft)	1.07					1.05		1.09		
Water Surface Slope (Channel) (ft/ft)	0.0371					0.038		0.034		
Other										

Baseline Stream Data Summary Buffalo Creek Tributaries Mitigation Project: R5										
Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)		2.8			1.0		5.0		9.5	2.0
Floodprone Width (ft)		26.2			1.0	10.0	25.0		25.0	2.0
Bankfull Mean Depth (ft)		0.8			1.0		0.3		0.7	2.0
Bankfull Max Depth (ft)		1.0			1.0		0.5		1.4	2.0
Bankfull Cross Sectional Area (ft^2)		2.1			1.0		1.7		6.6	2.0
Width/Depth Ratio		3.7			1.0		14.8		13.7	2.0
Entrenchment Ratio		9.3			1.0	2.0	5.0		5.3	2.0
Bank Height Ratio		1.8			1.0		1.0		1.0	2.0
Max part size (mm) mobilized at bankfull	134					96		195		
Rosgen Classification	E5b					B4		B4		
Bankfull Discharge (cfs)	7.0					7.0		7.0		
Sinuosity (ft)	1.14					1.10		1.07		
Water Surface Slope (Channel) (ft/ft)	0.0275					0.0287		0.0361		
Other										

Baseline Stream Data Summary Buffalo Creek Tributaries Mitigation Project: R6										
Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)		4.2			1.0		6.0		12.0	1.0
Floodprone Width (ft)		7.9			1.0	25.0	30.0		50.0	1.0
Bankfull Mean Depth (ft)		0.5			1.0		0.4		0.9	1.0
Bankfull Max Depth (ft)		0.8			1.0		0.6		1.7	1.0
Bankfull Cross Sectional Area (ft^2)		2.1			1.0		2.2		11.4	1.0
Width/Depth Ratio		8.2			1.0		16.4		12.6	1.0
Entrenchment Ratio		1.9			1.0	4.2	5.0		4.2	1.0
Bank Height Ratio		1.3			1.0		1.0		1.0	1.0
Max part size (mm) mobilized at bankfull	199					171		262		
Rosgen Classification	B5a					B4		B4		
Bankfull Discharge (cfs)	12.0					12.0		12.0		
Sinuosity (ft)	1.13					1.11		1.10		
Water Surface Slope (Channel) (ft/ft)	0.0566					0.0574		0.042		
Other										

Monitoring Data - Cross Section Morphology Monitoring Summary
Buffalo Creek Tributaries Mitigation Project, DMS Project #100042

	Cross-Section 1 (Riffle - R3 lower)							Cross-Section 2 (Pool - MS-R1)							Cross-Section 3 (Riffle - MS-R1)							Cross-Section 4 (Pool - MS-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	269.76	269.75	269.76	270.00				266.51	266.46	266.47	266.66				266.54	266.41	266.50	266.43				260.58	260.64	260.59	260.79			
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	1.00	0.95	1.03				N/A	N/A	N/A	N/A				1.00	1.03	1.02	1.04				N/A	N/A	N/A	N/A			
Thalweg Elevation	268.18	268.45	268.38	268.60				264.61	264.59	264.37	264.59				265.08	264.64	265.02	264.78				257.83	257.75	257.50	257.58			
LTOB[2] Elevation	269.76	269.75	269.69	270.04				266.51	266.48	266.41	266.64				266.54	266.46	266.54	266.51				260.58	260.50	260.56	260.77			
LTOB[2] Max Depth (ft)	1.58	1.30	1.31	1.44				1.90	1.89	2.04	2.04				1.46	1.82	1.52	1.73				2.75	2.76	3.06	3.19			
LTOB[2] Cross Sectional Area (ft^2)	6.88	6.88	6.26	7.19				15.14	15.47	14.28	14.75				15.47	16.23	16.01	16.45				23.68	21.25	23.06	23.15			
	Cross-Section 5 (Riffle - MS-R1)							**Cross-Section 6 (Riffle - R4)**							**Cross-Section 7 (Riffle - R5 lower)**							**Cross-Section 8 (Riffle - R5 lower)**						
	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	259.95	259.94	259.90	259.96				260.86	260.84	260.89	260.81				261.95	261.85	261.90	261.96				257.59	257.54	257.54	257.59			
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	1.00	0.97	0.98				1.00	1.05	0.97	0.99				1.00	1.01	1.01	0.99				1.00	1.02	0.99	1.00			
Thalweg Elevation	258.52	258.50	258.49	258.63				260.34	260.22	260.18	260.17				260.54	260.50	260.68	260.72				256.11	256.14	256.07	256.13			
LTOB[2] Elevation	259.95	259.94	259.87	259.94				260.86	260.87	260.88	260.81				261.95	261.86	261.92	261.95				257.59	257.56	257.53	257.59			
LTOB[2] Max Depth (ft)	1.43	1.43	1.38	1.31				0.52	0.65	0.70	0.64				1.41	1.36	1.24	1.23				1.48	1.43	1.46	1.46			
LTOB[2] Cross Sectional Area (ft^2)	12.96	12.95	12.47	12.58				2.10	2.26	1.99	2.07				6.62	6.70	6.79	6.46				8.35	8.61	8.22	8.38			
	Cross-Section 9 (Riffle - MS-R2)							**Cross-Section 10 (Pool - MS-R2)**							**Cross-Section 11 (Riffle - R6)**							**Cross-Section 12 (Riffle - MS-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	254.44	254.43	254.67	254.47				254.21	254.34	254.14	254.27				253.11	253.05	253.13	253.05				251.51	251.55	251.51	251.39			
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	0.96	0.94	0.98				N/A	N/A	N/A	N/A				1.00	1.01	0.96	0.94				1.00	1.01	1.02	1.01			
Thalweg Elevation	252.66	252.52	252.85	252.57				251.29	251.10	250.29	250.72				251.46	251.42	251.53	251.53				249.79	249.72	249.80	249.68			
LTOB[2] Elevation	254.44	254.36	254.56	254.44				254.21	254.17	254.01	254.18				253.11	253.07	253.07	252.96				251.51	251.57	251.55	251.40			
LTOB[2] Max Depth (ft)	1.78	1.84	1.71	1.87				2.92	3.07	3.72	3.46				1.65	1.66	1.53	1.43				1.73	1.85	1.76	1.72			
LTOB[2] Cross Sectional Area (ft^2)	15.98	15.00	14.29	15.52				25.22	22.39	23.52	23.88				11.39	11.65	10.59	10.28				16.19	16.47	16.84	16.35			

	Cross-Section 13 (Pool - MS-R2)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	251.18	250.68	250.68	250.96	250.96		
Bank Height Ratio_Based on AB Bankfull[1] Area	N/A	N/A	N/A	N/A	N/A		
Thalweg Elevation	247.57	245.52	245.47	245.90	254.90		
LTOB[2] Elevation	251.05	251.01	250.93	250.82	250.82		
LTOB[2] Max Depth (ft)	3.48	5.49	5.46	4.92	4.92		
LTOB[2] Cross Sectional Area (ft^2)	35.74	45.43	43.28	36.76	36.76		

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

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

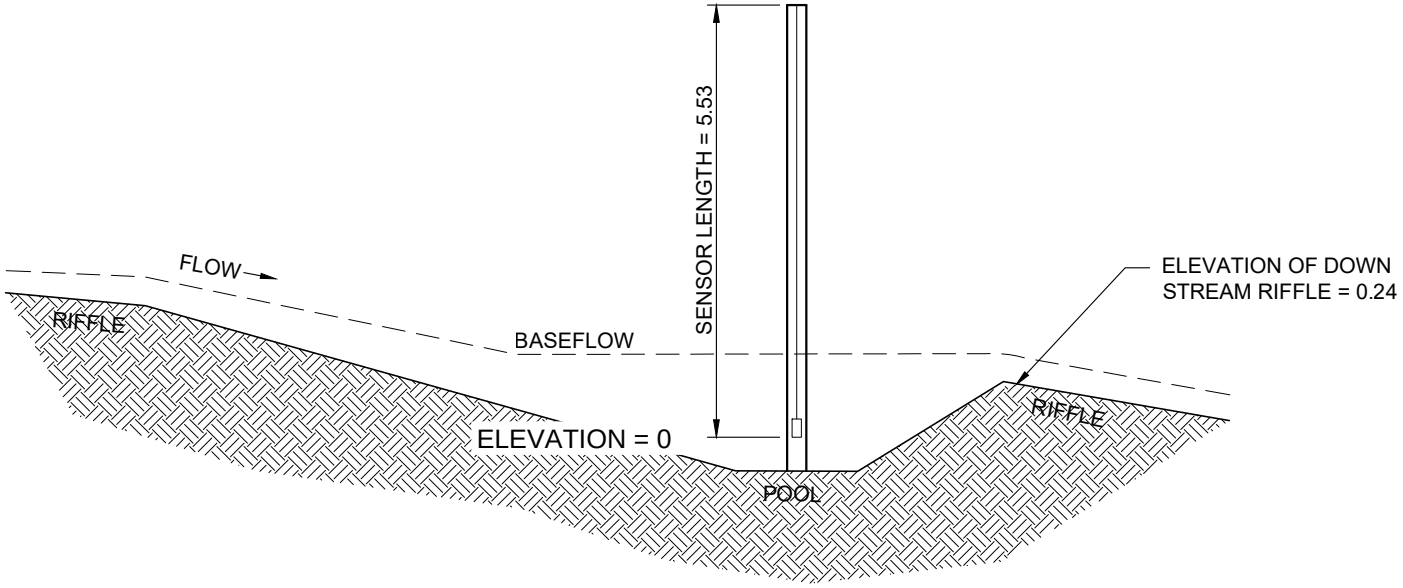
2 - **LTOB Area and Max depth -** These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as above. The difference between the LTOB elevation and the thalweg elevation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

Note: The smaller the channel the closer the survey measurements are to their limit of reliable detection, therefore inter-annual variation in morphological measurement (as a percentage) is by default magnified as channel size decereases. Some of the variability above is the result of this factor and some is due to the large amount of depositional sediments observed.

