Appendix E3 - Stormwater Restoration (Restoration Monitoring)

C. Milton Wright High School Stream Restoration Post Construction

Annual Monitoring Report – Year 3

Harford County, Maryland

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Prepared For:

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Table of Contents

List of Figures

List of Tables

List of Appendices

1.0 Introduction

The C. Milton Wright Stream Restoration project restored an unnamed perennial tributary to Bynum Run (the mainstem) and three contributing tributaries in Harford County, Maryland. The purpose of the project was to generate nutrient and sediment reductions within the project area to support the Harford County DPW Watershed Protection and Restoration Office in meeting Total Maximum Daily Load (TMDL) goals as mandated in the county's Municipal Separate Storm Sewer System (MS4) permit.

This project was authorized by the U.S. Army Corps of Engineers (USACE) through Nationwide Permit #27 for the stream and wetland restoration and under Category A of the Maryland State Programmatic General Permit-5 (MDSPGP-5) for the culvert replacement, Activity d. Linear Transportation Activities [CENAB-OPR-MN (HA Board of Education/C. Milton Wright HS/Stream Restoration) NAB-2020-61083-M49]. Special Conditions #4 through #6 require:

- Monitoring of stream flow classification
- Evaluating structural stability of the stream restoration using longitudinal profiles
- Reporting vegetation species and cover
- Evaluating stream habitat quality using the U.S. Environmental Protection Agency's Rapid Bioassessment Protocol (RBP)
- Conducting invasive species monitoring and preparing an invasive species eradication and maintenance plan
- Photographing site conditions annually along the entire stream restoration project area; photo monitoring of site conditions
- Identifying any necessary corrective measures.

A Letter of Authorization was issued by the Maryland Department of the Environment (MDE) on July 15, 2021 (20-NT-0175/202061083). MDE Condition 19 requires monitoring to identify and evaluate changes in:

- channel cross-section, pattern, and profile
- bed materials
- channel stability
- structure stability and condition
- vegetation viability

The monitoring effort may include topographic surveys of monumented cross-sections within the realigned channel segment, visual field observations, photographic documentation, vegetation viability measurements, and identification of any necessary corrective measures.

Figure 1. Vicinity Map

2.0 Background Information

2.1 Site Description

The project site is located at C. Milton Wright High School at 1301 N Fountain Green Rd, in Bel Air. The project permanently impacted 3,845 linear feet of stream and 365 square feet of palustrine forested (PFO) wetlands. It also temporarily impacted 84 linear feet of stream and 1,979 square feet of PFO wetlands. In addition to the restoration, an existing undersized culvert was replaced with a bottomless culvert that permanently impacted 16 linear feet of stream. The restoration includes the mainstem channel: an unnamed tributary to Bynum Run, and three of its unnamed tributaries. Tributary 1 is approximately 200 linear feet. Tributary 2 is approximately 140 linear feet, and Tributary 3 is approximately 280 linear feet. The Mainstem is approximately 3200 linear feet.

The project site is located within Maryland's Piedmont Plateau Physiographic province. The drainage area is mostly zoned R2 Urban Residential with fringe areas in an Agricultural District. The land within the Agricultural District is currently being used as 0.5 acre Residential. According to Web Soil Survey, the project area is predominantly underlain by hydrologic soil types C & D ranging from moderately to poorly drained soils. The drainage area of the restoration ranges from approximately 24 acres at the upstream end to 80 acres at the downstream end.

2.2 Restoration Description

The restoration design follows a riffle – pool sequence throughout the mainstem and unnamed tributaries. Grade control structures consisting of rock cross vanes, rock sills, log j-hooks, and log sills are utilized throughout the reach to stabilize the stream bed and makeup vertical elevations. Floodplain grading has been completed to lower the stream's bank height ratio and improve floodplain connectivity.

3.0 Methodology

Monitoring data will be collected through scheduled site visits over a five-year monitoring program. During year 3, a geomorphic assessment, visual inspection, bed material visual observation, RBP Habitat assessment, invasive species survey, vegetative cover assessment, and photo documentation took place. The monitoring activities are designed to evaluate conditions associated with the stream restoration project. The following table summarizes annual monitoring activities throughout the 5-year monitoring period:

Table 1: Monitoring Program Requirements

Monitoring Requirement	Schedule	Year 1 - 2023	Year 2 - 2024	Year 3 - 2025	Year 4 - 2026	Year 5 - 2027
Flow Classification	Spring/Summer			X		X
Cross-Sections Monuments and Survey	Spring	X		X		X
Longitudinal Profile Survey	Spring	X		X		X
Visual Inspection and Photo Documentation	Spring	X		X		X
Bed Material Visual Observation	Spring	X		X		X
RBP Habitat Assessment	Summer	X		X		X
Invasive Species Monitoring and Management Plan	Summer			X		X
Vegetative Cover	Summer			X		X
Monitoring Report	October	X		X		X
Site Walkthrough and Monitoring Memo	Growing Season		X		X	

3.1 Geomorphic Assessment

The baseline geomorphic assessment was conducted on July 3rd, 9th, 29th and 30th, as well as August 6th 2025. Seven cross-sections and a longitudinal profile were surveyed to document the Year 3 conditions and for comparison with Year 1. The field data collection activities were based on data collection methods described in *Stream Channel Reference Sites: An Illustrated Guide to Field Technique* (Harrelson et al., 1994). Field data was entered into the Reference Reach spreadsheet STREAM module 4.3L (Mecklenburg, 2006) for analysis. All references to left or right bank are facing downstream. For consistency, the stream reaches established in the C. M. Wright Stream Restoration Design Report prepared by RES, were maintained for monitoring. These reaches include Reaches 1, 2A, 2B, 3, 4, and Unnamed Tributary (UT) 1, UT2, and UT3. **Table 2** below lists the monitored reaches and their extents.

Table 2: Stream Reaches

Reach ID	Extents
1	Beginning of Mainstem – Confluence with Tributary 1
2A	Confluence with Tributary 1 – EX. 42" CMP over walking path
2B	EX 42" CMP over walking path – Confluence with Tributary 2
3	Confluence with Tributary 2 – Confluence with Tributary 3
4	Confluence with Tributary 3 – End of Mainstem
UT1	Tributary 1
UT2	Tributary 2
UT3	Tributary 3

3.1.1 Longitudinal Profile

The Year 3 monitoring schedule includes the measurement of a longitudinal profile of the stream. Longitudinal profile includes a survey of the thalweg elevation and water surface elevations within the restored channel in addition to bankfull and top of bank elevation shots at a minimum of every 100 feet. The longitudinal profile surveys are used to characterize the slope and morphology of the stream channel through the study area. The profiles were broken out by reach and elevations were referenced and tied in using the existing culverts on site with a known invert elevation. Specifically, the culverts at Station 24+02, elevation 331.4', and Station 34+18.3, elevation 308.3. A measuring tape was laid down in the center of the channel for all reaches. Changes in slope and extent of bed features will be evaluated by overlaying previously monitored profile elevations. Changes might include pool depth, riffle and pool spacing, and length of riffles and pools. The Year 3 (2025) profile survey is graphed with the Year 1 (2023) survey results for comparison.

3.1.2 Cross-Sections

Seven cross-sections established during Year 1 of monitoring were resurveyed in Year 3. **Appendix B** shows the locations of the cross-sections. Each cross-section is located within a riffle feature. All cross-section pins from 2023 were located for survey in 2025. One cross-section each was taken in Tributaries 1, 2, and 3. The four remaining cross-sections are along the mainstem. Repeat surveys of the cross-sections during years following the monitoring period will allow changes in the bed and banks to be evaluated by overlaying the cross-sections. The Year 3 (2025) survey results were graphed with the Year 1 (2023) survey results for comparison.

3.2 Visual Inspection and Photo Documentation

During the monitoring survey, a visual inspection was performed for the mainstem and three tributaries. The inspection documented how the reach performed by examining the flow, vegetation growth, structure conditions, sediment loads, and additional features including outfall channels and wetlands. Areas to continue to monitor closely where failure could possibly occur were documented in the field book and photographed. Photo points were established along all reaches to serve as a baseline for monitoring each year. These photo locations show:

- Stream centerline
- Endpoints of each reach
- Top and bottom of each riffle, cascade, and plunge pool
- Constructed floodplain depressions
- Outfalls
- Points of interest
- Any potential problem areas that are noted during the assessment

Appendix A contains a photo point location map that displays the photo point numbers and locations in addition to the photo exhibit. Photos collected at each location point during Year 1 were retaken in monitoring Year 3 and will be taken again in Year 5 with the same orientation to document how the restoration area is evolving and used for side-by-side comparison.

3.3 Bed Material Visual Observation

A visual inspection of the streambed material was performed during the field assessment. The inspection examined the size and stability of streambed materials. Any evidence of sediment transport within the pools, riffles, and cascade structures was documented. The material inspection was closely monitored at the seven monumented cross-sections to serve as a baseline for future monitoring.

3.4 Rapid Bioassessment Protocol (RBP)

To assess stream habitat, an Environmental Protection Agency (EPA) Rapid Bioassessment Protocol (RBP) Habitat Assessment Field Datasheet for high gradient streams was completed for each reach. The high gradient RBP datasheets use qualitative ratings of habitat metrices that include epifaunal substrate/available cover, sediment deposition, channel flow status, channel alteration, bank stability, vegetative protection, and riparian vegetative zone width. The high gradient datasheet also includes parameters for embeddedness, velocity/depth regime, and frequency of riffles (or bends). Each parameter is given a score from 0-20, except for bank stability, vegetative protection, and riparian vegetative zone width, which score from 0-10 for each bank. The total is summed to generate an overall stream habitat score. For each parameter, scores from 0-5 fall in the poor condition category, scores from 6-10 fall in the marginal condition category, scores from 11-15 fall in the suboptimal condition category, and scores from 16-20 fall in the optimal condition category. T**able 3** below shows the overall narrative ranking associated with overall scores.

Table 3: EPA RBB Ranking Criteria

Score	Narrative
166 - 200	Excellent
154 - 165	Excellent/Good
113 – 153	Good
101 – 112	Good/Fair
60 – 100	Fair
54 – 99	Fair/Poor
0 – 53	Poor

Source: Van Ness et al., 1997; Stribling et al., 1999

3.5 Vegetative Assessment

An assessment of species richness and vegetative cover for the Year 3 monitoring period was completed once during the growing season, in the late summer prior to senescence. Representative plots were established within each planting zone according to the Landscape Plans and located using a hand-held Global Positioning System (GPS). A total of 14 representative plots were established, based on the total acreage of the limit of disturbance (LOD) and the sizes of the various landscape zones. The plot sizes were 400 square feet. Alternative plot sizes (e.g., belt transects of approximately 200 square feet) were used depending on the dimensions of the LOD and landscape zones. Eight plots were located in the upland woody zone, two in the riparian planting zone, two in the streambank planting zone, and two in the created forested wetland zone. The planted field zone was not included in the assessment as it consisted only of turfgrass, and species were largely not identifiable to species level due to regular mowing. Plot data was extrapolated to determine the success of vegetation establishment within each zone and the overall LOD.

Visual observations within each vegetation plot were recorded and included species, species richness, vegetative coverage within each stratum (i.e., trees, shrubs/saplings, herbaceous, woody vines), density of woody vegetation, dominant species within the plot, vegetation viability, evidence of disease or infestation, and composition of non-native invasive plants. Percentage of vegetative cover was used to determine whether the planted vegetation has an 85 percent aerial coverage, including native volunteer species, as required in the USACE permit. Observations of stressed, diseased, or browsed plantings were used to report vegetation viability. Stem density measurements were also used to determine the survivability of the plantings. A photographic record of the planting areas was made for documentation of each of the test plots, as well as of other areas of interest or concern that demonstrate the survivability and overall conditions of each area. A map of riparian vegetation test plot locations is provided in **Appendix G**.

3.6 Invasive Species Monitoring

An assessment of invasive species coverage within the project's LOD was conducted in the late growing season in Year 3. The assessment protocol included slowly walking transects across the proposed study area to identify invasive plant species recognized in the National Park Service/U.S. Fish and Wildlife Service document entitled *Plant Invaders of Mid-Atlantic Natural Areas* (Swearingen et al., 2014) and within the Maryland Invasive Species Council document entitled *Invasive Species of Concern in Maryland* (MD Invasive Species Council, 2005). These lists include both non-native invasive species and native species considered locally invasive by resource agencies. All identified invasive plants within the study area were documented by tracing the limits of each population or zone on field maps and using GPS to locate patches/zones of invasive species more accurately. For each distinct invasive species population, an estimate was made of the amount of the invasive cover relative to the total plant cover in the area. The total cover of each invasive species was then summarized for the entire project site. Since pre-construction invasive species data is not available, Year 3 will be considered the baseline year for future comparison. An invasive species eradication and maintenance plan was developed for submittal to the USACE as part of the Year 3 annual monitoring report, which is included in **Appendix M**.

3.7 Temporary Wetland Impact Monitoring

USACE permit special condition #9 requirements state that temporarily impacted wetlands should be restored. Monitoring of wetlands temporarily impacted by the project was conducted in Year 3. Sample plot locations were established randomly to provide a minimum of one plot per wetland impact area and within forested wetland planting areas. During the field assessment, Routine Data Forms applicable to the Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Eastern Mountains and Piedmont Region, Version 2.0 (USACE, 2012) were used to document hydrology, vegetation, and soils data at each sample plot.

4.0 Results

4.1 Geomorphic Assessment

Longitudinal profiles and cross-section graphs for each reach are included in **Appendix D**.

4.1.1 Longitudinal Profile

Reach 1, beginning at the upstream extent of the project consisted of approximately three riffle grade control structures, two rock structures, and two log structures. The measured Reach slope was approximately 3.8%, a slight decrease from 4% in Year 1. Riffle slopes averaged between 4.2 and 6.7%, compared to 5 and 6.6% in Year 1. There appears to have been some slight erosion at riffle crests evident in the profile comparison. In Year 1, a stream elevation drop of 0.81 feet was surveyed below the first rock structure at station 0+06, however the stream bed remained stable above and below the structure. This was consistent in Year 3. The third riffle grade control structure at approximately station 0+93 appears to have degraded at the riffle crest and appears to have shifted some material downstream as shown in the profile comparison. Results are summarized in **Table 4**.

Reach 2A, beginning at the confluence with UT1 had a surveyed length of approximately 1,259 linear feet and a reach slope of 2%, which is consistent with Year 1. This reach had 32 riffle grade controls surveyed which ranged in slopes between 1.9 and 6.2%, averaging 3.9%, compared to an average of 4.4% in Year 1. Additionally, 12 rock structures and 14 log structures were located in the Reach 2A survey. Reach 2A maintained perennial flow. Pool depths averaged 0.89 feet with a max baseflow pool depth of 1.4 feet recorded. While the max depth has stayed the same, a slight increase in the average pool depth was observed, consistent with normal scour as the project stabilizes. Slight aggradation was noted in a few riffles in Reach 2A, and slight deposition was observed throughout the reach. Overall, Reach 2A remains stable and surveyed elevations matched closely to recorded as-built elevations. Reach 2A longitudinal profile results are summarized in **Table 4**.

Reach 2B begins downstream of the existing pedestrian bridge at a 42-inch corrugated metal pipe (CMP). This reach had a surveyed length of approximately 588 linear feet. The reach slope averaged 3.0%, consistent with Year 1. A total of 15 riffle grade controls were recorded in the profile that ranged in slope from 0.44% - 6.9%. Seven rock structures and seven log structures were located in the surveyed section. Reach 2B maintained perennial flow throughout the reach. Max pool water surface elevations at the time of survey averaged 1.02 feet depths with a max depth of 1.6 feet. Slight shifts in riffle slope and pool depth are normal changes that often occur as the project stabilizes. The reach maintains vertical stability with surveyed elevations aligning with as-built survey elevations. Reach 2B longitudinal profile results are summarized in **Table 4**.

Reach 3 is the shortest reach with a surveyed length of approximately 209 linear feet. Reach 3 begins at the confluence with UT2 and continues until the confluence with UT3. The average reach slope was 1.6%. Five riffle grade control structures were surveyed within Reach 3. Riffle slopes averaged 4.4%, compared to 6.7% in Year 1, due to a structure slope range of 1.6 – 8.2%. Minor shifts in materials were observed in the profile survey, however structures appeared stable and will continue to be monitored. One rock structure and two log structures were present within Reach 3. One riffle crest, just downstream of XS-5, appears to have minor degradation, which can be seen in the profile comparison in **Appendix D**. All other structures appeared stable and were consistent with as-built surveyed elevations. Reach 3 maintained perennial flow. Max pool water surface elevations at the time of survey averaged 1.1 feet with a max depth of 1.45 feet. Slight shifts in riffle slope and pool depth are normal changes that often occur as the project stabilizes. Reach 3 generally maintains vertical stability with surveyed elevations aligning with as-built survey elevations. Reach 3 longitudinal profile results are summarized in **Table 4**.

Reach 4 begins at the confluence of UT3 and continues to the end of the project area. Reach 4 includes the new open bottom double box culvert located near monitoring station 24+03. The as-built survey noted changes that were part of RFI #26 which included moving the precast culvert to station 34+01.1 instead of 33+58 and placing additional riprap upstream and downstream of the culvert. The Year 3 monitoring survey matches the Year 1 elevations in this area. The survey of Reach 4 was approximately 867 linear feet with an average slope of 1.7% and included 19 riffle grade control structures that ranged in slopes between 0.4 – 6.1% with an average riffle slope of 3%. A total of eight log structures and 11 rock structures were surveyed along Reach 4. These structures appeared stable and continue to provide vertical stability. Reach 4 showed evidence of higher flows with more frequent out of bank events compared to Reaches 1-3. Many locations along Reach 4 included matted down vegetation within the floodplain. Isolated areas of minor bank erosion observed in Year 1, along outside meander bends, have appeared to have stabilized in Year 3. Stream bed elevations remained similar to as-built survey elevations; however, minor material shifting within the riffles had occurred which can be normal and not necessarily a sign of major instability. A minor depression noted in the cross-section 7 comparison from Year 1 appears to have filled in with vegetation and deposition in Year 3. Reach 4 maintained perennial flow throughout the surveyed area. Max pool water surface elevations at the time of the survey averaged 1.16 feet with a max pool depth of 1.8 feet. Slight shifts in riffle slope and pool depth are normal changes that often occur as the project stabilizes. Reach 4 longitudinal profile results are summarized in **Table 4**.