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

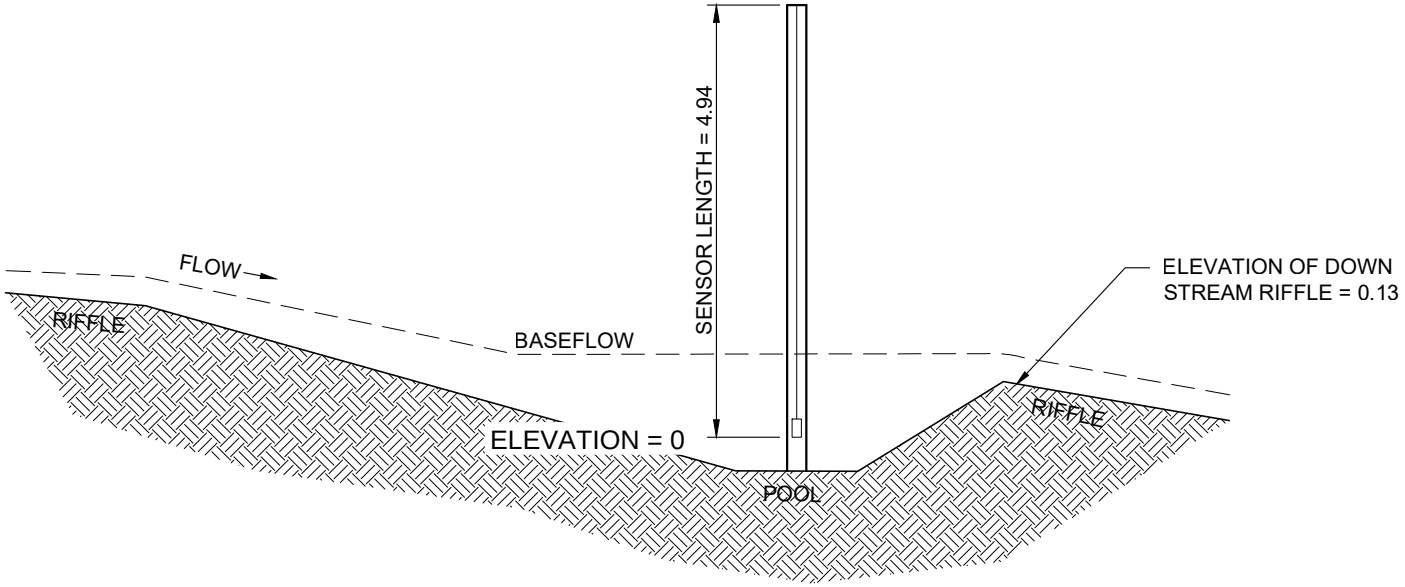
Verification of Bankfull Events - MS-R2 Buffalo Creek Tributaries Mitigation Project					
Monitoring Year	**Date of Collection**	**Date of Occurrence**	**Method**	**Photos**	**Measurement above bankfull (feet)**
MY1	5/26/2021	3/28/2021	Pressure Transducer	No	0.011
	7/13/2021	6/10/2021	Pressure Transducer	No	1.066
	7/13/2021	7/8/2021	Pressure Transducer	No	0.110
	7/13/2021	unknown	Visual Wrack Lines	Yes	N/A
	11/9/2021	10/25/2021	Pressure Transducer	No	0.27
	11/9/2021	unknown	Cork Crest Gauge	Yes	0.400
	11/9/2021	unknown	Sediment Deposition	Yes	N/A
MY2	4/8/2022	1/3/2022	Pressure Transducer	No	0.31
	4/8/2022	1/16/2022	Pressure Transducer	No	0.245
	4/8/2022	3/24/2022	Pressure Transducer	No	0.855
	8/24/2022	7/9/2022	Pressure Transducer	No	0.726
	8/24/2022	8/12/2022	Pressure Transducer	No	0.945
MY3	6/9/2023	4/8/2023 - 4/9/2023	Pressure Transducer	No	0.198
	6/9/2023	4/14/2023	Pressure Transducer	No	0.689
	6/9/2023	4/21/2023	Pressure Transducer	No	0.487
	6/9/2023	4/30/2023	Pressure Transducer	No	1.073
	6/9/2023	5/16/2023	Pressure Transducer	No	0.546
	9/5/2023	6/21/2023	Pressure Transducer	No	0.109
	9/5/2023	7/13/2023	Pressure Transducer	No	1.375
	9/5/2023	8/14/2023	Pressure Transducer	No	0.579



FLOW GAUGE #1 - R4

Flow Depth = 0.21 feet

*All elevations relative to sensor depth

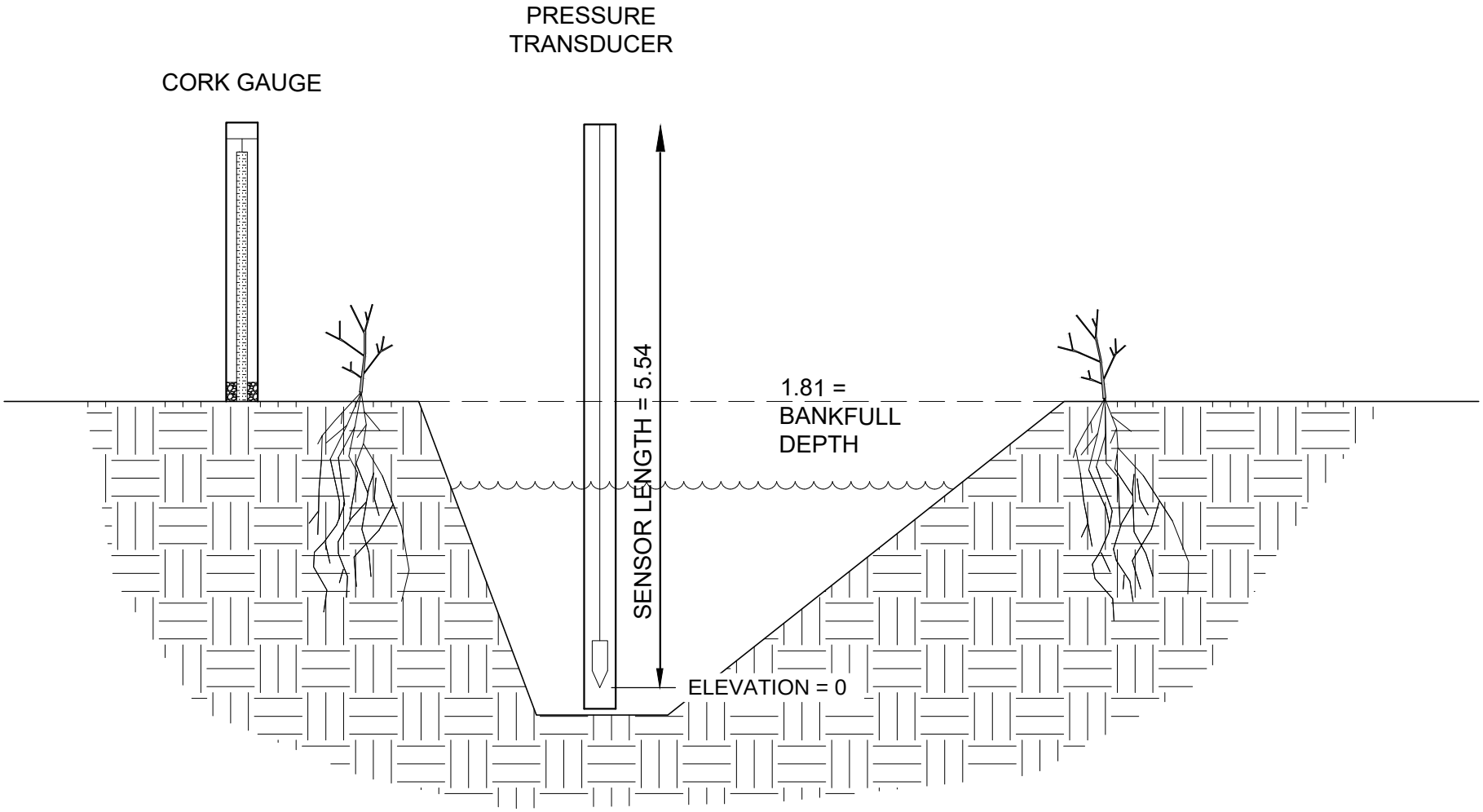


FLOW GAUGE #2 - R6

Flow Depth = 0.13 feet

*All elevations relative to sensor depth

CROSS SECTIONAL VIEW OF STREAM

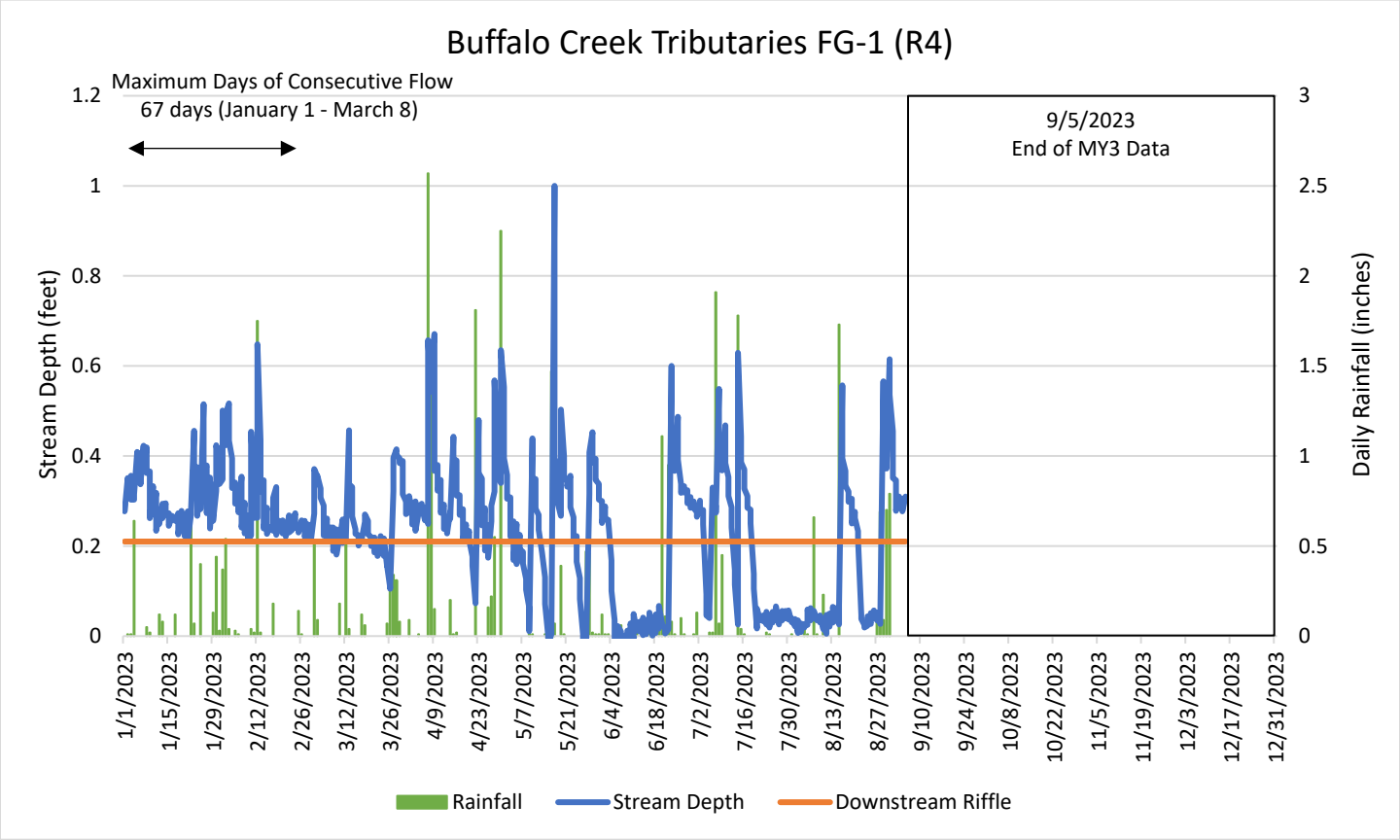


Crest Gauge CG-1 (MS - R2)