Unnamed Tributary 1 (UT1) is located at the top of the project area. This section was surveyed for approximately 204 LF and had an average slope of 5.9%, compared to 6.2% in Year 1. Twelve riffle grade control structures were surveyed along UT1 and had structure slopes that ranged from 2.5 to 7.8% with an average slope of 5.9%. The profile differed from Year 1 survey showing shifts in the riffle locations, however the overall slope and riffle slopes remained stable between the two monitoring years. A total of six rock structures and two log structures were located along the profile. The right bank pin of Cross-Section 1 was used as a benchmark to tie the UT1 survey elevations to Reaches 1 and 2A. The immediate area of UT1 is regularly mowed as part of a pedestrian path through the project area, which could be contributing to increased flows to the reach, resulting in the observed changes. Based on the profile survey, UT1 appears to have downcut compared to Year 1. The channel has narrowed, as seen in the cross-section 1 comparison. Vegetation has taken off upstream, but the mowing of the walking path that runs across that channel is likely affecting stability of the reach. This area should be closely monitored in future years. Riffle crests at approximately station 0+44 and 1+00 appear to have washed out; however, the material appeared to stay within the reach as the downstream elevations remained consistent between Year 1 and 3. Baseflow was absent from the UT, but pools maintained standing water at the time of survey. The average pool depth was 0.35 feet with a max pool depth of 0.4 feet. UT1 longitudinal profile results are summarized in **Table 4**.

Unnamed Tributary 2 (UT2) enters the mainstem from the left floodplain near monitoring station 24+03. UT2 is a small tributary nearly covered by tall grass. In Year 3, vegetation has continued to proliferate within the channel. UT2 was surveyed for approximately 136 linear feet and had an average reach slope of 3.7%, consistent with Year 1. The survey extended upstream of the design profile to include placed riprap that was shown on the as-built survey. Riffles along UT2 had an average slope of 9.3% and ranged between 0 – 25% with the steepest slopes observed near the downstream extent of the reach. No baseflow was present along UT2 at the time of survey. Standing water was observed within the pools with an average water depth of 0.25 feet and a maximum pool depth of 0.3 feet. A total of three rock structures and one log structure were surveyed along the channel profile. Structure and bed elevations matched well with Year-1 elevations indicating that the channel bed remains stable. UT2 longitudinal profile results are summarized in **Table 4**.

Unnamed Tributary 3 (UT3) begins at an existing 30-inch Reinforced Concrete Pipe (RCP) where a large plunge pool provides outlet protection. UT3 was surveyed for approximately 281 linear feet and ends where it flows into Reach 4 at survey station 21+98. This reach showed evidence of high flows that topped the streambanks frequently based on matted down vegetation. UT3 has a reach slope of 3.2%, consistent with Year 1 observations. A total of 11 riffles were surveyed along UT3. Material movement noted in Year 1 appears to have continued slightly, as surveyed elevations are very close to previous measurements, with only a few areas of note. The upstream extent of UT3 contained structure drops that ranged between 0.5 – 1 foot of vertical drop, lowering the bed elevation rapidly until approximately monitoring station 1+40. At approximately station 0+50, scour has increased below the 1' drop and will continue to be monitored. Riffle slopes ranged from 2.1 - 16% and averaged 6.8% throughout the tributary. A total of four rock structures and two log structures were surveyed along the reach. The plunge pool at the top of the reach had some mild deposition compared to Year 1. Some mild erosion was observed near the downstream extent of the tributary. Overall, the stream bed appeared stable, but the upstream structures and downstream erosion will continue to be monitored for changes in elevation or material movement. UT3 longitudinal profile results are summarized in **Table 4**.

Table 4: Longitudinal Profile Measured Parameters

Reach	Reach Slope (%)		Riffle Length Avg. (FT)		Riffle Slope Avg. (%)		Deepest Pool at Baseflow (FT)		Pool-Pool Spacing Avg. (FT)	
	2023	2025	2023	2025	2023	2025	2023	2025	2023	2025
1	4	3.8	20	21	5.8	5.1	0.75	0.7	36.2	36.6
2A	2	2	16.7	20.8	4.4	3.9	1.4	1.4	38.4	36.7
2B	3	3	15.3	19.5	5.3	4.5	1.35	1.6	37.5	39.6
3	1.5	1.6	7.9	11.5	6.7	4.4	1.25	1.45	40.1	37
4	1.7	1.7	18.4	20.6	3.3	3	1.58	1.8	45.4	45.4
UT1	6.2	5.9	8.6	15.1	9.9	5.9	0.5	0.4	17.4	25.7
UT2	3.7	3.7	5.2	9.1	4.8	9.3	0.3	0.3	16.1	19.2
UT3	3.2	3.2	10.7	13.1	5.8	6.8	1.6	1.6	22.9	28.1

4.1.2 Cross-Sections

The seven cross-sections monumented and surveyed during Year 1 were re-surveyed in Year 3. All cross-sections were established in a riffle section of stream. Cross-sections were spread throughout the monitoring area with one cross-section located along each tributary and four cross-sections located along the mainstem. Mainstem cross-sections were conducted in Reaches 2A, 3, and 4. Results of Year 1 cross-sectional data are compared to Year 3 cross-sectional data in **Appendix D**, designed cross-sectional data is included in the cross-section measurement tables below for comparison. That data can also be found in the C. M. Wright Stream Restoration Design Report, 2021 under Section 1.9: Design Discharge Selection / Cross-Section Design. The channels were designed to meet bankfull channel conditions, indicating that bankfull was located at top of low bank at each cross-section. This will be maintained throughout the monitoring period to evaluate any changes in the depth and width of the channel over time. Cross-sectional area, bankfull width, bankfull depth, and width / depth ratios, entrenchment ratios and bank height ratios were evaluated in the cross-section comparisons. Cross-section graphs and photos are located in **Appendix D** of this report.

Overall, cross-section data collected in Year 3 shows some minor channel differences that can be expected three years post construction. Many of the cross-section differences stem from increased vegetation extending into the channel area causing aggradation and reducing the overall width. The Year 3 survey still indicates that the channel is laterally stable and maintains sufficient channel capacity in each of these locations. Slight channel aggradation was observed in all cross-sections, consistent with sediment transport as the project ages. Similarly, a slight decrease in cross-sectional area was observed throughout the project, with the only exception being XS-6 located along UT3, which increased slightly. **Table 5** shows the results of the cross-sectional area comparison.

Table 5: Cross-Sectional Area Comparison

XS Number	Reach	Designed	Year 1	Year 3
1	UT1	0.58	1.12	0.6
2	2A	3.12	2.15	1.7
3	2A	3.12	2.04	1.0
4	UT2	0.58	0.48	0.3
5	3	3.92	4.24	3.2
6	UT3	2.42	2.77	2.9
7	4	5.08	5.05	4.0

A Width to depth (W/D) ratio, calculated by dividing the bankfull width by the bankfull mean depth was used as a metric to evaluate channel stability. In Year 3, width/depth ratio has generally decreased across most cross-sections compared to Year 1. Decreases were largest in Cross-Sections 1 and 2, which is consistent with the increased vegetation and slight aggradation noted in Year 3. The W/D ratio of Cross-Sections 3 and 5 are closest to that of Year 1, changing only slightly, as overall channel area has not changed. Cross-Section 4 has been impacted by the amount of vegetation, resulting in the observed decrease. Cross-Section 5 is similar to Year 1 conditions. Cross-Section 6 along UT3 has also seen a decrease. These decreases in W/D ratio are attributed to increases in aggradation cause by maturing vegetation along the channel in noted locations. The W/D ratios recorded in Year 3 still fall within the general range acceptable for a Rosgen C channel type (>12). Cross-Sections 1, 4, 5 and 6 have a W/D ratio that is slightly below the cutoff for a C channel but otherwise appear stable. T**able 6** summarizes the results of the W/D ratios.

Table 6: Width / Depth Ratio Comparison

XS Number	Reach	Designed	Year 1	Year 3
1	UT1	13.33	19.93	11.4
2	2A	13.06	19.71	13.2
3	2A	13.06	20.84	20.8
4	UT2	13.33	12.68	10.2
5	3	13.33	11.24	11.2
6	UT3	13.02	11.33	9.6
7	4	13.23	14.54	12.4

Entrenchment Ratio (ER) and Bank Height Ratio (BHR) were also evaluated for channel stability. Entrenchment Ratio is determined by dividing the flood prone width by the bankfull width. Flood prone width is the flooded width at a stage twice the max depth. A Rosgen C channel type is slightly entrenched with an ER greater than 2.2. All cross-sections surveyed in Year 3 maintain an ER greater than 2.2, showing increases compared to Year 1. Cross-Sections 4 and 5 contained a flood prone width greater than the extent of the cross-sections due to a flatter floodplain. Therefore, these cross-sections were noted as >8. **Table 7** shows the results calculated for ER. The BHR is determined by dividing the bank height by the max bankfull depth. All cross-sections in Year 3 maintain a functioning BHR with ratios ≤1.0 except for Cross-Sections 6 and 7. These cross-sections showed aggradation along the banks causing a slightly elevated

BHR; however, the cross-sections were overall stable with no signs of downcutting or vertical instability. These values have not changed considerably since Year 1. **Table 8** shows the results for BHR.

Table 7: Entrenchment Ratio (ER)

XS Number	Reach	Year 1	Year 3
1	UT1	3.4	5.2
2	2A	4.0	6.7
3	2A	4.8	6.9
4	UT2	>8	>8
5	3	>8	>8
6	UT3	6.1	6.3
7	4	3.8	4.2

Table 8: Bank Height Ratio (BHR)

XS Number	Reach	Designed	Year 1	Year 3
1	UT1	≤ 1.0	1.0	0.8
2	2A	≤ 1.0	0.9	1.0
3	2A	≤ 1.0	0.8	1.0
4	UT2	≤ 1.0	1.0	1.0
5	3	≤ 1.0	0.9	1.0
6	UT3	≤ 1.0	1.0	1.1
7	4	≤ 1.0	1.0	1.2

4.2 Visual Inspection and Photo Documentation

During the Year 1 monitoring assessment, a sitewide visual inspection was completed along all the reaches. Photo points were established and will be utilized for future monitoring years to compare site conditions. Years 1, 2 and 3 photos are located in **Appendix A** in addition to a map noting the location of each photo point. Overall, the stream is performing well with minimal issues noted. Floodplain vegetation has continued to proliferate throughout most of the reach, providing some shade to the stream. Additionally, growing livestakes were observed throughout the reach that will continue to grow for future shading opportunities. Minor issues noted during the site walk are noted below.

Cattail growth is has continued to establish in UT3 and along reaches 2B, 3, and 4. Over time, cattails can take over in the stream channel and alter flow paths. Areas of cattails, most notably downstream of the stream crossing in Reach 4, have expanded considerably since Year 1. It is likely that they will continue to spread but will be closely monitored in future years to ensure they do not become problematic.

A fallen tree located in Reach 2B during the Year 1 survey that could be seen in Year 1 Photo Points 32A and 33A was not present during Year 3 monitoring and appears to have been removed.

In Year 1, just below the culvert crossing along Reach 4, there was evidence of vehicles crossing the stream. The stream channel did not appear to be impacted from the stream crossing; however, banks may erode over time due to the lack of vegetation being able to establish in this location and the repeated disturbance from vehicle tracking. This area was revisited in Year 3, and established vegetation suggests that this area is no longer used for crossing the stream. Photos of this area are included in **Appendix C**.

Bank erosion was observed in Reach 4 in four separate locations. All observations were located along an outside meander of a pool. In all instances, the right bank has eroded, leaving vertically exposed banks. Soil stabilization matting remains draped over the bank, providing some protection and livestakes remain along the top of bank. This erosion was not observed to have worsened in Year 3 in comparison to Year 1 observations. As vegetation continues to proliferate, stream banks are expected to stabilize. The outside meanders located along Reach 4 will continue to be monitored to see if conditions worsen, remain the same, or improve. Photos of bank erosion observed along Reach 4 are included in **Appendix C**.

4.3 Bed Material Visual Observation

The project utilized one riffle mix for all reaches in order to withstand the maximum bankfull shear stress projected. The C. M. Wright Stream Restoration Design Report, 2021, section 1.14 outlines the Riffle Mix Design and grain size comparisons. The designed riffle mix consisted of a d84 of 84mm and a d100 of 180 mm. Reaches 1, 2A, 2B, 3, & 4 which are all connected along the mainstem shared similar bed material characteristics. Similar to Year 1, due to low water surface elevations, much of the bed substrate was sticking out of the water. Natural channel substrates consisting of small gravels and fines have filled in throughout the mainstem indicating some sediment transport is occurring. The majority of pools along the mainstem consisted of natural channel material and were free of heavy deposition from fine sediments. Overall, the material along the mainstem appears stable and is not likely to move based on the size of the material compared to the channel capacity and smaller channel dimensions.

UT1 did not have baseflow during the time of survey. Similar to Year 1, voids were present between the bed material with minimal fines observed. Leaves and other debris were observed in the riffle sections. A walking path parallels UT1 along the right floodplain that eventually crosses the channel. The bed material at the trail crossing will continue to be monitored to record any potential impacts overtime. Overall, the material appears stable and is not likely to move due to its size.

UT2 was also dry during the time of survey through the riffle sections where bed material was placed. The bed material in UT2 included silt/clay in between riprap material that eliminated voids and created a cohesive streambed. Additionally, the streambed had vegetation growing within the channel, covering up much of the riprap material. This vegetation has continued to proliferate and was abundant in Year 3. Bed material in UT2 remains stable and is not likely to move based on the surrounding silt/clay material and vegetation present throughout the reach.

UT3 contained a balanced mixture of large, medium, and small gravels in addition to fine sediments that filled in voids around the riprap. Larger material was sticking out of the streambed, but the stream maintained perennial surface flow throughout the reach. Sediment deposition in the upstream plunge pool observed in Year 1 remained, but did not appear to be actively accumulating in Year 3. Evidence of material shifting was observed in the top half of the reach where slopes and structure drops are steeper. Bed material along UT3 remains stable, especially in the downstream area, but will continue to be monitored.

4.4 Rapid Bioassessment Protocol (RBP) Assessment

Pre-construction RBP forms were performed by the design team in July 2021 along all reaches of the mainstem and tributaries 1, 2, and 3. Pre-construction and Year 1 RBP results can be found in **Appendix E**. Year 3 RBP assessment forms are in **Appendix F**. Overall, post construction Year 3 monitoring results show an increase or maintaining of scores. Scores are expected to increase through the monitoring period with increases in vegetation and available in-stream habitats.

4.5 Riparian Vegetation and Landscape Zone Assessment

A total of 56 herbaceous plant species, 30 woody tree and shrub species and four woody vine species were identified in the 14 vegetative monitoring plots in Year 3. Total native vegetation cover per plot ranged from 67 to 129%, with a site average of 96%. Based on these results, the native vegetation cover meets the 85% coverage criteria in Year 3. It is likely that native cover will continue to increase in future monitoring years as planted vegetation continues to mature and establish on site. The total number of woody (tree and shrub) stems in the study plots, including planted and volunteer species, ranged from three to 73, with an average stem density of 3,019 stems/acre, which is greater than the MDE standard stem density of 435 stems/acre. Though a few dead and stressed woody plants were observed, overall, the planted vegetation appeared healthy throughout the site.

The locations of the vegetation monitoring plots assessed in Year 3 are shown in **Appendix G**. A detailed summary of herbaceous and woody vegetation cover and woody stem density data collected at each plot is included in **Appendix H and I**, respectively. A photographic log of each plot is included in **Appendix J**. A summary of plot data for each of the planting zones is included below.

Forested Wetland Planting Zone

Plot 1 consisted of 16 species and was dominated by common buttonbush (*Cephalanthus occidentalis),* an unknown grass (*Poaceae* sp.), and Japanese stiltgrass (*Microstegium vimineum*). The total percentage cover of native species within this plot was 90. A total of nine woody stems were identified in this plot for a total stem density of 2,203 stems/acre. Woody plant species consisted of common buttonbush, tuliptree (*Liriodendron tulipifera*), black gum (*Nyssa sylvatica*), and an elm species (*Ulmus* sp.). All plantings were healthy, and no evidence of disease or infestation was observed.

Plot 10 consisted of 15 species and was dominated by deer-tongue rosette grass (*Dichanthelium clandestinum)* and Japanese stiltgrass. The total percentage cover of native species within this plot was 99. A total of 10 woody stems were identified in this plot for a total stem density of 2,055 stems/acre. Woody plant species consisted of black willow (*Salix nigra*), silky willow (*Salix sericea),* sweetgum (*Liquidambar styraciflua),* and American sycamore (*Platanus occidentalis).* All plantings were healthy, and no evidence of disease or infestation was observed.

Riparian Planting Zone

Plot 2 consisted of 19 species and was dominated by spotted touch-me-not (*Impatiens capensis),* tuliptree, tall goldenrod (*Solidago altissima),* and Japanese stiltgrass. The total percentage cover of native species within this plot was 129. A total of 42 woody stems were identified in this plot (including 24 tuliptree seedlings) for a total density of 4,574 stems/acre. Woody plant species consisted of common buttonbush, silky dogwood (*Cornus amomum),* black willow*,* black walnut (*Juglans nigra),* northern spicebush (*Lindera benzoin),* tuliptree, and willow oak (*Quercus phellos)*. One silky dogwood was stressed with evidence of deer browse. All other woody species were healthy, and no evidence of disease or infestation was observed.