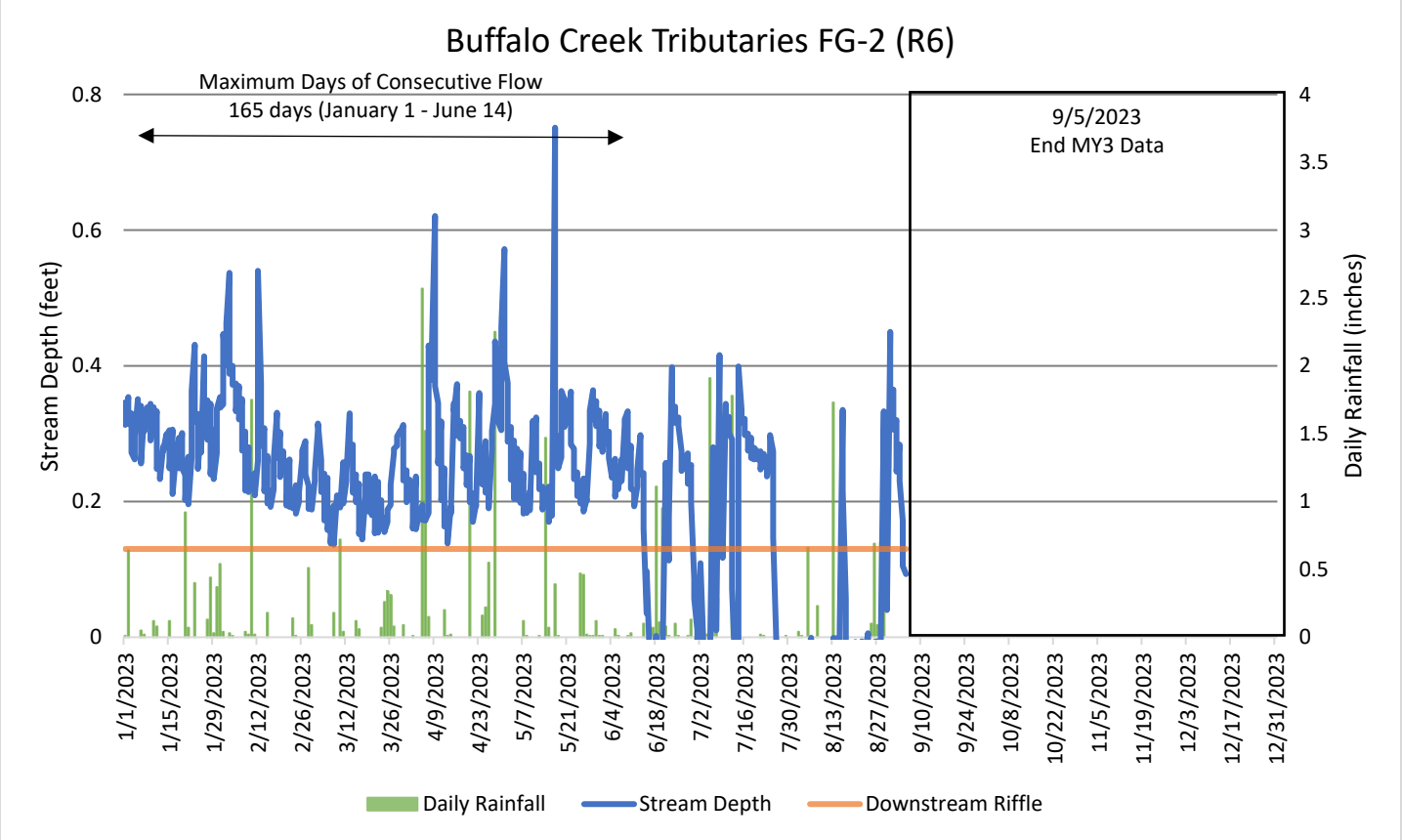
Bankfull Event Depth = 1.81

*All elevations relative to sensor depth

Flow Gauge Graphs

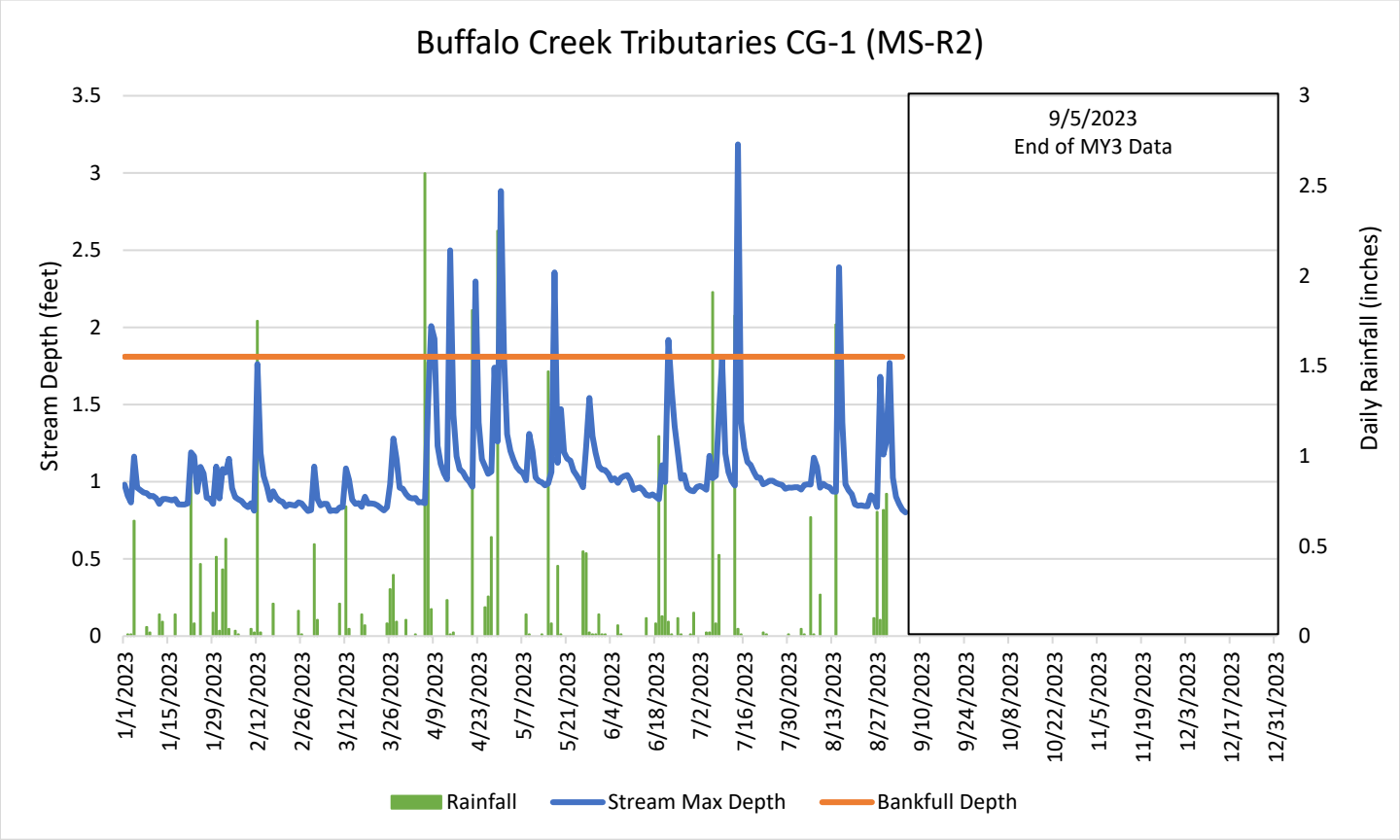


***FG-1:** 166 Cumulative days of flow, 82 days of no flow



***FG-2:** 194 Cumulative days of flow, 54 days of no flow

Crest Gauge Graph

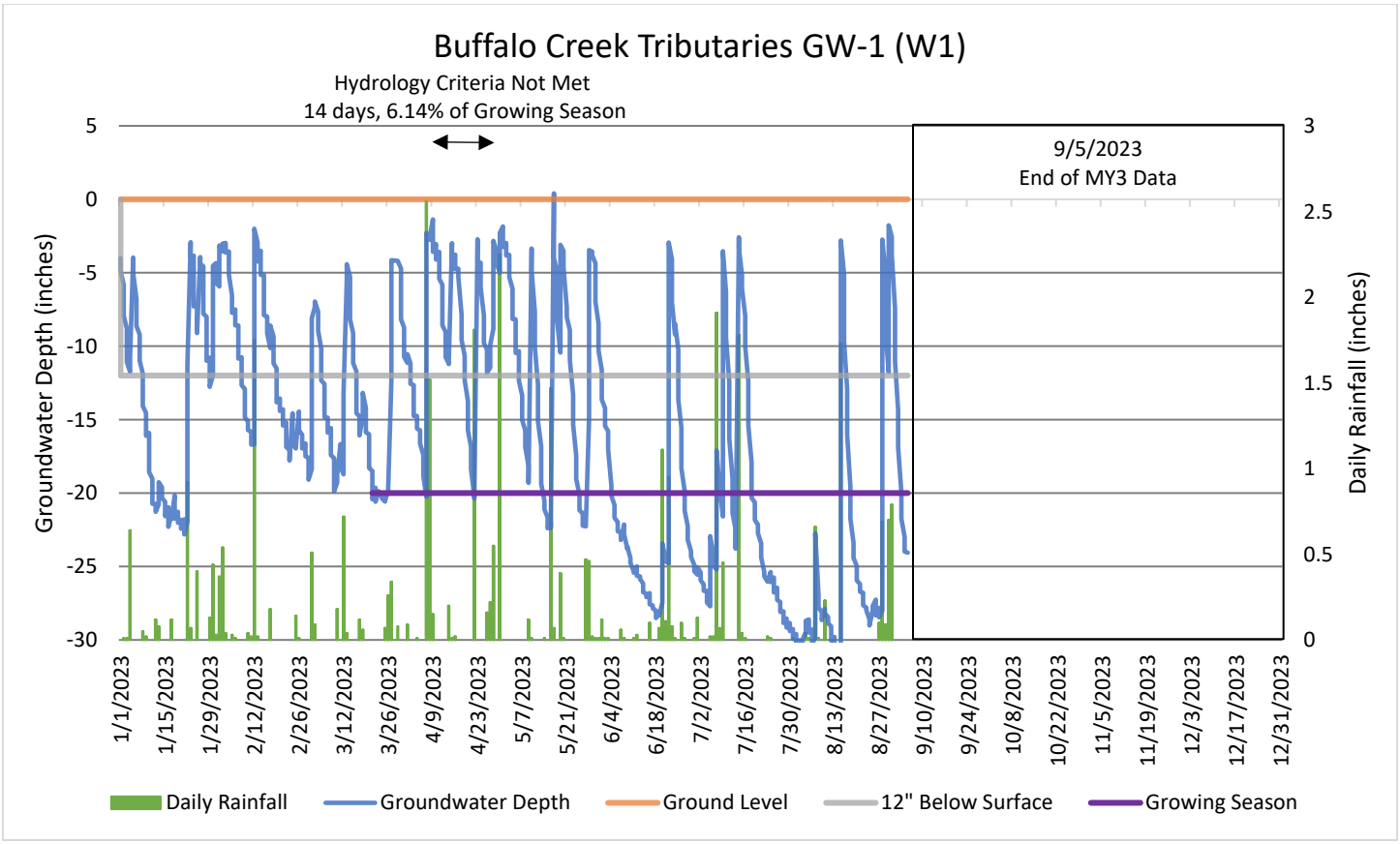


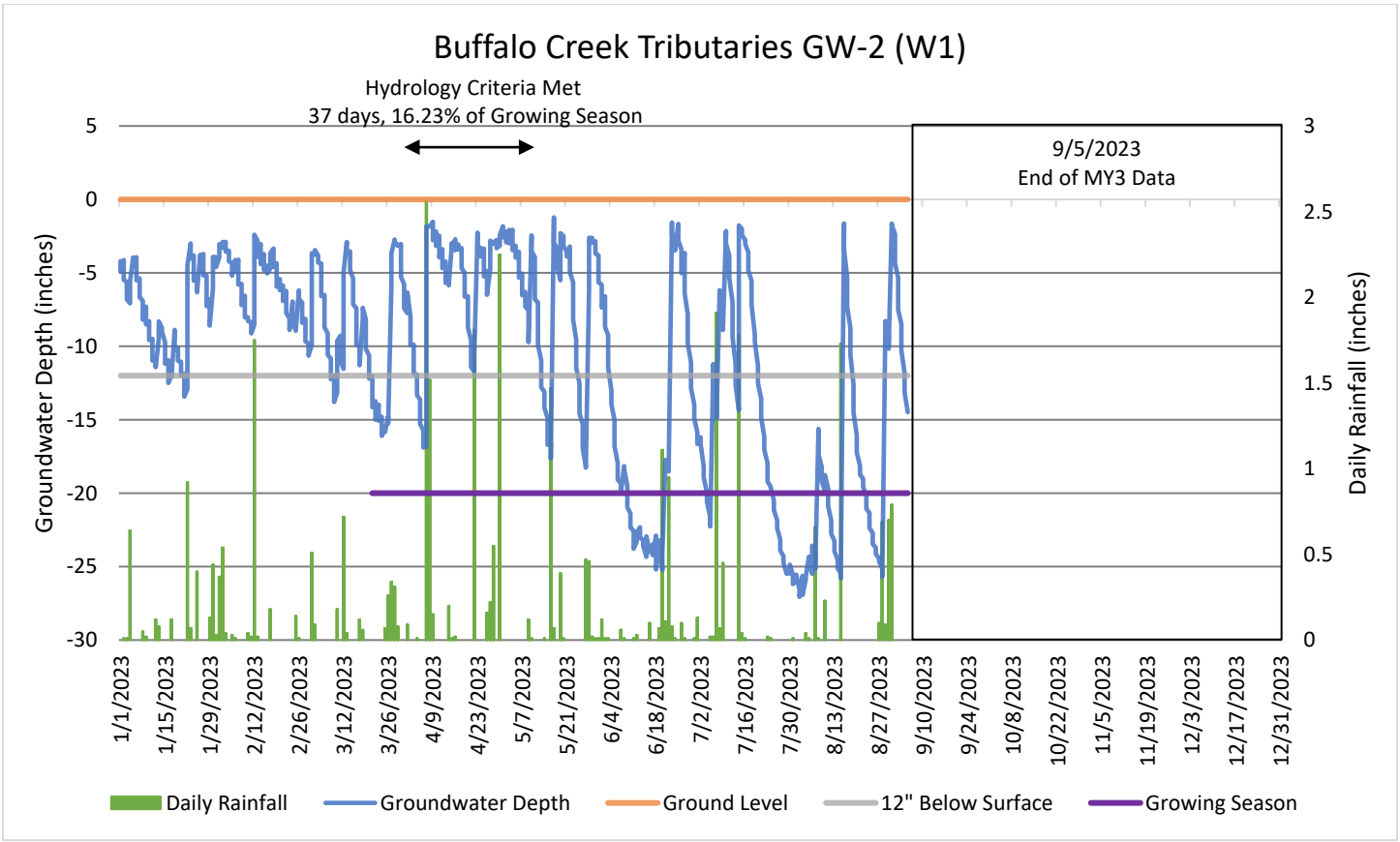
***CG-1:** 8 bankfull events in MY3 with a maximum of 1.375' above bankfull