Plot 4 consisted of 19 species and was dominated by deer-tongue rosette grass and small carpet grass (*Arthraxon hispidus*). The total percentage cover of native species within this plot was 76. A total of 13 woody stems were identified in this plot for a total density of 1,416 stems/acre. Woody plant species consisted of common buttonbush, silky dogwood, River birch (*Betula nigra),* northern spicebush*,* and tuliptree. Woody species were healthy, and no evidence of disease or infestation was observed.

Upland Woody Planting Zone

Plot 3 consisted of 21 species and was dominated by deer-tongue rosette grass, tuliptree, and Japanese stilt grass. The total percentage cover of native species within this plot was 95. A total of 73 woody stems were identified in this plot (including 62 tuliptree seedlings) for a total density of 7,950 stems/acre. Woody plant species consisted of silky dogwood, northern spicebush, southern arrowwood (*Viburnum dentatum),* common persimmon (*Diospyros virginiana),* green ash (*Fraxinus pennsylvanicus),* tuliptree, American sycamore, and Callery pear (*Pyrus calleryana)*. The silky dogwood and southern arrowwood were very stressed but all other woody species were healthy, and no evidence of disease or infestation was observed. A small portion of this plot was mulched.

Plot 5 consisted of 22 species and was dominated by deer-tongue rosette grass, Japanese stiltgrass, and multiflora rose (*Rosa multiflora).* The total percentage cover of native species within this plot was 67. A total of 18 woody stems were identified in this plot for a total density of 1,960 stems/acre. Woody plant species consisted of silk tree (*Albizia julibrissin),* tuliptree, and Callery pear. Overall, woodies were stressed by invasives and vine coverage. A few empty cages were observed, which were overtaken by vines. No evidence of disease or infestation was observed.

Plot 7 consisted of 20 species and was dominated by deer-tongue rosette grass and multiflora rose. The total percentage cover of native species within this plot was 85. A total of 29 woody stems were identified in this plot for a total density of 3,158 stems/acre. Woody plant species consisted of tuliptree, northern red oak (*Quercus rubra),* black willow, burningbush (*Euonymus alatus),* black walnut, an unknown privet, northern spicebush, black cherry (*Prunus serotina),* and staghorn sumac (*Rhus typhina).* The northern red oak and black walnut were stressed, and vines were climbing several other plantings, but most were healthy otherwise. No evidence of disease or infestation was observed.

Plot 8 consisted of 27 species and was dominated by deer-tongue rosette grass, black willow, Japanese stiltgrass, and multiflora rose. The total percentage cover of native species within this plot was 83. A total of 12 woody stems were identified in this plot for a total density of 1,307 stems/acre. Woody plant species consisted of eastern redbud (*Cercis canadensis),* tuliptree, black willow, and American sycamore*.* All plantings were healthy, and no evidence of disease or infestation was observed.

Plot 9 consisted of 17 species and was dominated by small-spike false nettle (*Boehmeria cylindrica),* deer-tongue rosette grass, and Japanese stiltgrass. The total percentage cover of native species within this plot was 124. A total of 14 woody stems were identified in this plot for a total density of 1,525 stems/acre. Woody plant species consisted of common buttonbush, black willow, and silky willow*.* All plantings were healthy, and no evidence of disease or infestation was observed.

Plot 11 consisted of 16 species and was dominated by deer-tongue rosette grass, black willow, and multiflora rose. The total percentage cover of native species within this plot was 106. A total of eight woody stems were identified in this plot for a total density of 871 stems/acre. Woody plant species consisted of northern spicebush, black willow, and amur honeysuckle (*Lonicera maackii).* All plantings were healthy, and no evidence of disease or infestation was observed.

Plot 12 consisted of 20 species and was dominated by an unknown blackberry (*Rubus* sp.), tall goldenrod, small carpetgrass, oriental bittersweet (*Celastrus orbiculatus)*, Japanese honeysuckle (*Lonicera japonica),* and multiflora rose. The total percentage cover of native species within this plot was 76. A total of three woody stems were identified in this plot for a total density of 650 stems/acre. Woody plant species consisted of common persimmon and swamp white oak (*Quercus bicolor)*. The swamp white oak was stressed but other trees were healthy. No evidence of disease or infestation was observed. The plot size in this area was limited due to the encroachment of gravel and mowed fields.

Plot 14 consisted of 18 species and was dominated by deer-tongue rosette grass, virginia wild-rye (*Elymus virginicus),* and Japanese stiltgrass. The total percentage cover of native species within this plot was 106. A total of 10 woody stems were identified in this plot for a total density of 1,089 stems/acre. Woody plant species consisted of silky dogwood, black gum, black willow, and northern spicebush. All plantings were healthy, although some were beginning to be impacted by invasive vines, and no evidence of disease or infestation was observed.

Streambank Planting Zone

Plot 6 consisted of 18 species and was dominated by shallow sedge (*Carex lurida)* and common buttonbush. The total percentage cover of native species within this plot was 122. A total of 31 woody stems were identified in this plot for a total density of 6,752 stems/acre. Woody plant species consisted of common buttonbush, American sycamore, black willow, silky willow, red maple, swamp white oak, and northern red oak*.* One dead tree was observed, and a gall was noted on a buttonbush, but plantings were otherwise healthy. No evidence of disease or infestation was observed.

Plot 13 consisted of 19 species and was dominated by deer-tongue rosette grass, silky willow, and Japanese stiltgrass. The total percentage cover of native species within this plot was 122. A total of 31 woody stems were identified in this plot for a total density of 6,752 stems/acre. Woody plant species consisted of common buttonbush, black willow, and silky willow*.* All plantings were healthy, although some cut willow remains were observed in the vicinity of the plot. No evidence of disease or infestation was observed.

4.6 Invasive Species Monitoring

Twenty invasive species were documented within the study area, covering 30 mapped invasive area polygons and one additional standalone point (**Appendix K**). Mapped invasive areas within the project area totaled 282,559 square feet (6.50 acres). The total coverage of invasive species site-wide was 74,622 square feet (1.71 acres), covering 20% of the study area.

A list of observed invasive plant species and estimated percent coverage of each species site-wide is summarized in **Table 9**. The coverage of each species in square feet by zone is summarized in **Appendix L.** In addition to the species documented by mapped zones, one point was mapped to represent the occurrence of an invasive species that occurred as an isolated individual, *Paulownia tomentosa*. The species documented with this point and its square foot coverage are summarized in **Appendix L** and the location of is represented in **Appendix K.**

The most dominant invasive species observed project-wide were Japanese stiltgrass (6.46%), followed by small carpetgrass (3.98%) and multiflora rose (3.96%). Recommendations for treatment are included in the management plan in **Appendix M**.

Table 9: Percent Invasive Cover by Species

Scientific Name	Common Name	Percent Cover
Albizia julibrissin	Mimosa	0.05
Alliaria petiolata	Garlic Mustard	0.02
Ampelopsis brevipedunculata	Amur Peppervine	0.14
Arthraxon hispidus	Small Carpetgrass	3.98
Celastrus orbiculatus	Oriental Bittersweet	0.09
Cirsium arvense	Canada Thistle	0.12
Elaeagnus umbellata	Autumn Olive	0.17
Glechoma hederacea	Ground Ivy	0.54
Hedera helix	English Ivy	0.03
Lespedeza cuneata	Chinese Lespedeza	0.69
Ligustrum sp.	Unknown Privet	0.53
Lonicera japonica	Japanese Honeysuckle	1.93
Lonicera maackii	Amur Honeysuckle	0.27
Microstegium vimineum	Japanese Stiltgrass	6.46
Paulownia tomentosa	Princess Tree	<0.01
Persicaria perfoliata	Mile-a-minute	0.11
Phragmites australis	Common Reed	0.03
Rosa multiflora	Multiflora Rose	3.96
Rubus phoenicolasius	Wineberry	0.98
Vinca minor	Common Periwinkle	0.05
Total		**20.15**

In addition to the species documented above, broadleaf cattail (*Typha latifolia)* and/or narrowleaf cattail (*Typha angustifolia)* presence was monitored and recorded in thirteen zones throughout the study area, totaling approximately 1,867 square feet (0.5%) coverage. These species were not deemed to be of concern as they were found in relatively low concentrations and were predominately patchy and scattered in nature sitewide. Therefore, they were not included in the overall invasive coverage calculations for the site.

4.7 Temporary Wetland Impact Monitoring

Wetland hydrology, dominant plant species, and soil profile descriptions were recorded at the six pre-established monitoring plots depicted in **Appendix N** to document the impacted wetland areas. Given the small size of the impact areas, each plot characterizes the entire associated impact area. All data forms are presented in **Appendix O**. Photos of each plot are presented in a photo log in **Appendix P**. During Year 3 monitoring, four of the six temporarily impacted wetland areas met all three parameters of a wetland. WET1 and WET2 did not meet all three parameters and will be reassessed for wetland conditions in future monitoring years. Descriptions of each test plot are included below.

WET1 had no hydrologic indicators observed during the site visit. Based on the dominance test for hydrophytic vegetation, 20 percent of the dominant species within the test plot were considered OBL, FACW, or FAC. The dominant species included smooth blackhaw (*Viburnum prunifolium),* multiflora rose, eastern poison ivy (*Toxicodendron radicans),* Japanese honeysuckle, and an unknown sedge (*Carex* sp.). Soil samples did not meet a hydric soil indicator. Photo 1 in **Appendix P** depicts WET1.

Hydrologic indicators observed at WET2 during the site visit included oxidized rhizospheres along living roots and geomorphic position. Based on the dominance test for hydrophytic vegetation, 29 percent of the dominant species within the test plot were considered OBL, FACW, or FAC. The dominant species included tuliptree, wineberry (*Rubus phoenicolasius)*, multiflora rose, spotted touch-me-not, Japanese honeysuckle, and oriental bittersweet. Soil samples met the Depleted Matrix (F3) hydric soil indicator. Photo 2 in **Appendix P** depicts WET2.

Hydrologic indicators observed at WET3 during the site visit included geomorphic position and FAC-neutral test. Based on the dominance test for hydrophytic vegetation, 100 percent of the dominant species within the test plot were considered OBL, FACW, or FAC. The dominant species included deer-tongue rosette grass and lamp rush (*Juncus effusus)*. Soil samples met the Depleted Matrix (F3) hydric soil indicator. Photo 3 in **Appendix P** depicts WET3.

Hydrologic indicators observed at WET4 during the site visit included surface water, high water table, saturation, geomorphic position and FAC-neutral test. Based on the dominance test for hydrophytic vegetation, 100 percent of the dominant species within the test plot were considered OBL, FACW, or FAC. The dominant species included marsh primrose-willow (*Ludwigia palustris).* Soil samples met the Redox Dark Surface (F6) hydric soil indicator. Photo 4 in **Appendix P** depicts WET4.

Hydrologic indicators observed at WET5 during the site visit included surface water, high water table, saturation, oxidized rhizospheres along living roots, geomorphic position and FAC-neutral test. Based on the dominance test for hydrophytic vegetation, 100 percent of the dominant species within the test plot were considered OBL, FACW, or FAC. The dominant species included lamp rush and small-spike false-nettle*.* Soil samples met the Depleted Matrix (F3) hydric soil indicator. Photo 5 in **Appendix P** depicts WET5.

Hydrologic indicators observed at WET6 during the site visit included oxidized rhizospheres along living roots, geomorphic position and FAC-neutral test. Based on the dominance test for hydrophytic vegetation, 100 percent of the dominant species within the test plot were considered OBL, FACW, or FAC. The dominant species included common buttonbush and small-spike false-nettle*.* Soil samples met the Depleted Matrix (F3) hydric soil indicator. Photo 6 in **Appendix P** depicts WET6.

5.0 Conclusions & Recommendations

5.1 Summary of Results

Overall, the C. Milton Wright High School Stream Restoration site is performing well. Surveyed profile elevations along the mainstem of Reaches 1, 2A, 2B, 3, and 4 as well as UT1, UT2, and UT3 all generally show stable streambed elevations that follow similar elevations to as-built conditions. Monumented cross-sections established throughout the mainstem, and tributaries demonstrate that the stream is maintaining its channel dimensions and functioning as intended. Bed material observations show that adequate channel substrate remains site wide with only slight deposition and material shifting. Visual observations and photo documentation display the significant floodplain vegetation that has taken off throughout the site and the overall stable channel conditions present during the 2025, Year 3, monitoring period. Minor issues observed do not appear to be impacting the site significantly and will continue to be monitored based on the permit conditions. Areas of concern from Year 1 have largely been resolved. The tree across the channel in Reach 2B was no longer present, and the majority of erosion noted in the downstream extent of Reach 4 appeared to have stabilized. Areas along the mainstem to be revisited in Year 5 include the rock sill structure that has seemingly washed out in Reach 1, as well as the cattails populating the channel downstream of the box culvert. UT1 will continue to be monitored to ensure the mowed path does not continue to affect the downstream extent. The vegetation in UT2, as well as noted scour in UT3 will be revisited to ensure the channel is performing as intended.

Riparian plantings appear to be generally healthy. A few stressed and dead plantings were observed within monitoring plots as described in **Section 4.5 Riparian Vegetation and Landscape Zone Assessment**. The 85% native cover requirement was readily met with an average cover of 96% in Year 3. Invasive species were present across the study area, with a sitewide average of 20% relative cover. Recommendations for treatment are included below and in **Appendix M.** Four of the six temporarily impacted wetland areas currently meet all three wetland parameters. These areas will be monitored again in future years to ensure all temporarily impacted areas are functioning as wetlands. Wetland monitoring should be completed earlier in the season during future monitoring years to ensure wetland hydrology is thoroughly assessed.

5.2 Recommendations

The site has completed its first 3 years of monitoring and will continue to be monitored for 2 more years. At this time, small recommendations are proposed that could benefit the stream and prevent future problems from occurring. It is recommended that the newly installed culvert crossing continue to be utilized as the only stream access point along Reach 4 instead of crossing through the stream, just downstream of the culvert crossing.

Cattail growth should be monitored along Reaches 2B, 3, 4, and UT3 to ensure it does not overtake the channel. Additionally, the outside meander banks located in Reach 4 that showed erosion should be monitored closely in Years 4 and 5 to see if conditions improve or worsen. The riffle in Reach 1 that appeared to have washed out should be revisited to ensure the upstream structures remain stable.

Management of invasive plants within the site should be focused on those species whose area-wide distribution is patchier in nature and for which treatment options have a higher likelihood of success. See the Invasive Species Management Plan **Appendix M** for details on invasive species to target and their locations at the site, and treatment options.

6.0 Literature Cited

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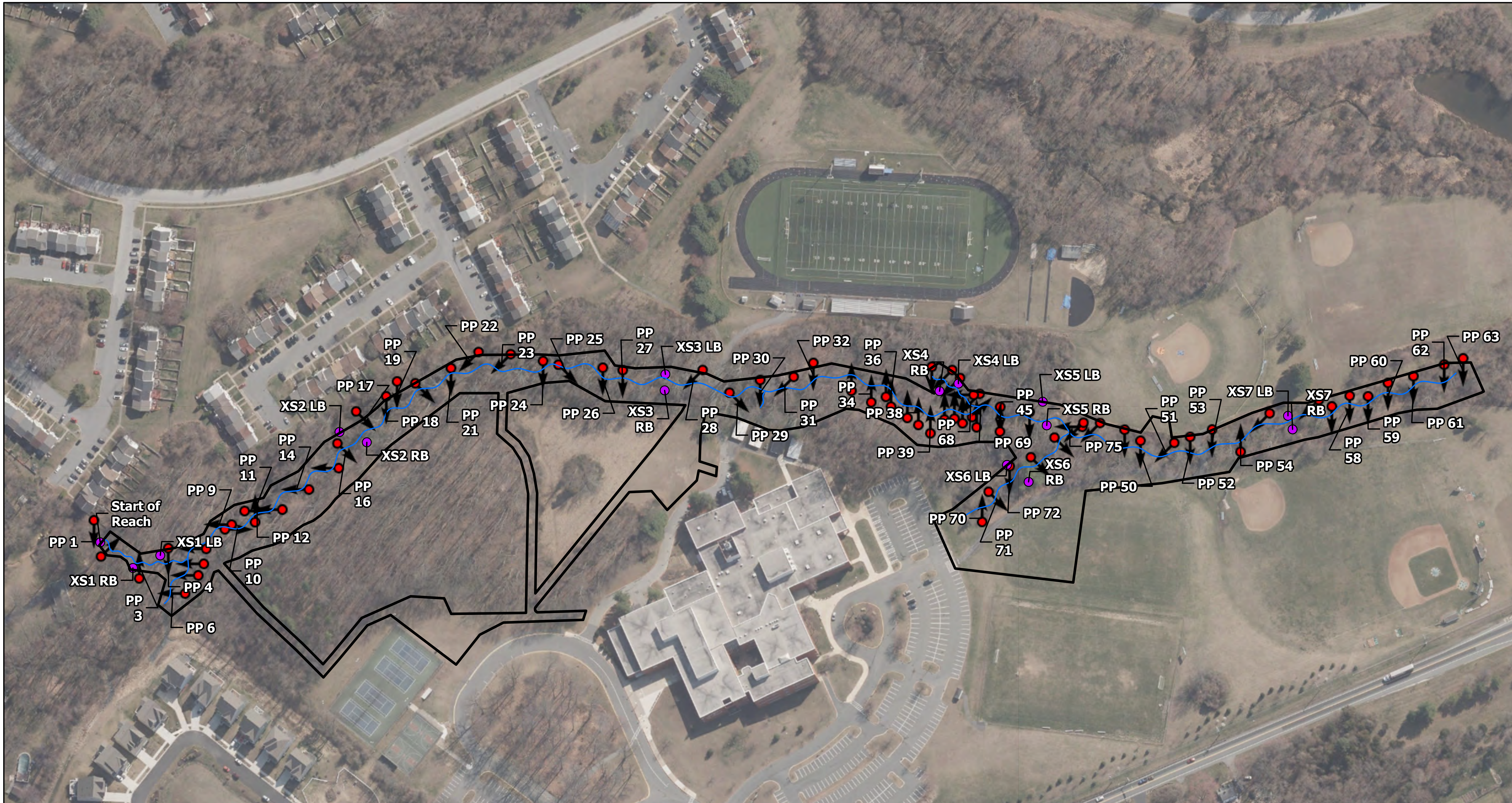
APPENDIX A: Photo Exhibit and Photo Point Location Map



COASTAL RESOURCES INC.

C. Milton Wright Stream Restoration
Photo Point Map

Appendix: A

Harford County, Maryland
September 2025

Photo Points

Cross Sections and Landmarks

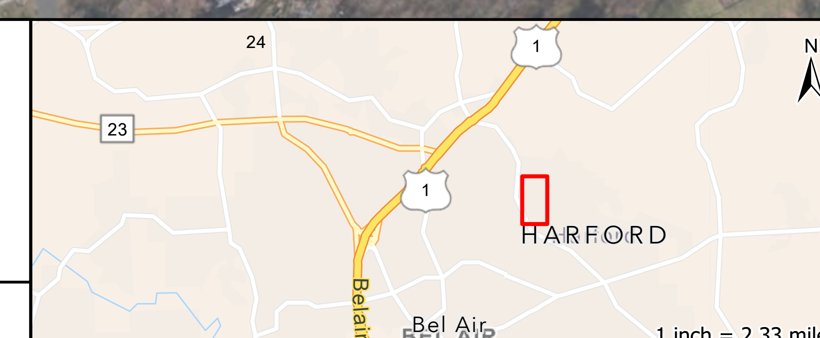
LOD

Stream Centerline

N E S W

0 90 180
feet
1 inch = 185 feet

Map Center, NAD83
39.5615°, -76.3288°



C. Milton Wright – Tributary 1

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 1 Downstream



Photo Point 2 Upstream

C. Milton Wright – Tributary 1

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 3a: Upstream



Photo Point 3b: Downstream

C. Milton Wright – Tributary 1

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 4



Photo Point 5

C. Milton Wright – Tributary 2

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)
		

Photo Point 64a: Upstream

Photo Point 64b: Upstream

C. Milton Wright – Tributary 2

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 65a: Downstream



Photo Point 65b: Upstream

C. Milton Wright – Tributary 2

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 66a: Downstream



Photo Point 66b: Upstream

C. Milton Wright – Tributary 2

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 67a: Downstream



Photo Point 67b: Upstream

C. Milton Wright – Tributary 2

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)
		

Photo Point 68a: Upstream

Photo Point 68b: Upstream

C. Milton Wright – Tributary 2

Year 1 (2023)

Year 2 (2024)

Year 3 (2025)

Photo Point 69: Confluence

C. Milton Wright – Tributary 3

Year 1 (2023)

Year 2 (2024)

Year 3 (2025)

Photo Point 70: Culvert

C. Milton Wright – Tributary 3

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 71a: Downstream



Photo Point 71b: Upstream

C. Milton Wright – Tributary 3

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 72a: Downstream



Photo Point 72b: Upstream

C. Milton Wright – Tributary 3

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 73a: Downstream



Photo Point 73b: Upstream

C. Milton Wright – Tributary 3

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 74a: Downstream



Photo Point 74ab Upstream

C. Milton Wright – Tributary 3

Year 1 (2023)

Year 2 (2024)

Year 3 (2025)

Photo Point 75: Confluence

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 6a: Upstream Beginning of Work



Photo Point 6a: Downstream Beginning of Work

C. Milton Wright - Mainstem

Year 1 (2023) | Year 2 (2024) | Year 3 (2025)

Photo Point 7a: Upstream

Photo Point 7b: Downstream

C. Milton Wright - Mainstem

Year 1 (2023)

Year 2 (2024)

Year 3 (2025)

Photo Point 8a: Upstream

Photo Point 8b: Downstream

C. Milton Wright - Mainstem

Year 1 (2023) | Year 2 (2024) | Year 3 (2025)

Photo Point 8b: Downstream

Photo Point 9b: Downstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)

Photo Point 10: Floodplain

Photo Point 11a: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)
		

Photo Point 11b: Downstream

Photo Point 12: Floodplain

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 13a: Upstream



Photo Point 13b: Downstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 14a: Downstream Pool and Right Bank Floodplain



Photo Point 14b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 15a



Photo Point 15b

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)

Photo Point 16a: Downstream

Photo Point 16b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 17a: Downstream



Photo Point 17b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)

Year 2 (2024)

Year 3 (2025)

Photo Point 18a: Downstream

Photo Point 18b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023) | Year 2 (2024) | Year 3 (2025)



Photo Point 19a: Downstream



Photo Point 19b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 20a: Downstream



Photo Point 20b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)

Year 2 (2024)

Year 3 (2025)

Photo Point 20b: Upstream

Photo Point 21b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)
		

Photo Point 22a: Downstream

Photo Point 22b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 23a: Downstream



Photo Point 23b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 24a: Downstream



Photo Point 24b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)
		

Photo Point 25a: Downstream

Photo Point 25b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023) | Year 2 (2024) | Year 3 (2025)



Photo Point 26a: Downstream



Photo Point 26b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 27a: Downstream



Photo Point 27b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 28a: Downstream



Photo Point 28b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023) | Year 2 (2024) | Year 3 (2025)

Photo Point 29a: Downstream

Photo Point 29b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 30a: Downstream



Photo Point 30b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)
		

Photo Point 31a: Downstream

Photo Point 31b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023) | Year 2 (2024) | Year 3 (2025)



Photo Point 32a: Downstream



Photo Point 32b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)
		

Photo Point 33a: Downstream

Photo Point 33b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 34a: Downstream



Photo Point 34b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)
		

Photo Point 35a: Downstream

Photo Point 35b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 36a: Downstream



Photo Point 36b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023) | Year 2 (2024) | Year 3 (2025)



Photo Point 37a: Downstream



Photo Point 37b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023) | Year 2 (2024) | Year 3 (2025)



Photo Point 38a: Downstream



Photo Point 38b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 39a: Downstream



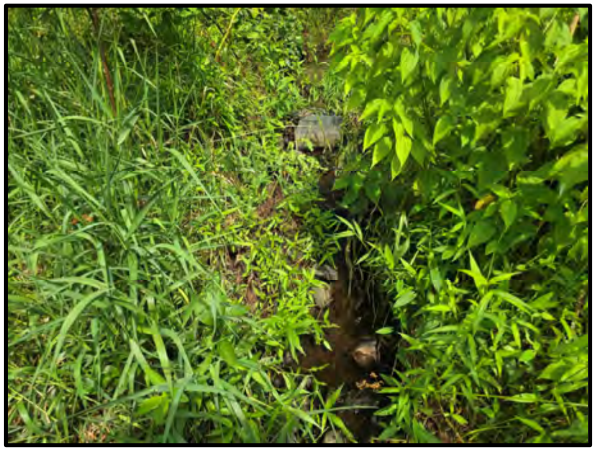


Photo Point 39b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 40a: Downstream



Photo Point 40b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)

Year 2 (2024)

Year 3 (2025)

Photo Point 41a: Downstream

Photo Point 41b: Upstream

Year 1 (2023) | Year 2 (2024) | Year 3 (2025)



Photo Point 42a: Downstream



Photo Point 42b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)
		

Photo Point 43a: Downstream

Photo Point 44b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)
		

Photo Point 44a: Downstream

Photo Point 44b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 45a: Downstream



Photo Point 45b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 46a: Downstream



Photo Point 46b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)

Year 2 (2024)

Year 3 (2025)



Photo Point 47a: Downstream



Photo Point 47b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)

Year 2 (2024)

Year 3 (2025)

Photo Point 48a: Downstream

Photo Point 48b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)
		

Photo Point 49a: Downstream

Photo Point 49b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)
		

Photo Point 50a: Downstream

Photo Point 50b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 51a: Downstream



Photo Point 51b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 52a: Downstream



Photo Point 52b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 53a: Downstream



Photo Point 53b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 54a: Downstream



Photo Point 54b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 55a: Downstream



Photo Point 55b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023) | Year 2 (2024) | Year 3 (2025)



Photo Point 56a: Downstream



Photo Point 56b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)
		

Photo Point 57a: Downstream

Photo Point 57b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 58a: Downstream



Photo Point 58b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023) | Year 2 (2024) | Year 3 (2025)



Photo Point 59a: Downstream



Photo Point 59b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023) | Year 2 (2024) | Year 3 (2025)



Photo Point 60a: Downstream



Photo Point 60b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)

Photo Point 61a: Downstream

Photo Point 61b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)



Photo Point 62a: Downstream



Photo Point 62b: Upstream

C. Milton Wright - Mainstem

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)

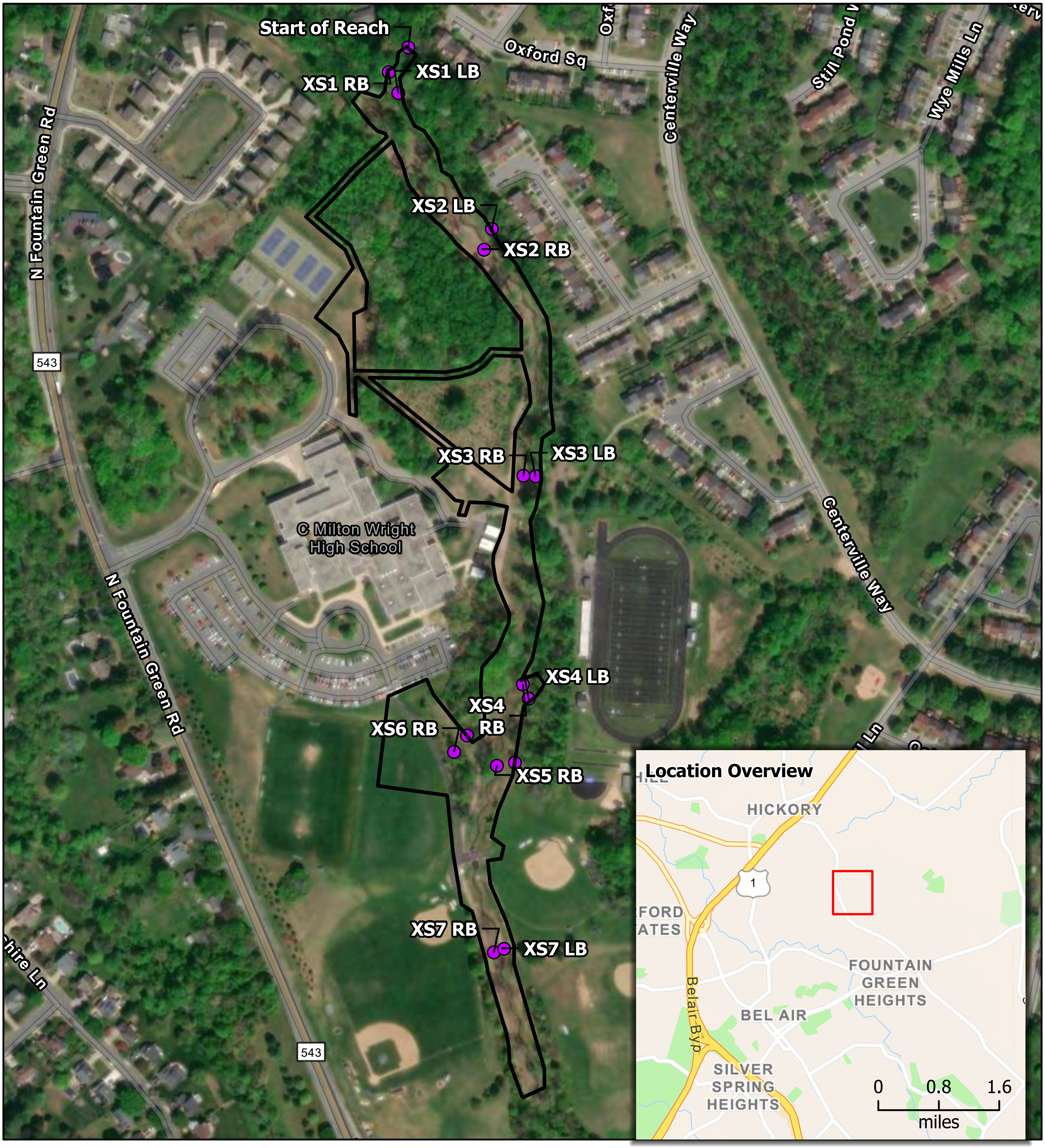


Photo Point 63a: Downstream



Photo Point 63b: Upstream

APPENDIX B: Cross-Section Vicinity Map



COASTAL RESOURCES INC.

C. Milton Wright Stream Restoration
Year Three Monitoring

Appendix B
Cross Section Map

Harford County, MD
September 2025

N W E S

Cross Sections and Landmarks
LOD

0 0.06 0.12
miles

APPENDIX C: Area of Concern Map and Photos

COASTAL RESOURCES INC.

C. Milton Wright Stream Restoration
Year Three Monitoring

Appendix C
Area of Concern Map

Harford County, MD
September 2025

N
W E
S

Areas Of Concern
LOD
Stream Centerline

0 0.03 0.05
miles

C. Milton Wright – Areas of Concern

Year 1 (2023)

Year 2 (2024)

Year 3 (2025)

Area of Concern 1

Area of Concern 2

C. Milton Wright – Areas of Concern

Year 1 (2023) | Year 2 (2024) | Year 3 (2025)



Area of Concern 3



Area of Concern 4

C. Milton Wright – Areas of Concern

Year 1 (2023)

Year 2 (2024)

Year 3 (2025)

Area of Concern 5

C. Milton Wright – Areas of Concern

Year 1 (2023)	Year 2 (2024)	Year 3 (2025)
		