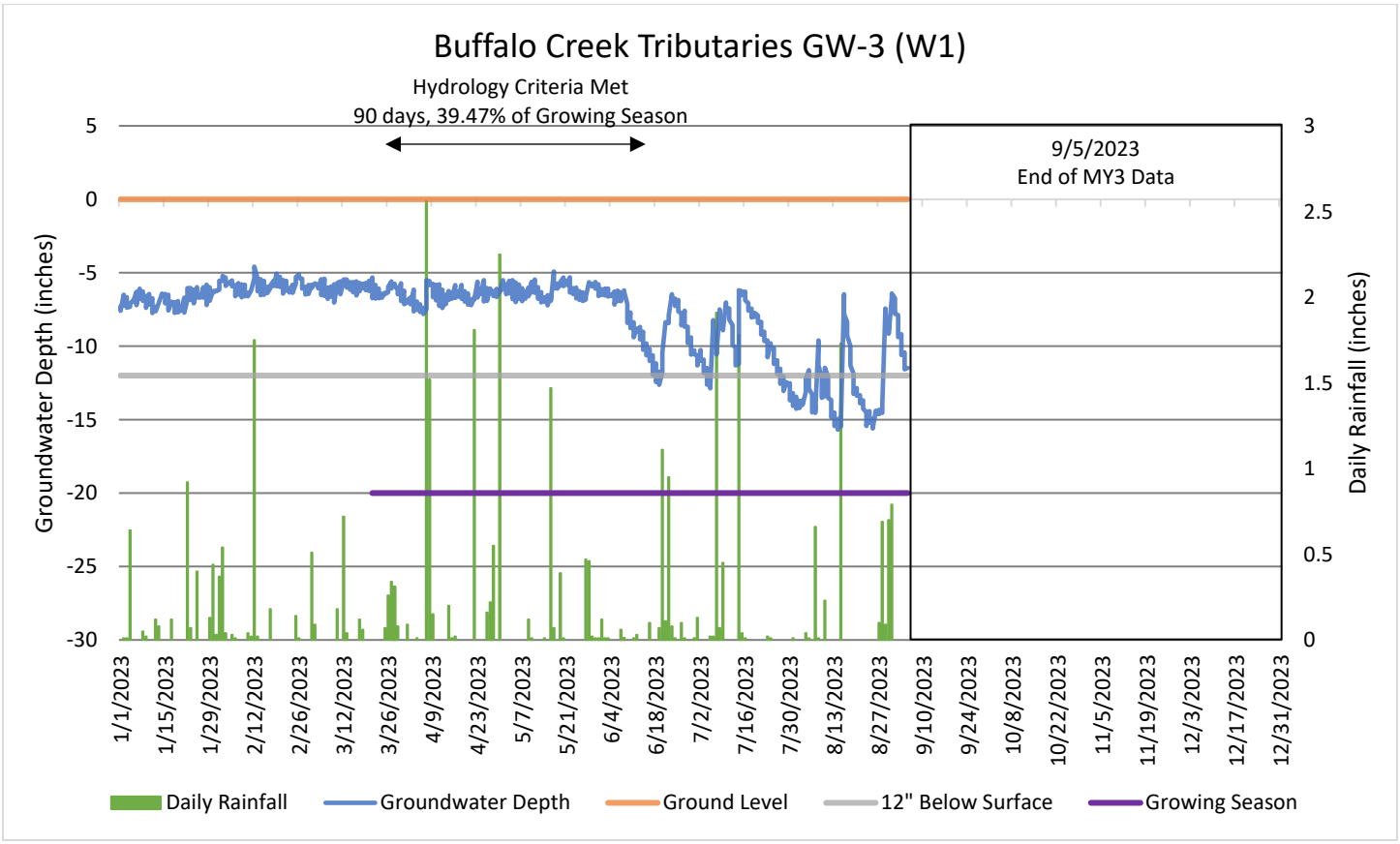
Max Consecutive Hydroperiod Saturation within 12 Inches of Soil Surface (Percent of Growing Season 3/21-11/3) CRONOS Station:Clayton (CLAY)								
Monitoring Gauge Name	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**Mean**
Groundwater Gauge 1 (W1)	**2.20%**	**10.13%**	**6.14%**					**6.16%**
Groundwater Gauge 2 (W1)	**17.62%**	**10.57%**	**16.23%**					**14.81%**
Groundwater Gauge 3 (W1)	**21.15%**	**32.16%**	**39.47%**					**30.93%**
Groundwater Gauge 4 (W2)	**16.74%**	**26.00%**	**36.40%**					**26.38%**
Groundwater Gauge 5 (W2)	**72.69%**	**37.44%**	**63.60%**					**57.91%**
Groundwater Gauge 6 (W2)	**55.07%**	**22.47%**	**35.96%**					**37.83%**
Groundwater Gauge 7 (W3)	**12.33%**	**4.85%**	**24.12%**					**13.77%**
Groundwater Gauge 8 (W3)	*	*	**21.93%**					**21.93%**

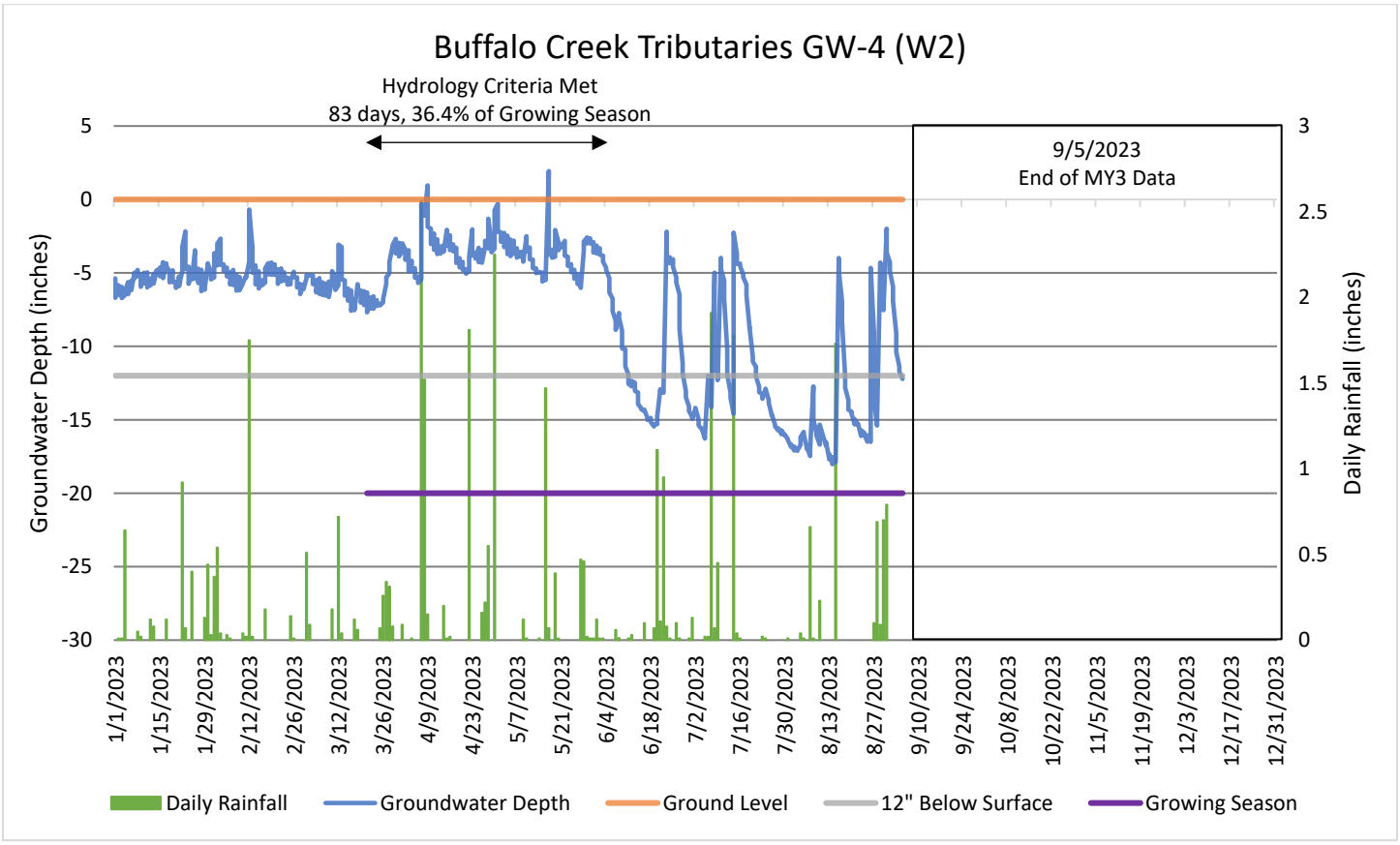
*GW-8 was installed in W3 prior to MY3 to better monitor W3 Hydrology