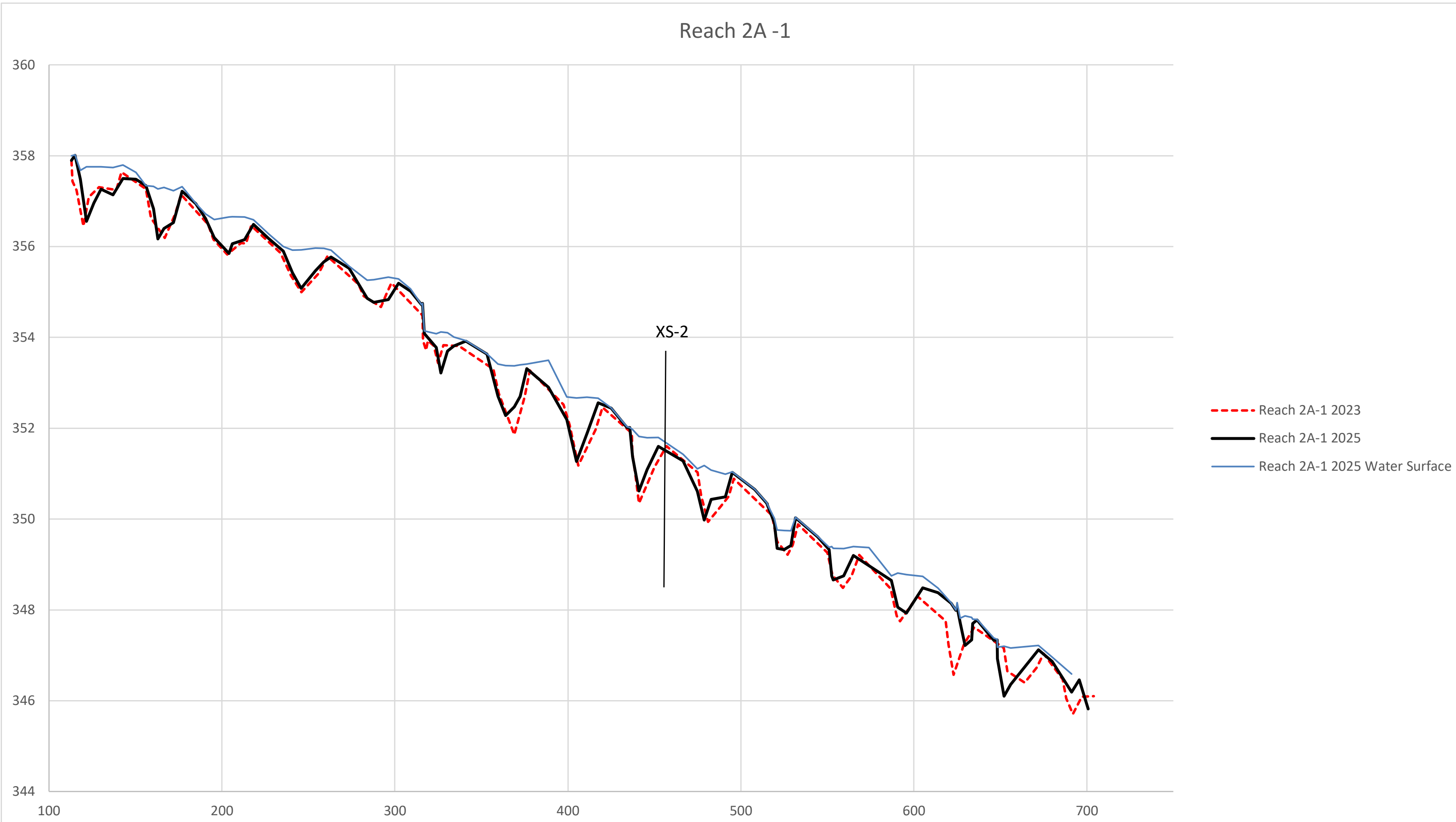
Area of Concern 6: Left Bank Crossing

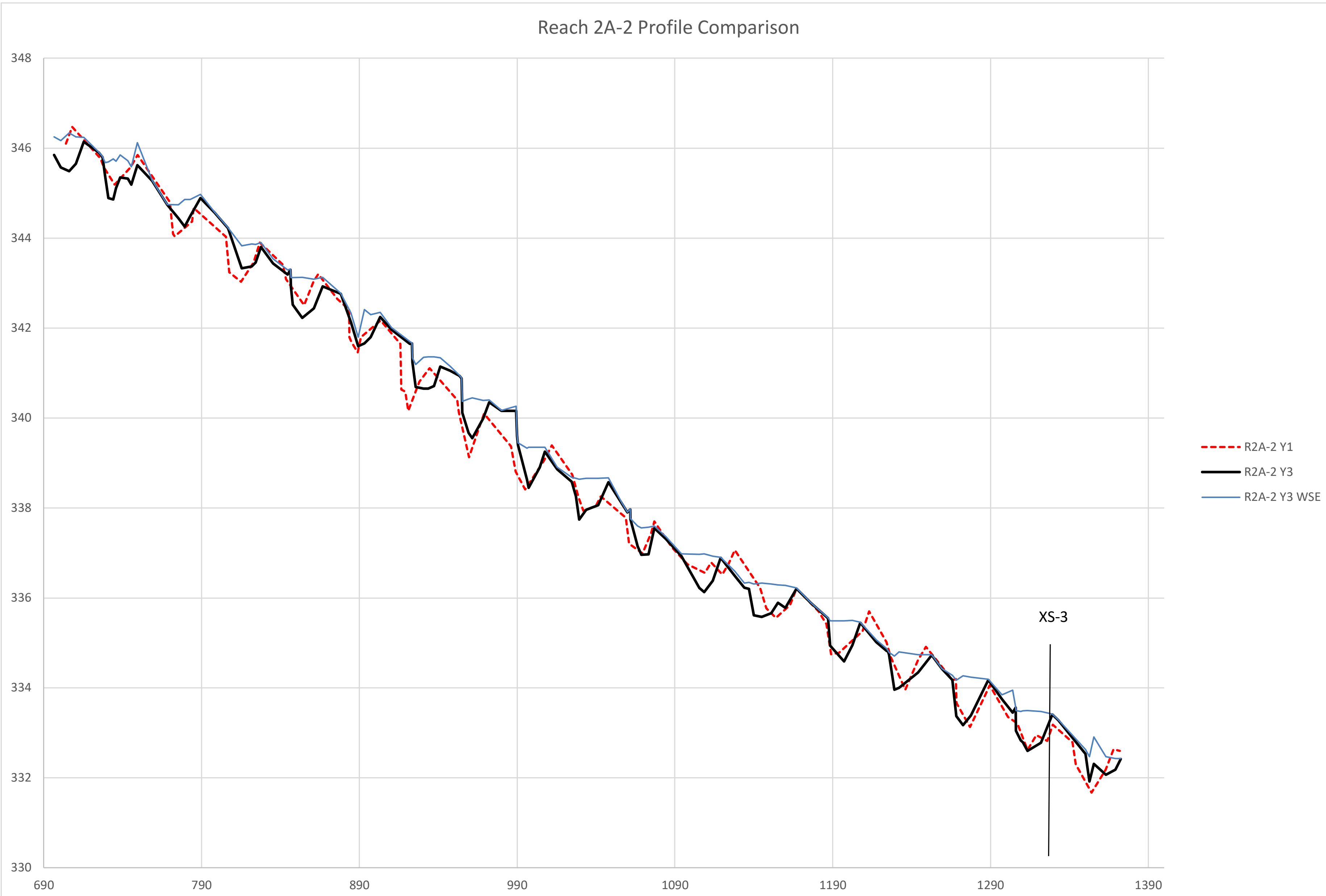
Area of Concern 6: Right Bank Crossing

APPENDIX D: Longitudinal Profile and Cross-Section Graphs

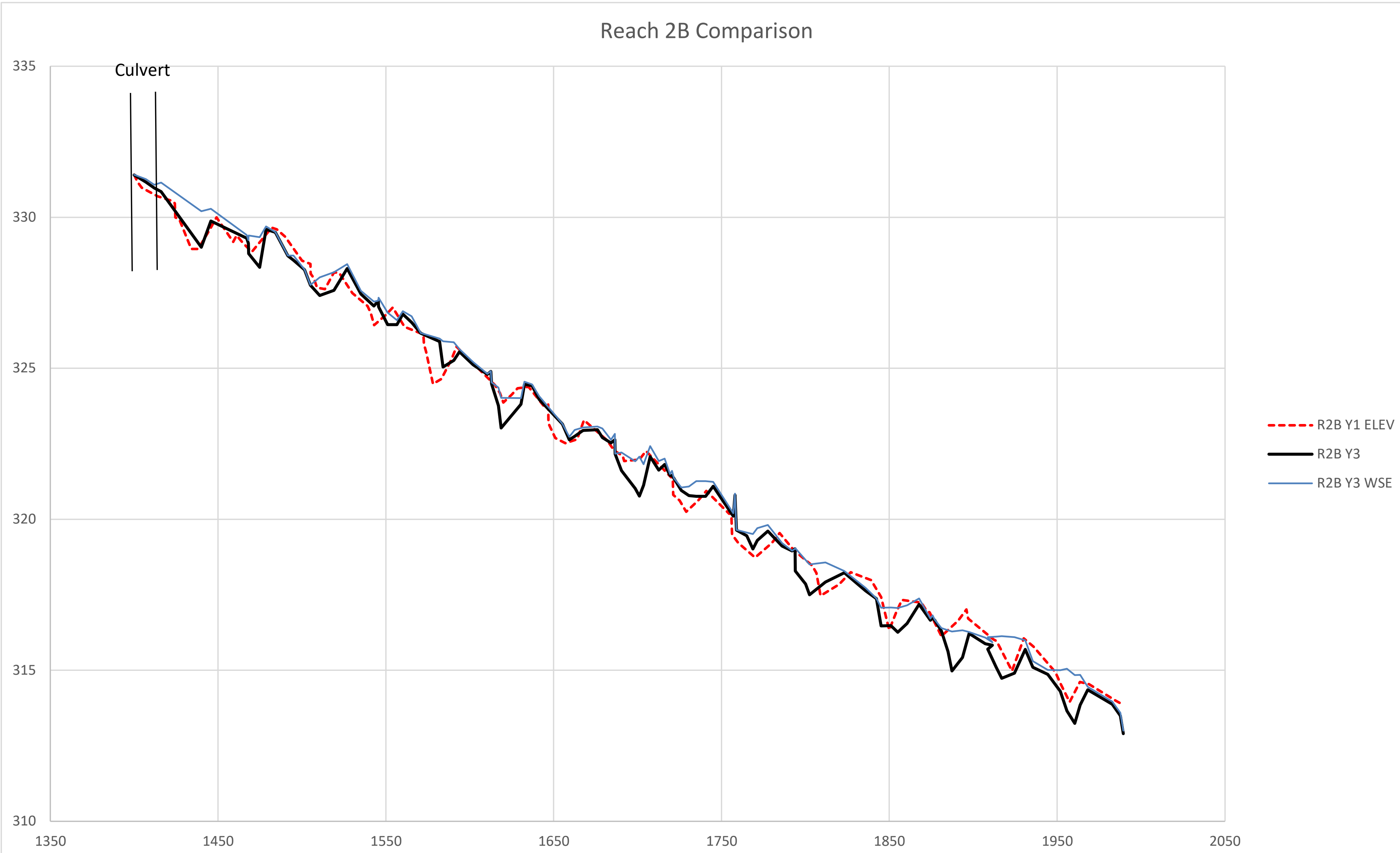
C. Milton Wright Reach 1 Profile
Elevation (ft)
363
362
361
360
359
358
357
0
10
20
30
40
50
60
70
80
90
100
110
Channel Distance (ft)
Reach 1 Water Surface Elevation
Reach 1 Ground Elevation 2023
Reach 1 Ground Elevation 2025



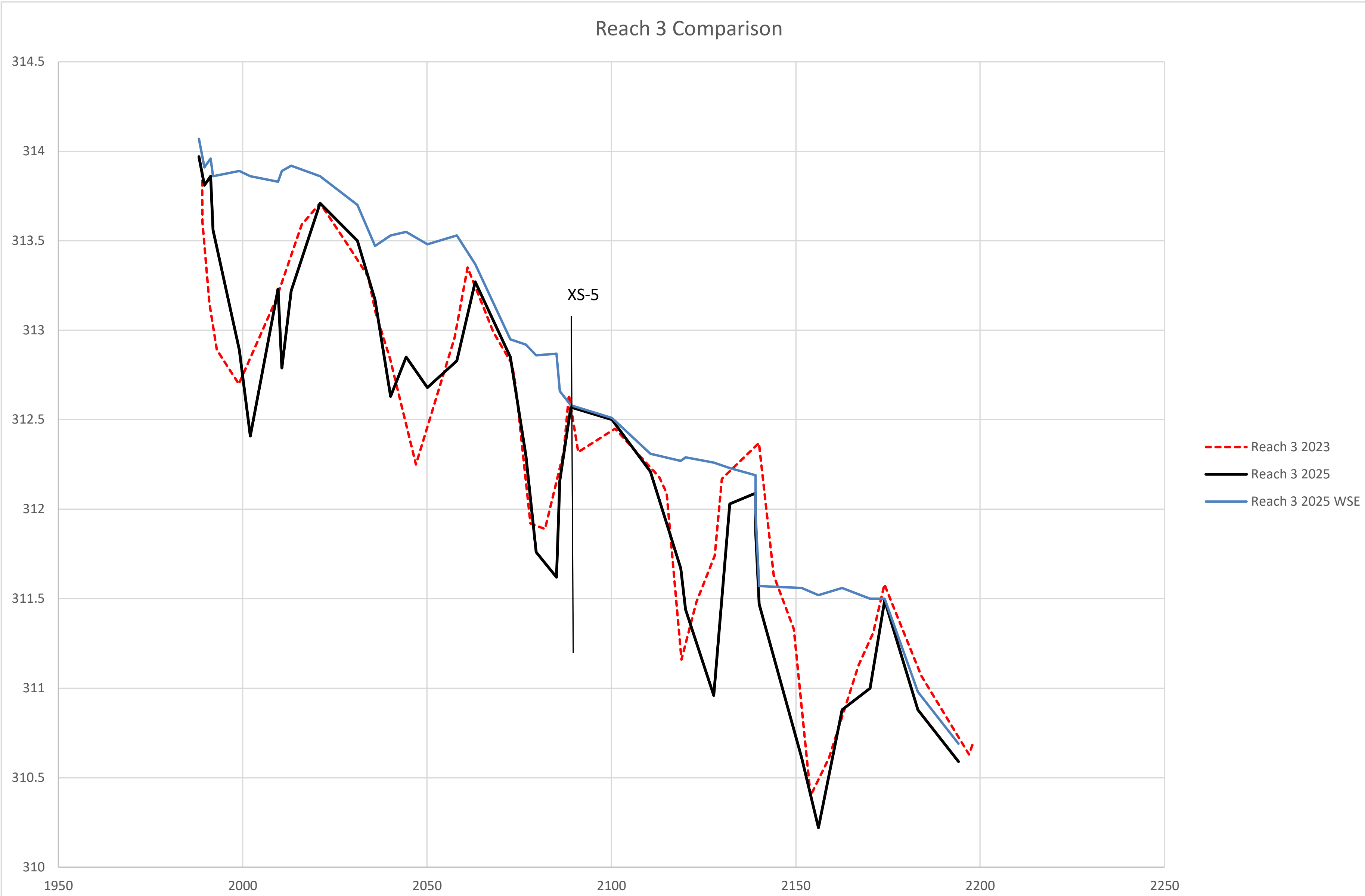
Reach 2A -1
360
358
356
354
352
350
348
346
344
100
200
300
400
500
600
700
XS-2
Reach 2A-1 2023
Reach 2A-1 2025
Reach 2A-1 2025 Water Surface



Reach 2A-2 Profile Comparison
348
346
344
342
340
338
336
334
332
330
690
790
890
990
1090
1190
1290
1390
XS-3
R2A-2 Y1
R2A-2 Y3
R2A-2 Y3 WSE

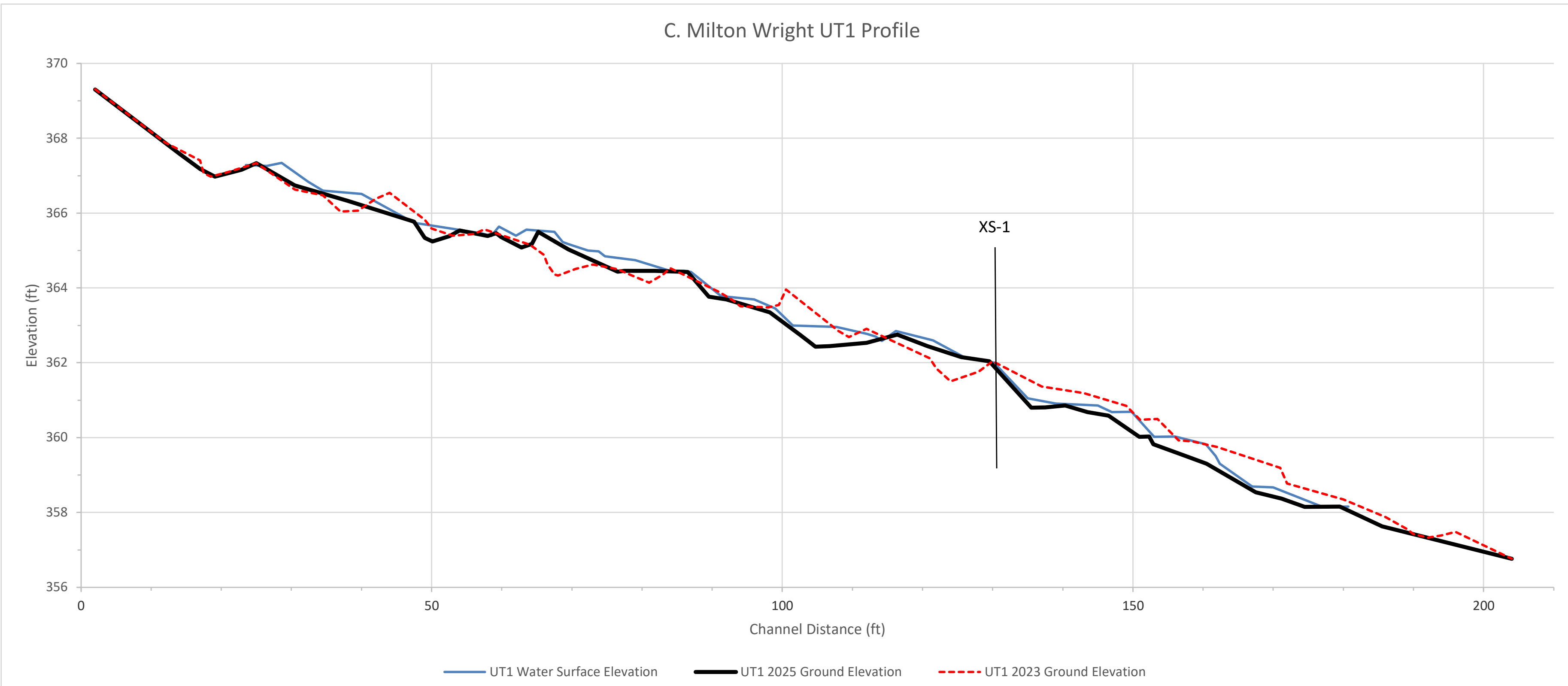


Reach 2B Comparison
Culvert
335
330
325
320
315
310
1350
1450
1550
1650
1750
1850
1950
2050
R2B Y1 ELEV
R2B Y3
R2B Y3 WSE

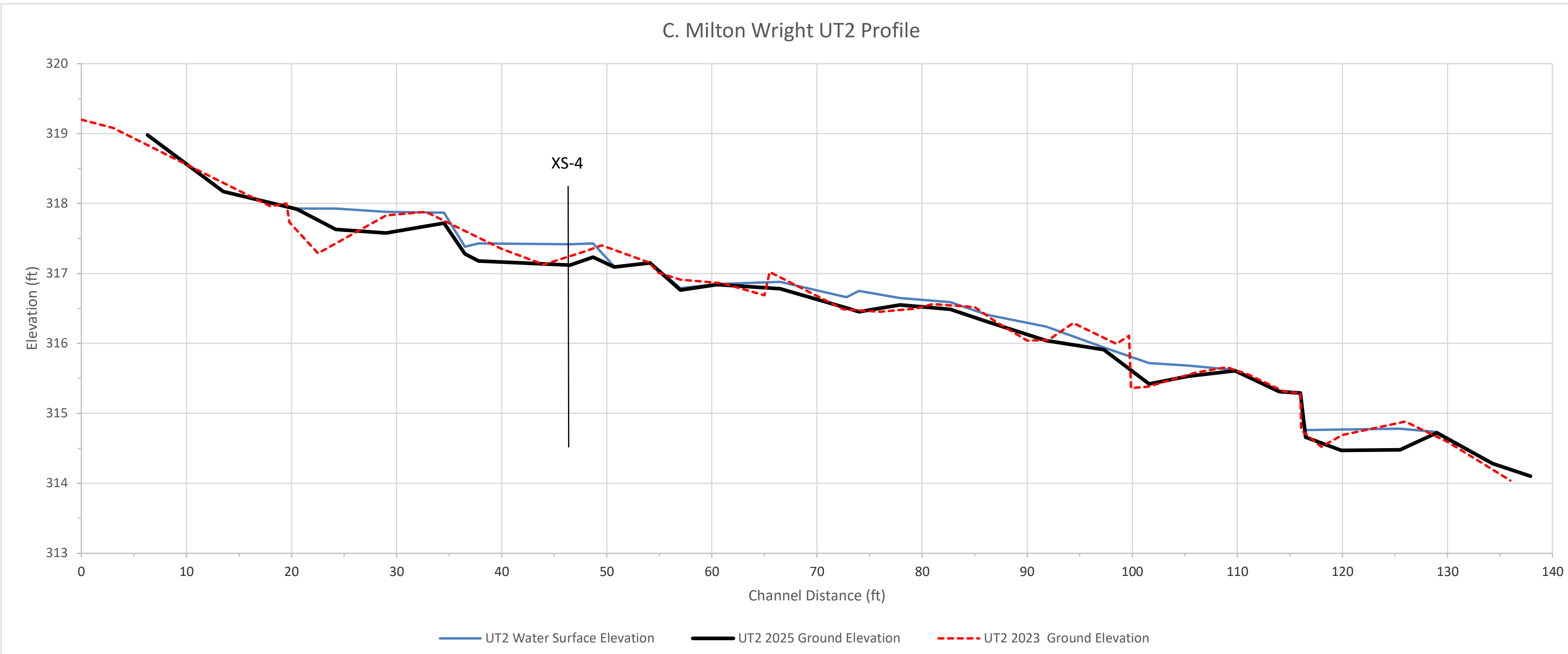


Reach 3 Comparison
314.5
314
313.5
313
312.5
312
311.5
311
310.5
310
1950
2000
2050
2100
2150
2200
2250
XS-5
Reach 3 2023
Reach 3 2025
Reach 3 2025 WSE