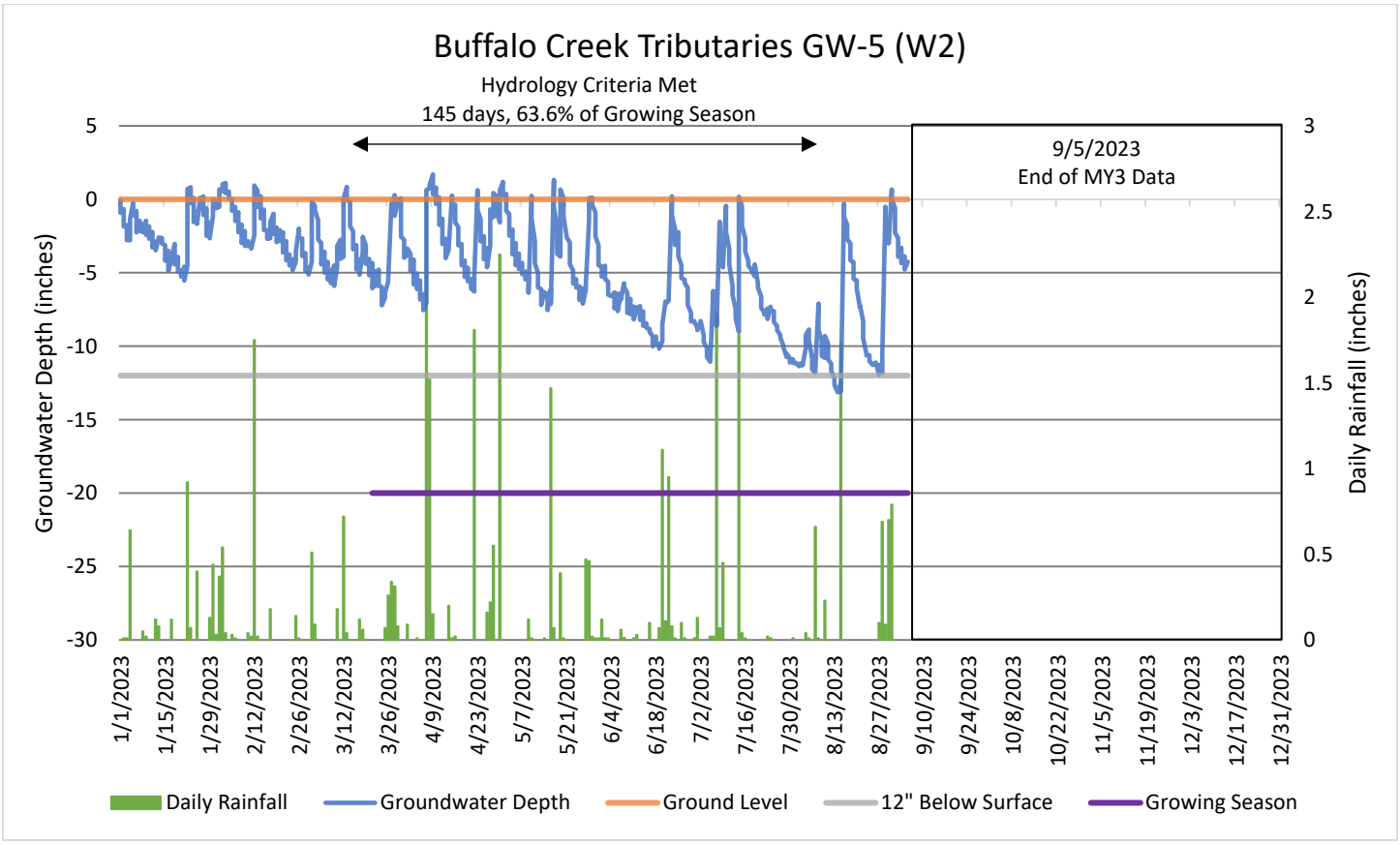
Groundwater Gauge Graphs

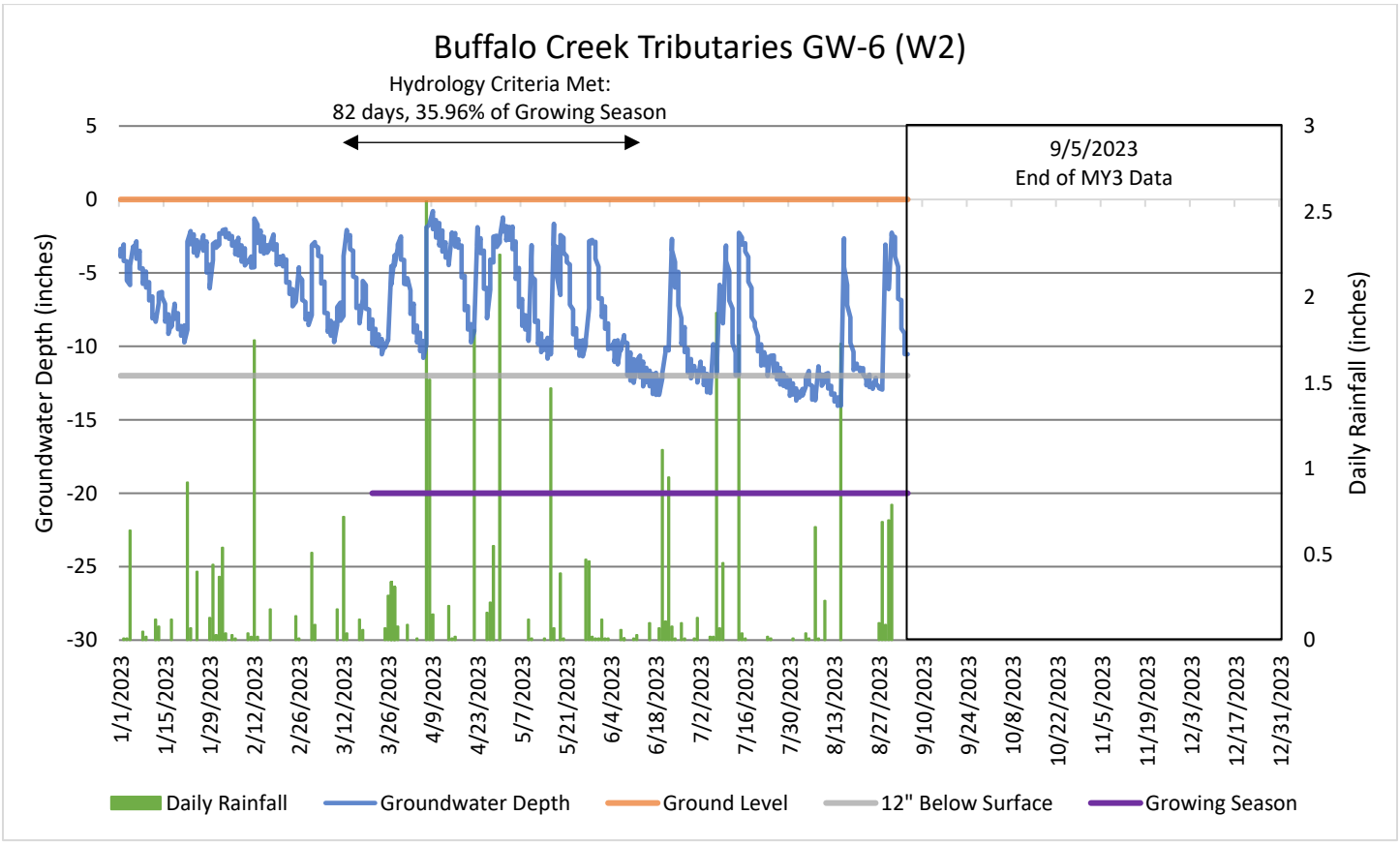


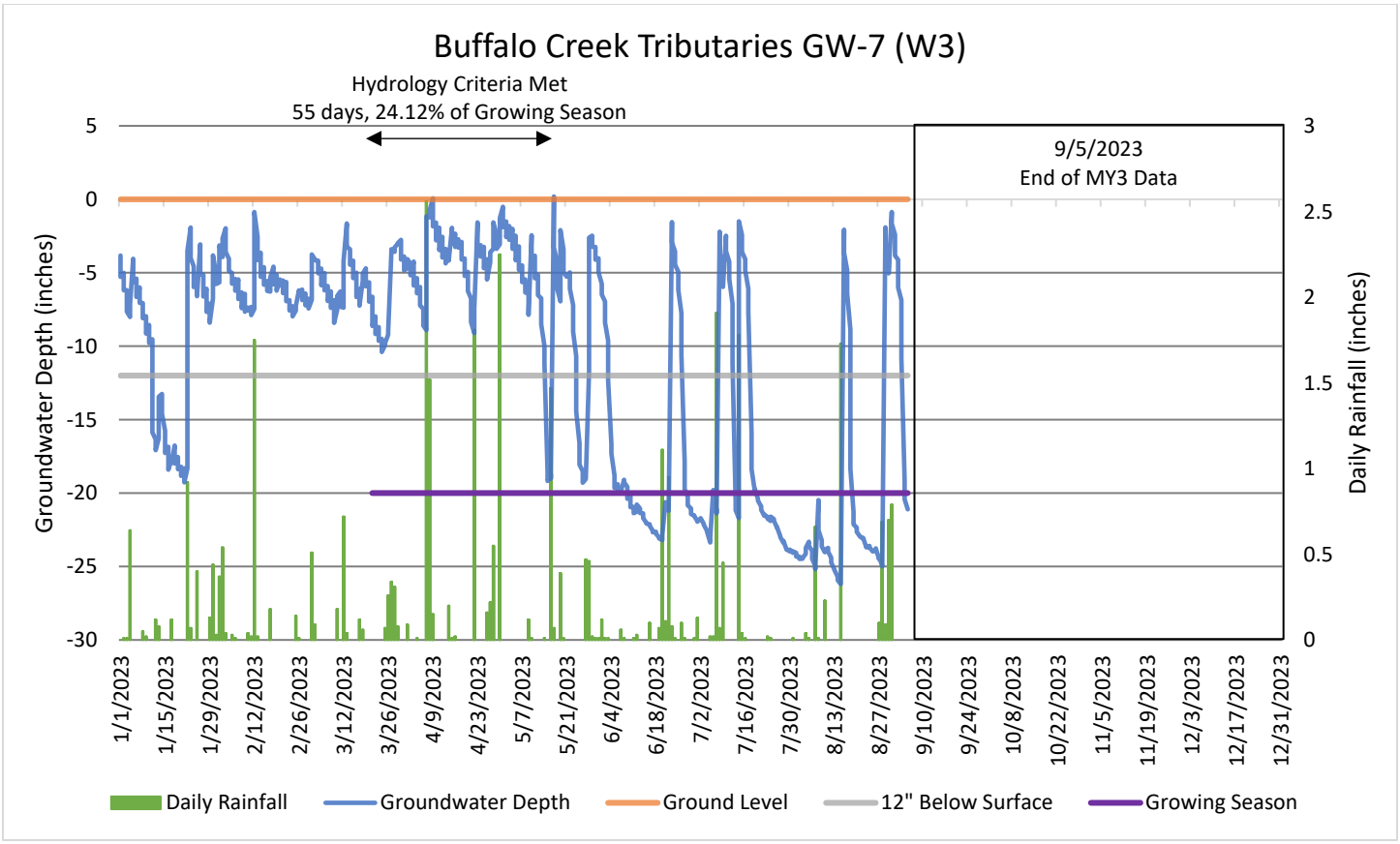


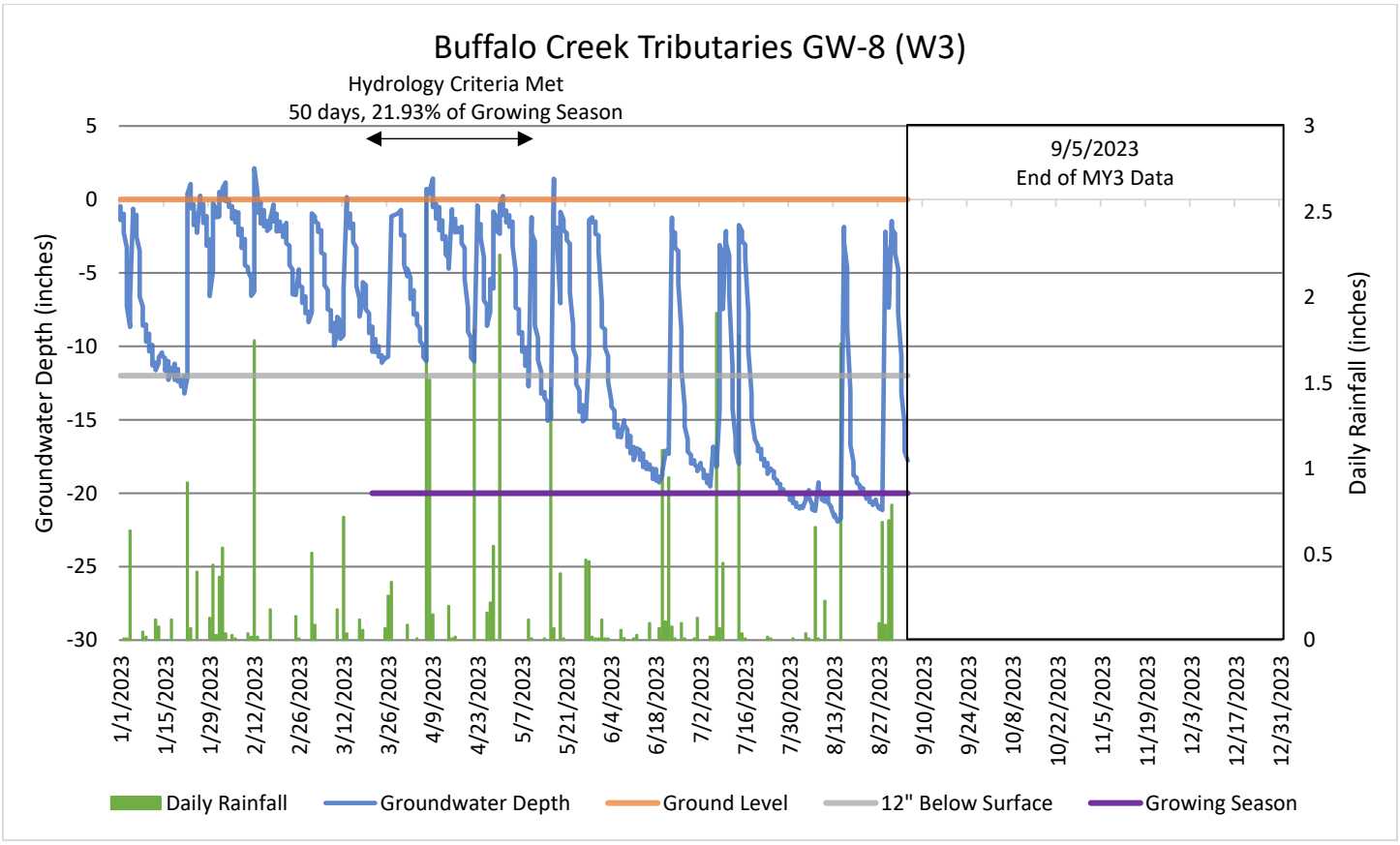

Buffalo Creek Tributaries GW-3 (W1)
Hydrology Criteria Met
90 days, 39.47% of Growing Season
9/5/2023
End of MY3 Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3
2.5
2
1.5
1
0.5
0
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Daily Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Buffalo Creek Tributaries GW-4 (W2)
Hydrology Criteria Met
83 days, 36.4% of Growing Season
9/5/2023
End of MY3 Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3
2.5
2
1.5
1
0.5
0
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Daily Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season

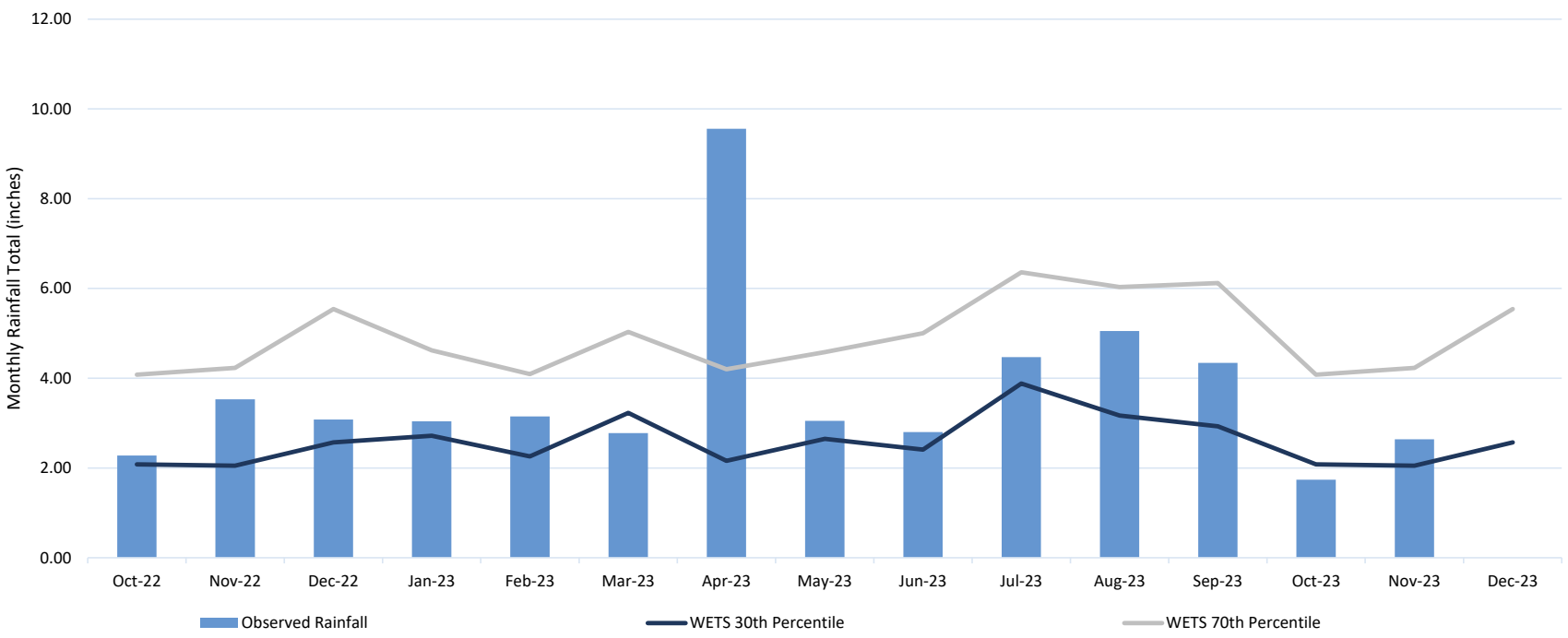

Buffalo Creek Tributaries GW-5 (W2)
Hydrology Criteria Met
145 days, 63.6% of Growing Season
9/5/2023
End of MY3 Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3
2.5
2
1.5
1
0.5
0
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Daily Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Buffalo Creek Tributaries GW-6 (W2)
Hydrology Criteria Met:
82 days, 35.96% of Growing Season
9/5/2023
End of MY3 Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3
2.5
2
1.5
1
0.5
0
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Daily Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Buffalo Creek Tributaries GW-7 (W3)
Hydrology Criteria Met
55 days, 24.12% of Growing Season
9/5/2023
End of MY3 Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3
2.5
2
1.5
1
0.5
0
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Daily Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season


Buffalo Creek Tributaries GW-8 (W3)
Hydrology Criteria Met
50 days, 21.93% of Growing Season
9/5/2023
End of MY3 Data
Groundwater Depth (inches)
Daily Rainfall (inches)
5
0
-5
-10
-15
-20
-25
-30
3
2.5
2
1.5
1
0.5
0
1/1/2023
1/15/2023
1/29/2023
2/12/2023
2/26/2023
3/12/2023
3/26/2023
4/9/2023
4/23/2023
5/7/2023
5/21/2023
6/4/2023
6/18/2023
7/2/2023
7/16/2023
7/30/2023
8/13/2023
8/27/2023
9/10/2023
9/24/2023
10/8/2023
10/22/2023
11/5/2023
11/19/2023
12/3/2023
12/17/2023
12/31/2023
Daily Rainfall
Groundwater Depth
Ground Level
12" Below Surface
Growing Season

Buffalo Creek Mitigation Site
Rainfall Data



Rainfall Summary Table

	Oct-2022	Nov-2022	Dec-2022	Jan-2023	Feb-2023	Mar-2023	Apr-2023	May-2023	Jun-2023	Jul-2023	Aug-2023	Sep-2023	Oct-2023	Nov-2023	Dec-2023
Observed Rainfall	2.28	3.53	3.08	3.04	3.15	2.78	9.56	3.05	2.80	4.47	5.05	4.34	1.74	2.64	**
WETS 30th Percentile	2.08	2.05	2.57	2.72	2.26	3.23	2.16	2.65	2.41	3.88	3.17	2.93	2.08	2.05	2.57
WETS 70th Percentile	4.08	4.23	5.54	4.62	4.09	5.03	4.20	4.58	5.00	6.36	6.03	6.12	4.08	4.23	5.54
Normal	N	N	N	N	N	L	H	N	N	N	N	N	L	N	**

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

**Incomplete month of data

Appendix E:
Project Timeline and Contact Info

Activity or Deliverable	Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted	NA	1/2/2018
Mitigation Plan Approved	NA	6/29/2020
Construction (Grading) Completed	NA	4/22/2021
Planting Completed	NA	4/26/2021
As-built Survey Completed	NA	6/16/2021
MY-0 Baseline Report	05/04/21	6/17/2021
Encroachment 1 & 2 Documented	N/A	8/11/2021
MY1 Monitoring Report	11/09/21	11/24/2021
Encroachment 1 & 2 Planting	N/A	1/6/2022
Encroachment 3 Documented	N/A	8/18/2022
MY2 Monitoring Report	09/16/22	11/30/2022
Invasive Treatment	N/A	6/8/2023
MY3 Monitoring Report	09/05/23	12/29/2023

Buffalo Creek Tributaries Mitigation Project: DMS #100042	
Provider	7721 Six Forks Road, Suite 130
Water & Land Solutions, LLC	Raleigh, NC 27615
Mitigation Provider POC: Leah Farr	(919) 971 - 4575
Designer	7721 Six Forks Road, Suite 130
Water & Land Solutions, LLC	Raleigh, NC 27615
Primary project design POC: Christopher Tomsic	(828) 493-3287
Construction Contractor	114 W. Main Street
Providence Construction Services, LLC	Clayton, NC 27520
Primary Construction POC: Mike Rouse	(919) 805-6324

Appendix F:
MY3 Benthic Data

Macrobenthic Sampling Data

MS-R2 - Buffalo Creek Mitigation Site			
Monitoring Year	MY0	MY3	
Biotic Index Score	6.83	8.00	
Water Quality Level	Fair	Poor	

MY3 - View Upstream

MY3 - View Downstream

Biotic Index Data and Scores

Pre-Construction 2020	
Taxa / Biotic Index Value	**MS-R2**
EPHEMEROPTERA	
Family Heptageniidae	
Maccaffertium modestum (5.7)	R
TRICHOPTERA	
Family Hydropsychidae	
Cheumatopsyche spp (6.6)	A
Hydropsyche betteni (7.9)	A
Family Philopotamidae	
Chimarra spp (3.3)	R
COLEOPTERA	
Family Elmidae	
Macronychus glabratus (4.7)	R
ODONATA	
Family Aeshnidae	
Boyeria vinosa (5.6)	R
Family Calopterygidae	
Calopteryx spp (7.5)	C
Family Cordulegastridae	
Cordulegaster spp (5.7)	C
OLIGOCHAETA	
Family Naididae	
Pristina spp (7.7)	R
MEGALOPTERA	
Family Corydalidae	
Nigronia serricornis (4.6)	C
Total Taxa Richness	10
EPT Taxa Richness	4
EPT Abundance	22
Biotic Index	**6.83**

Key
R = Rare, C = Common, A = Abundant

MY3 2023	
Taxa / Biotic Index Value	**MS-R2**
EPHEMEROPTERA	
Family Baetidae	
Baetis intercalaris (1.5)	R
TRICHOPTERA	
Family Hydroptilidae	
Tropisternus spp (9.3)	R
ODONATA	
Family Aeshnidae	
Boyeria vinosa (5.8)	R
Family Coenagrionidae	
Enallagma spp (8.5)	C
Family Libellulidae	
Perithemis spp (9.4)	C
COLEOPTERA	
Family Haliplidae	
Peltodytes spp (8.4)	R
DIPTERA; CHIRONOMIDAE	
no genus specified (7.2)	R
GASTROPODA	
Family Lymnaeidae	R
Total Taxa Richness	**8**
EPT Taxa Richness	**2**
EPT Abundance	**2**
Biotic Index	**8.00**