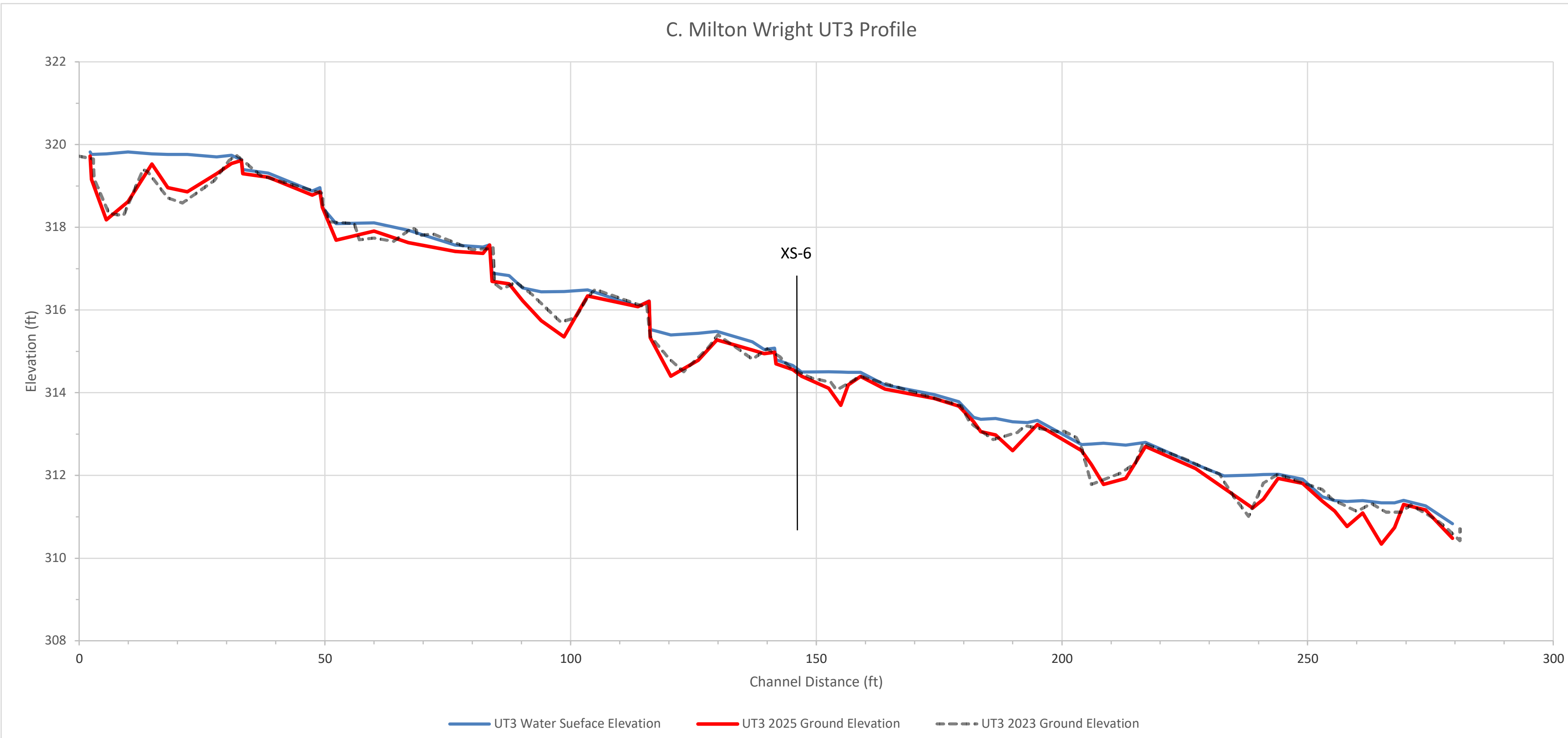
C. Milton Wright Reach 4 Profile
Culvert
XS-7
Elevation (ft)
312
310
308
306
304
302
300
298
296
294
2200
2300
2400
2500
2600
2700
2800
2900
3000
3100
Channel Distance (ft)
Reach 4 Ground Elevation 2023
Reach 4 Water Surface Elevation
Reach 4 Ground Elevation 2025



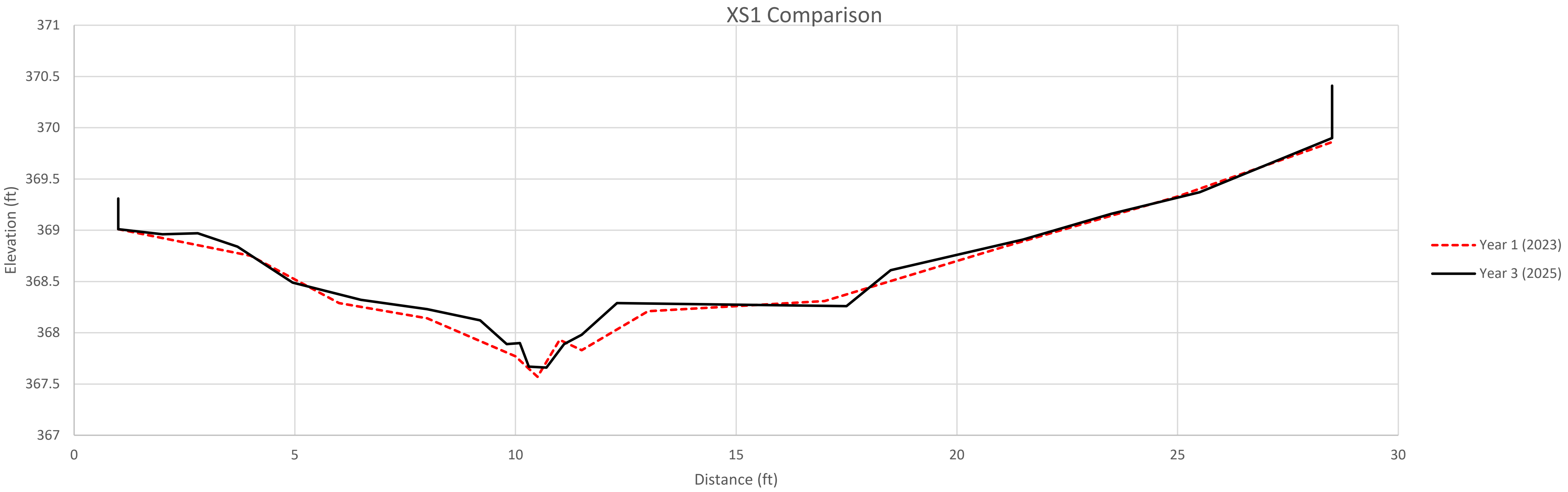
C. Milton Wright UT1 Profile
Elevation (ft)
370
368
366
364
362
360
358
356
0
50
100
150
200
Channel Distance (ft)
XS-1
UT1 Water Surface Elevation
UT1 2025 Ground Elevation
UT1 2023 Ground Elevation



C. Milton Wright UT2 Profile
XS-4
Elevation (ft)
320
319
318
317
316
315
314
313
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
Channel Distance (ft)
UT2 Water Surface Elevation
UT2 2025 Ground Elevation
UT2 2023 Ground Elevation



C. Milton Wright UT3 Profile
322
320
318
316
314
312
310
308
Elevation (ft)
0
50
100
150
200
250
300
Channel Distance (ft)
XS-6
UT3 Water Sueface Elevation
UT3 2025 Ground Elevation
UT3 2023 Ground Elevation

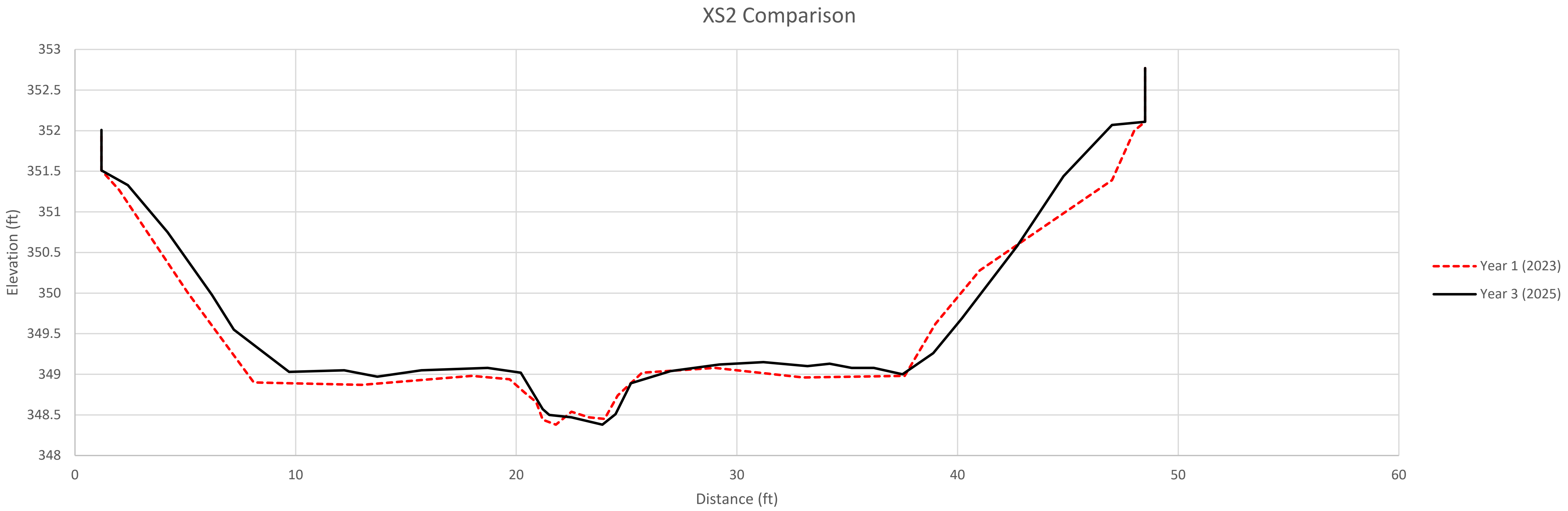


XS-1 Facing Upstream

XS-1 Facing Downstream

XS-1 Facing Left Bank

XS-1 Facing Right Bank



XS-2 Facing Upstream

XS-2 Facing Downstream

XS-2 Facing Left Bank

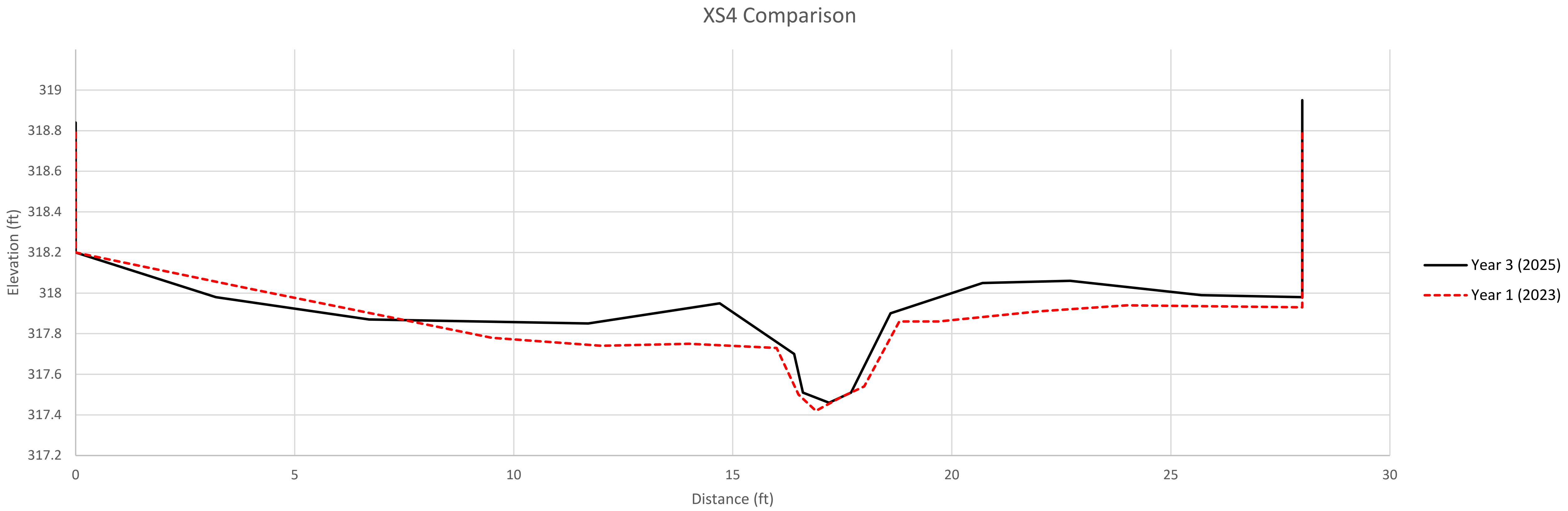
XS-2 Facing Right Bank

XS-3 Facing Upstream

XS-3 Facing Downstream

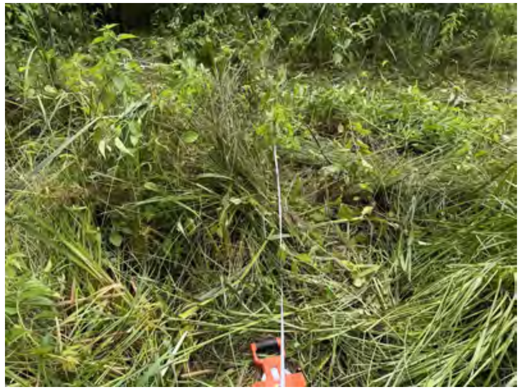
XS-3 Facing Left Bank

XS-3 Facing Right Bank



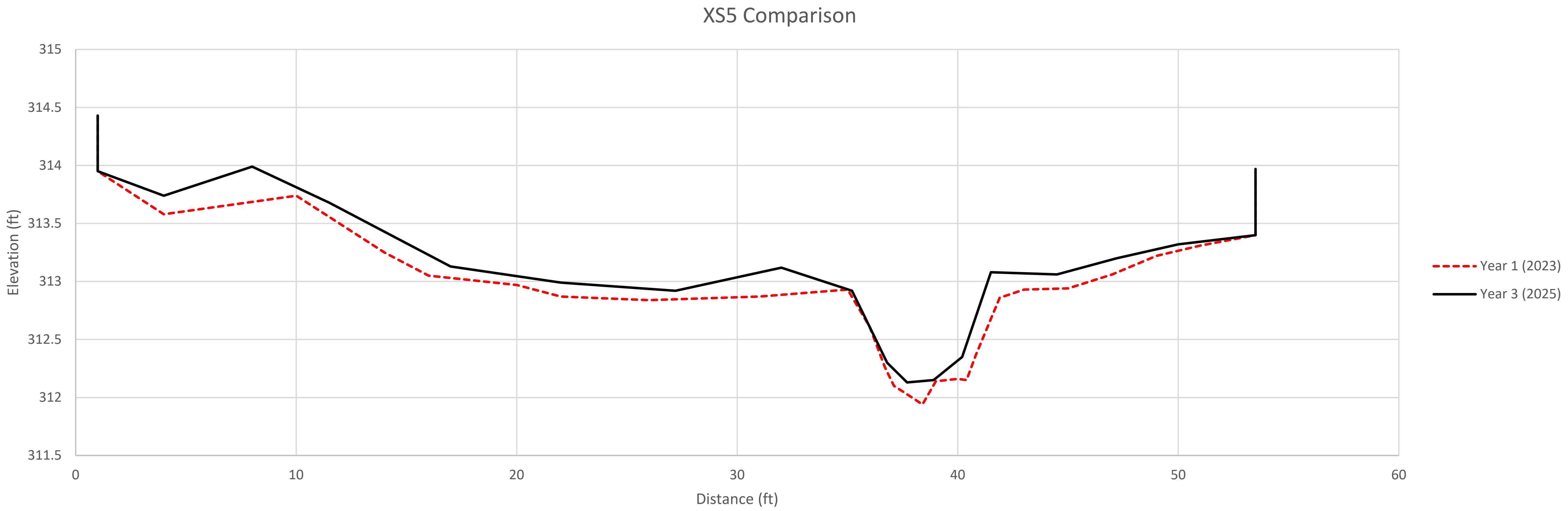
XS-4 Facing Upstream

XS-4 Facing Downstream



XS-4 Facing Left Bank

XS-4 Facing Right Bank

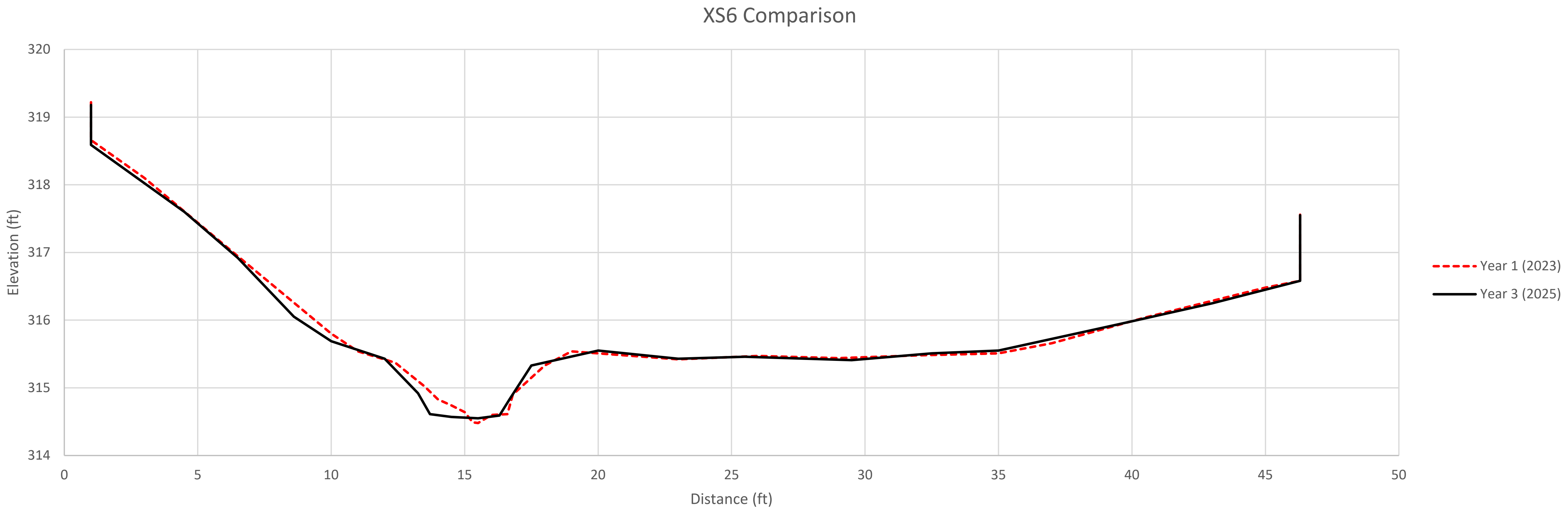


XS-5 Facing Upstream

XS-5 Facing Downstream

XS-5 Facing Left Bank

XS-5 Facing Right Bank

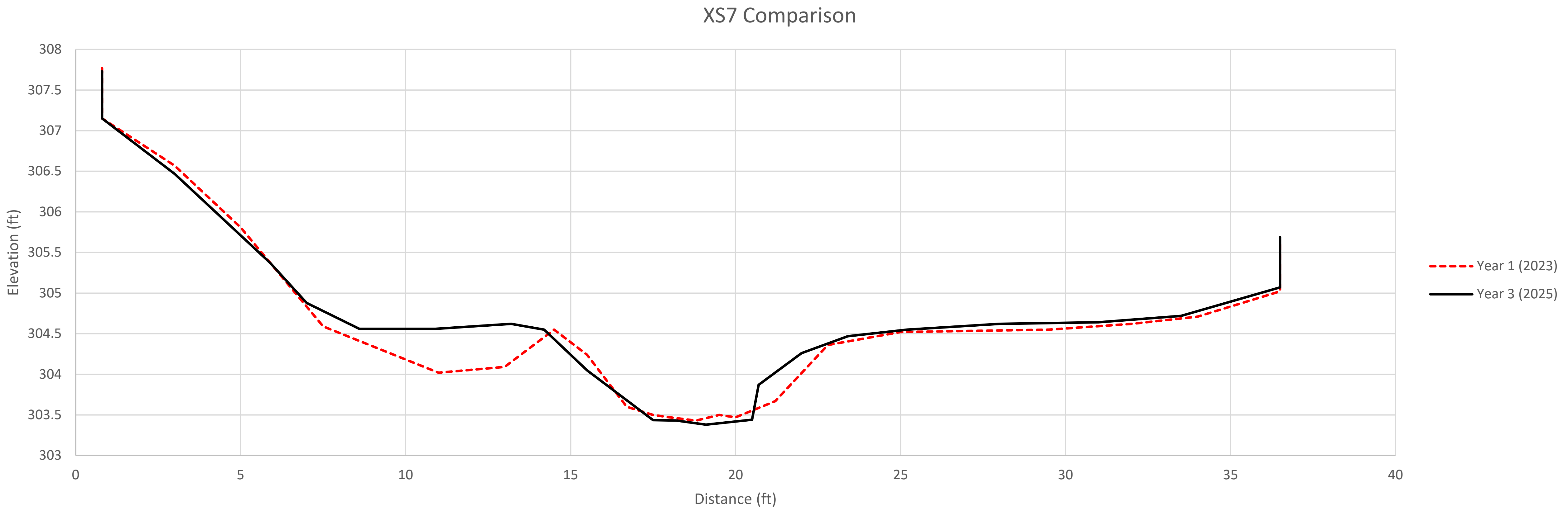


XS-6 Facing Upstream

XS-6 Facing Downstream

XS-6 Facing Left Bank

XS-6 Facing Right Bank



XS-7 Facing Upstream

XS-7 Facing Downstream

XS-7 Facing Left Bank

APPENDIX E: Pre-Construction and Year 1 RBP Assessments

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT1	LOCATION C Milton Wright High School
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT 39.56497375 LONG -76.332988074	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS RHG	
FORM COMPLETED BY RHG	DATE 7/15/21 TIME 2:56 PM AM PM — REASON FOR SURVEY UT Bynum Run Stream Restoration

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 4	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE _3_ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE _3_ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 5 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 6 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 49

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT2	LOCATION C Milton Wright High School
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT 39.56069842 LONG -76.32831326	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS RHG	
FORM COMPLETED BY RHG	DATE 7/15/21 TIME 1:15 PM AM PM
	REASON FOR SURVEY UT Bynum Run Stream Restoration

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE _3_ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE _5_ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 3 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 2 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 61

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT3	LOCATION C Milton Wright High School
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT 39.559943 LONG -76.329227	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS RHG	
FORM COMPLETED BY RHG	DATE 7/15/21 TIME 12:34 PM AM PM
REASON FOR SURVEY UT Bynum Run Stream Restoration	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 14	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE _7_ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE _2_ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE _5_ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE _2_ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE _7_ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE _5_ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score _91_

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT Bynum Run at UT1	LOCATION C Milton Wright High School
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT 39.56451315 LONG -76.32965467	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS RHG	
FORM COMPLETED BY RHG	DATE 7/15/21 TIME 2:29 PM AM PM — REASON FOR SURVEY UT Bynum Run Stream Restoration

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 4	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 4	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 4	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE _4_ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE _5_ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 5 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 6 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 79

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT Bynum Run Reach 1	LOCATION C Milton Wright High School
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT 39.56479544 LONG -76.33011381	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS RHG	
FORM COMPLETED BY RHG	DATE 7/15/21 TIME 3:07 PM AM PM | REASON FOR SURVEY UT Bynum Run Stream Restoration

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 4	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE _7_ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE _5_ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 106

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT Bynum Run Reach 2A	LOCATION C Milton Wright High School
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT 39.56248904 LONG -76.32858911	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS RHG	
FORM COMPLETED BY RHG	DATE 7/15/21 TIME 1:55 PM AM PM — REASON FOR SURVEY UT Bynum Run Stream Restoration

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 4	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE _4_ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE _5_ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 4 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 3 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 82

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT Bynum Run Reach 2B	LOCATION C Milton Wright High School
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT 39.56085303 LONG -76.32866226	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS RHG	
FORM COMPLETED BY RHG	DATE 7/15/21 TIME 1:28PM AM PM — REASON FOR SURVEY UT Bynum Run Stream Restoration

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 9	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 4	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE _4_ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE _6_ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 4 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 5 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 95

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT Bynum Run at UT3	LOCATION C Milton Wright High School
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT 39.55986231 LONG -76.32899022	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS RHG	
FORM COMPLETED BY RHG	DATE 7/15/21 TIME 12:14 PM AM PM — REASON FOR SURVEY UT Bynum Run Stream Restoration

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 9	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE _4_ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE _4_ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 3 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 5 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score ____94____

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT Bynum Run Reach 4	LOCATION C Milton Wright High School
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT 39.55812533 LONG -76.32879213	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS RHG	
FORM COMPLETED BY RHG	DATE 7/15/21 TIME 12:04 PM AM PM / REASON FOR SURVEY UT Bynum Run Stream Restoration

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 14	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 14	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE _3_ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE _2_ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 4 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 3 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 3 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 107

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT 1	LOCATION CMW High School
STATION #__________ RIVERMILE__________	STREAM CLASS III
LAT _______________ LONG _______________	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS JES, DH	
FORM COMPLETED BY JES	DATE 6/29/2023 TIME ________ AM PM — REASON FOR SURVEY Year 1 Post Con Monitoring

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 5 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 106

Comments:

Year 1 Monitoring - 2023

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT2	LOCATION CMW High School, Harford County MD
STATION #__________ RIVERMILE__________	STREAM CLASS III
LAT _______________ LONG _______________	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS JES, SJM	
FORM COMPLETED BY JES	DATE 6/30/2023 TIME ________ AM PM — REASON FOR SURVEY Year 1 Post Con Monitoring

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 3	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 101

Comments:

Year 1 Monitoring - 2023

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT3	LOCATION CMW High School Harford County, MD
STATION #_________ RIVERMILE_________	STREAM CLASS III
LAT ____________ LONG ____________	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS JES, SJM	
FORM COMPLETED BY JES	DATE 6/30/2023 TIME _______ AM PM — REASON FOR SURVEY Year 1 Post Con Monitoring

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 14	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 9	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 126

Comments:

Year 1 Monitoring - 2023

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Reach 1 (mainstem)	LOCATION CMW High School Harford County, MD
STATION #__________ RIVERMILE__________	STREAM CLASS III
LAT ______________ LONG ______________	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS JES, DH	
FORM COMPLETED BY JES	DATE 6/29/2023 TIME ________ AM PM
REASON FOR SURVEY Year 1 Post Con Monitoring	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Comments:

Total Score 138

Year 1 Monitoring - 2023

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Reach 2A (mainstem)	LOCATION CMW High School Harford County, MD		
STATION #__________ RIVERMILE__________	STREAM CLASS III		
LAT _______________ LONG _______________	RIVER BASIN Bush River Basin - Bynum Run		
STORET #	AGENCY		
INVESTIGATORS JES, DH			
FORM COMPLETED BY JES	DATE 6/29/2023 TIME ________ AM PM	REASON FOR SURVEY Year 1 Post Con Monitoring	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Comments:

Total Score 140

Year 1 Monitoring - 2023

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Reach 2B (mainstem)	LOCATION CMW High School Harford County, MD
STATION #__________ RIVERMILE__________	STREAM CLASS III
LAT _______________ LONG _______________	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS JES, DH	
FORM COMPLETED BY JES	DATE 6/29/2023 TIME ________ AM PM
	REASON FOR SURVEY Year 1 Post Con Monitoring

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Comments:

Total Score 145

Year 1 Monitoring - 2023

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Reach 3 (mainstem)	LOCATION CMW High School Harford County, MD
STATION #__________ RIVERMILE__________	STREAM CLASS III
LAT _______________ LONG _______________	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS JES, SJM	
FORM COMPLETED BY JES	DATE 6/30/2023 TIME ________ AM PM — REASON FOR SURVEY Year 1 Post Con Monitoring

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Comments:

Total Score 151

Year 1 Monitoring - 2023

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Reach 4 (mainstem)	LOCATION CMW High School Harford County, MD
STATION #__________ RIVERMILE__________	STREAM CLASS III
LAT _______________ LONG _______________	RIVER BASIN Bush River Basin - Bynum Run
STORET #	AGENCY
INVESTIGATORS JES, SA	
FORM COMPLETED BY JES	DATE 8/3/2023 TIME ________ AM PM / REASON FOR SURVEY Year 1 Post Con Monitoring

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 138

Comments:

Year 1 Monitoring - 2023

APPENDIX F: Year 3 Monitoring RBP Assessments

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT1	LOCATION C. Milton Wright
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT _______________ LONG _______________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MTB, DEH	
FORM COMPLETED BY MTB	DATE 8/06/2025 TIME ________ AM PM | REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 14	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 97

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Reach 1	LOCATION C. Milton Wright	
STATION #__________ RIVERMILE__________	STREAM CLASS	
LAT _______________ LONG _______________	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS MTB, DEH		
FORM COMPLETED BY MTB	DATE 08/06/2025 TIME ________ AM PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	**Suboptimal**	**Marginal**	**Poor**
	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 137

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Reach 2A	LOCATION C. Milton Wright
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT _______________ LONG _______________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MTB, DEH	
FORM COMPLETED BY MTB	DATE 08/06/2025 TIME ________ AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 142

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Reach 2B	LOCATION C. Milton Wright
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT _______________ LONG _______________	RIVER BASIN
STOREET #	AGENCY
INVESTIGATORS MTB, DEH	
FORM COMPLETED BY MTB	DATE 08/06/2025 TIME ________ AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 147

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT2	LOCATION C. Milton Wright	
STATION #__________ RIVERMILE__________	STREAM CLASS	
LAT _______________ LONG _______________	RIVER BASIN	
STOREET #	AGENCY	
INVESTIGATORS MTB, DEH		
FORM COMPLETED BY MTB	DATE 08/06/2025 TIME ________ AM PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 3	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 1	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 105

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Reach 3	LOCATION C. Milton Wright
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT _______________ LONG _______________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MTB, DEH	
FORM COMPLETED BY MTB	DATE 08/06/2025 TIME ________ AM PM / REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 151

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME UT3	LOCATION C. Milton Wright
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT _______________ LONG _______________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS MTB, DEH	
FORM COMPLETED BY MTB	DATE 08/06/2025 TIME ________ AM PM
	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 12	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 9	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 129

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Reach 4	LOCATION
STATION #__________ RIVERMILE__________	STREAM CLASS
LAT _______________ LONG _______________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY	DATE ________ TIME ________ AM PM
	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 14	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 143

APPENDIX G: Landscape Zone and Riparian Vegetation Plot Map

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Appendix G:
Landscape Zones and Riparian Vegetation Monitoring Plots

Sheet 1 of 2

Harford County, Maryland
October 2025

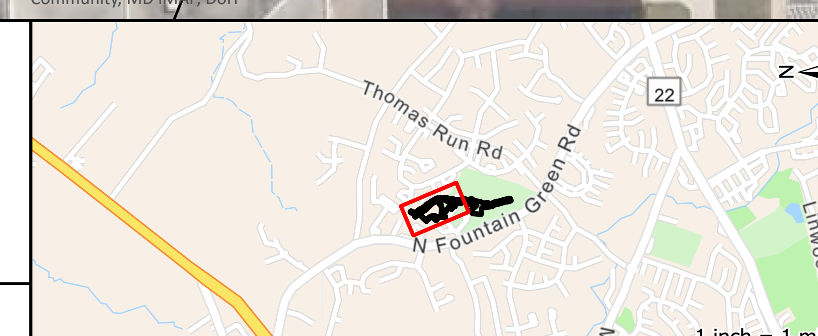
Vegetation Monitoring Plot
Stream Centerline
LOD
Map Sheet

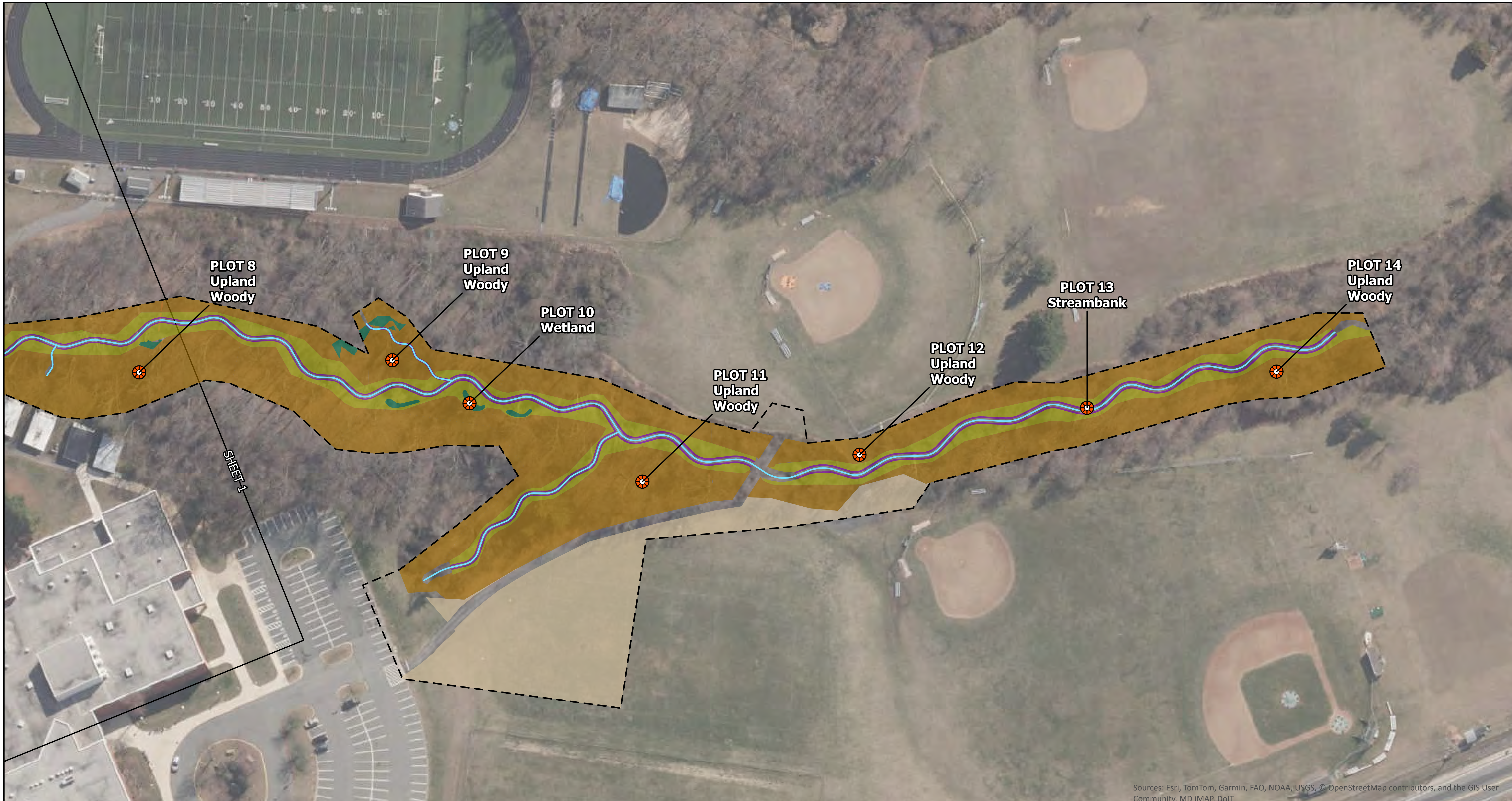
Landscape Zone
Proposed Planting Field
Proposed Planting Riparian - Planting And Seed Zone
Proposed Planting Streambank Zone
Proposed Upland Woody Zone
Proposed Wetland Forested Zone

N E S W

0 50 100
feet
1 inch = 100 feet

Map Center, NAD83
39.5633°, -76.3295°





COASTAL RESOURCES INC.

C. Milton Wright Stream Restoration Project

Appendix G:
Landscape Zones and Riparian Vegetation Monitoring Plots

Sheet 2 of 2

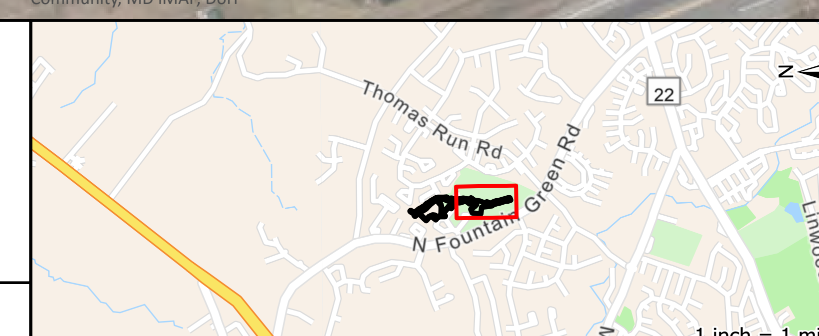
Harford County, Maryland
October 2025

Vegetation Monitoring Plot
Stream Centerline
LOD
Map Sheet

Landscape Zone
Proposed Planting Field
Proposed Planting Riparian - Planting And Seed Zone
Proposed Planting Streambank Zone
Proposed Upland Woody Zone
Proposed Wetland Forested Zone

0 50 100
feet
1 inch = 100 feet

Map Center, NAD83
39.5594°, -76.3289°



APPENDIX H: Summary of Herbaceous and Woody Vegetation Cover Data

PERCENT COVER DATA FOR WOODY AND HERBACEOUS SPECIES

Landscape Zone Type**	**Forested Wetland**	**Riparian**	**Upland Woody**	**Riparian**	**Upland Woody**	**Streambank**	**Upland Woody**	**Upland Woody**	**Upland Woody**	**Forested Wetland**	**Upland Woody**	**Upland Woody**	**Streambank**	**Upland Woody**	**Average**
Plot Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	
Plot Size	**Entire Area (178 sqft)**	**11.28' Radius**	**11.28' Radius**	**11.28' Radius**	**11.28' Radius**	**2' x 100'**	**11.28' Radius**	**11.28' Radius**	**11.28' Radius**	**Entire Area (212 sqft)**	**11.28' Radius**	**8' Radius**	**2' x 100'**	**11.28' Radius**	
Acer rubrum	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.1
Agrostis gigantea	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0.3
Agrostis perennans	0	0	0	0	0	0	0	0	0	0	0	2	5	0	0.5
Amorpha fruticosa	0	0	0	3	4	0	0	0	0	0	0	3	4	0	1.0
Apocynum cannabinum	0	0	2	0	0	0	0	3	0	0	0	0	0	0	0.4
Asclepias incarnata	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.1
Betula nigra	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1
Boehmeria cylindrica	0	4	0	4	0	0	0	4	**30**	15	3	0	8	0	4.9
Carex frankii	0	0	0	0	0	0	3	4	0	0	3	0	0	0	0.7
Carex lurida	0	8	0	0	2	**50**	0	4	15	5	0	0	3	0	6.2
Carex vulpinoidea	5	8	0	1	1	0	0	0	0	0	0	0	0	0	1.1
Cercis canadensis	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0.3
Cephalanthus occidentalis	**15**	10	0	1	0	**30**	0	0	1	0	0	0	13	0	5.0
Chamaecrista fasciculata	0	0	0	7	2	0	0	0	0	0	0	4	0	0	0.9
Cinna arundinacea	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1
Cornus amomum	0	3	1	1	0	0	0	0	0	0	0	0	0	2	0.5
Cuscuta gronovii	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0.1
Cyperus strigosus	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0.3
Daucus carota	0	0	0	0	0	0	0	0	0	0	0	2	0	3	0.4
Desmodium paniculatum	0	0	4	0	3	0	2	2	0	0	0	0	3	1	1.1
Dichanthelium clandestinum	5	8	**25**	**30**	**15**	10	**25**	**15**	**25**	**50**	**40**	4	**40**	**40**	23.7
Diospyros virginana	0	0	1	0	0	0	0	0	0	0	0	3	0	0	0.3
Elymus virginicus	10	0	5	3	2	0	0	6	0	0	7	0	0	**25**	4.1
Eupatorium perfoliatum	0	0	0	0	0	2	0	0	0	0	2	0	1	0	0.4
Eupatorium serotinum	0	3	0	0	0	1	0	2	0	0	0	0	3	0	0.6
Euthamia graminifolia	0	7	0	0	3	0	0	2	0	0	0	5	0	0	1.2
Eutrochium purpureum	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0.1
Fraxinus pennsylvanicus	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0.1
Galium aparine	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0.3
Geum canadense	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0.4
Impatiens capensis	10	**20**	0	0	4	5	0	0	5	0	3	0	4	2	3.8
Juglans nigra	0	1	0	0	0	0	8	0	0	0	0	0	0	0	0.6
Juncus effusus	3	3	2	5	0	5	0	2	6	3	0	0	1	0	2.1
Leersia oryzoides	0	0	0	0	0	0	0	0	15	0	0	0	0	0	1.1
Lindera benzoin	0	1	2	1	0	0	1	0	0	0	3	0	0	2	0.7
Liquidambar styraciflua	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.1
Liriodendron tulipifera	1	**20**	**35**	10	8	0	19	3	0	0	0	0	0	0	6.9
Monarda fistulosa	0	0	0	0	0	0	0	5	0	0	2	0	0	4	0.8
Nyssa sylvatica	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
Onoclea sensibilis	2	0	0	0	0	0	0	0	0	4	0	0	0	0	0.4
Persicaria sagittata	0	0	0	0	5	0	0	2	0	0	7	0	5	0	1.4
Persicaria virginiana	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0.2
Pilea pumila	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0.1
Platanus occidentalis	0	0	1	0	0	3	0	2	0	1	0	0	0	0	0.5
Prunus serotina	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.1
Poaceae sp.	**25**	0	0	0	0	0	0	0	0	0	0	5	0	0	2.1
Potentilla simplex	0	0	0	0	0	0	0	3	0	0	0	6	0	0	0.6
Quercus bicolor	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0.1
Quercus phellos	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Quercus rubra	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0.1
Rhus typhina	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0.3
Rubus sp.	0	0	3	0	3	0	0	1	2	0	0	**15**	0	5	2.1
Sagittaria latifolia	0	0	0	0	0	3	0	0	4	3	0	0	0	0	0.7
Salix nigra	0	3	0	0	0	4	5	**10**	5	6	**20**	0	7	10	5.0
Salix sericea	0	0	0	0	0	2	0	0	1	4	0	0	**20**	0	1.9
Scirpus atrovirens	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3
Scirpus cyperinus	0	0	0	0	0	0	0	0	4	5	0	0	0	0	0.6
Senecio hieraciifolius	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0.2
Solidago altissima	5	**25**	0	2	12	2	3	3	0	0	10	**15**	2	0	5.6
Solidago rugosa	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0.4
Solidago sp.	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0.3
Symphyotrichum sp.	1	0	0	0	0	0	0	0	0	0	0	5	0	0	0.4
Tridens flavus	0	0	2	0	0	0	0	1	0	0	0	2	0	0	0.4
Toxicodendron radicans	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0.6
Typha angustifolia	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0.1
Typha latifolia	0	0	0	0	0	0	0	0	8	0	0	0	3	0	0.8
Ulmus sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Verbesina alternifolia	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0.1
Viburnum dentatum	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1
Verbena urticifolia	0	0	0	0	0	0	2	3	0	0	0	0	0	0	0.4
Vitis sp.	0	0	7	0	0	0	5	0	0	0	0	0	0	0	0.9
*Albizia julibrissin**	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.1
*Arthraxon hispidus**	0	0	4	**40**	0	0	0	0	0	0	0	**10**	0	0	3.9
*Celastrus orbiculatus**	0	0	0	0	1	0	0	0	0	0	0	**10**	0	4	1.1
*Cirsium arvense**	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0.1
*Dactylis glomerata**	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0.1
*Duchesnea indica**	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.3
*Euonymus alatus**	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.1
*Glechoma hederacea**	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0.2
*Lespedeza cuneata**	0	0	0	0	0	0	0	3	0	0	0	0	4	0	0.5
Ligustrum sp.*	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0.1
*Lonicera japonica**	0	2	5	0	3	0	4	0	0	0	0	**12**	0	0	1.9
*Lonicera maackii **	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.1
*Microstegium vimineum**	**15**	**20**	**45**	10	**50**	20	0	**35**	**30**	**20**	0	0	**30**	**20**	21.1
*Persicaria maculosa**	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.1
*Persicaria perfoliata**	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0.2
*Pyrus calleryana**	0	0	2	0	4	0	0	0	0	0	0	0	0	0	0.4
*Rosa multiflora**	0	0	12	2	**15**	0	**50**	**7**	3	7	**25**	**12**	2	15	10.7
*Rubus phoenicolasius**	0	0	0	0	5	0	2	1	0	0	0	0	0	0	0.6
*Rumex crispus**	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.1
Total Native % Cover	90	129	95	76	67	122	85	83	124	99	106	76	122	106	96.0
Total % Cover	105	151	163	128	146	143	144	131	157	129	136	122	158	149	137.9

** Indicates non-native*

***Bold font indicates dominant species using the 50/20 rule*

APPENDIX I: Summary of Woody Stem Density Data

STEM DENSITY FOR WOODY PLANT SPECIES																
Landscape Zone Type		**Forested Wetland**	**Riparian**	**Upland Woody**	**Riparian**	**Upland Woody**	**Streambank**	**Upland Woody**	**Upland Woody**	**Upland Woody**	**Forested Wetland**	**Upland Woody**	**Upland Woody**	**Streambank**	**Upland Woody**	**Average**
Plot Number		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	
Plot Size		**Entire Area (178 sqft)**	**11.28' Radius**	**11.28' Radius**	**11.28' Radius**	**11.28' Radius**	**2' x 100'**	**11.28' Radius**	**11.28' Radius**	**11.28' Radius**	**Entire Area (212 sqft)**	**11.28' Radius**	**8' Radius**	**2' x 100'**	**11.28' Radius**	
Planted Species	*Cephalanthus occidentalis*	4	8	0	1	0	22	0	0	1	0	0	0	10	0	3.3
	Cercis canadensis	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0.1
	Cornus amomum	0	3	1	1	0	0	0	0	0	0	0	0	0	2	0.5
	Diospyros virginiana	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0.1
	Lindera benzoin	0	0	2	0	0	0	0	0	0	0	1	0	0	1	0.3
	Liriodendron tulipifera	0	0	0	0	0	0	3	2	0	0	0	0	0	0	0.4
	Nyssa sylvatica	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
	Platanus occidentalis	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0.1
	Quercus bicolor	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1
	Quercus rubra	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.1
	Salix nigra	0	1	0	0	0	3	4	2	12	4	4	0	6	5	2.9
	Salix sericea	0	0	0	0	0	1	0	0	1	4	0	0	15	0	1.5
	Viburnum dentatum	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1
	#PLANTED STEMS SURV/PLOT	4	12	4	2	0	28	8	6	14	8	5	3	31	9	9.6
	#PLANTED STEMS SURV/ACRE	978.9	1306.8	435.6	217.8	0	6098.4	871.2	653.4	1524.6	1643.8	544.5	650.1	6751.8	980.1	1618.4
Seedlings/ Volunteers	*Acer rubrum*	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.1
	*Albizia julibrissin**	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0.1
	Betula nigra	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1
	Cephalanthus occidentalis	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0.1
	Cercis canadensis	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.1
	Diospyros virginiana	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1
	*Euonymus alatus**	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.1
	Fraxinus pennsylvanica	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0.2
	Juglans nigra	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0.3
	Ligustrum sp.*	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.1
	Lindera benzoin	0	1	0	1	0	0	1	0	0	0	2	0	0	1	0.4
	Liquidambar styraciflua	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.1
	Liriodendron tulipifera	1	24	62	9	12	0	12	0	0	0	0	0	0	0	8.6
	*Lonicera maackii**	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.1
	Nyssa sylvatica	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
	Platanus occidentalis	0	0	1	0	0	0	0	5	0	1	0	0	0	0	0.5
	Prunus serotina	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.1
	*Pyrus calleryana**	0	0	2	0	5	0	0	0	0	0	0	0	0	0	0.5
	Quercus bicolor	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.1
	Quercus phellos	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0.1
	Quercus rubra	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.1
	Rhus typhina	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0.1
	Ulmus sp.	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
# STEMS SURVIVING/PLOT (ALL SPECIES)		9	42	73	13	18	31	29	12	14	10	8	3	31	10	21.6
# STEMS SURV/ACRE (ALL SPECIES)		2202.5	4573.8	7949.7	1415.7	1960.2	6752	3158.1	1306.8	1524.6	2054.7	871.2	650.1	6751.8	1089	3018.6

*Indicates non-native species

APPENDIX J: Vegetation Monitoring Photograph Log

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 1: Looking upstream at Plot-1 during Year 3.

Photo 2: Looking downstream at Plot-1 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 3: Looking at the left bank at Plot-1 during Year 3.

Photo 4: Looking at the right bank at Plot-1 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 5: Looking upstream at Plot-2 during Year 3.

Photo 6: Looking downstream at Plot-2 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 7: Looking at the left bank at Plot-2 during Year 3.

Photo 8: Looking at the right bank at Plot-2 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 9: Looking upstream at Plot-3 during Year 3.

Photo 10: Looking downstream at Plot-3 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 11: Looking at the left bank at Plot-3 during Year 3.

Photo 12: Looking at the right bank at Plot-3 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log


Photo 13: Looking upstream at Plot-4 during Year 3.


Photo 14: Looking downstream at Plot-4 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 15: Looking at the left bank at Plot-4 during Year 3.

Photo 16: Looking at the right bank at Plot-4 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 17: Looking upstream at Plot-5 during Year 3.

Photo 18: Looking downstream at Plot-5 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 19: Looking at the left bank at Plot-5 during Year 3.

Photo 20: Looking at the right bank at Plot-5 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 21: Looking upstream at Plot-6 during Year 3.

Photo 22: Looking downstream at Plot-6 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 23: Looking at the left bank at Plot-6 during Year 3.

Photo 24: Looking at the right bank at Plot-6 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 25: Looking upstream at Plot-7 during Year 3.

Photo 26: Looking downstream at Plot-7 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 27: Looking at the left bank at Plot-7 during Year 3.

Photo 28: Looking at the right bank at Plot-7 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 29: Looking upstream at Plot-8 during Year 3.

Photo 30: Looking downstream at Plot-8 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 31: Looking at the left bank at Plot-8 during Year 3.

Photo 32: Looking at the right bank at Plot-8 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 33: Looking upstream at Plot-9 during Year 3.

Photo 34: Looking downstream at Plot-9 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 35: Looking at the left bank at Plot-9 during Year 3.

Photo 36: Looking at the right bank at Plot-9 during Year 3.

Photo 37: Looking upstream at Plot-10 during Year 3.

Photo 38: Looking downstream at Plot-10 during Year 3.

Photo 39: Looking at the left bank at Plot-10 during Year 3.

Photo 40: Looking at the right bank at Plot-10 during Year 3.

Appendix J – C. Milton Wright Stream Restoration
Vegetation Monitoring Photo Log

Photo 41: Looking upstream at Plot-11 during Year 3.

Photo 42: Looking downstream at Plot-11 during Year 3.

Photo 43: Looking at the left bank at Plot-11 during Year 3.

Photo 44. Looking at the right bank at Plot-11 during Year 3.

Photo 45. Looking upstream at Plot-12 during Year 3.

Photo 46. Looking downstream at Plot-12 during Year 3.

Photo 47. Looking at the left bank at Plot-12 during Year 3.

Photo 48. Looking at the right bank at Plot-12 during Year 3.

Photo 49. Looking upstream at Plot-13 during Year 3.

Photo 50. Looking downstream at Plot-13 during Year 3.

Photo 51. Looking at the left bank at Plot-13 during Year 3.

Photo 52. Looking at the right bank at Plot-13 during Year 3.

Photo 53. Looking upstream at Plot-14 during Year 3.

Photo 54. Looking downstream at Plot-14 during Year 3.

Photo 55. Looking at the left bank at Plot-14 during Year 3.

Photo 56. Looking at the right bank at Plot-14 during Year 3.

Photo 57. Looking west at the Turf Grass Zone during Year 3.

Photo 58. Looking west at the Turf Grass Zone during Year 3.

APPENDIX K: Invasive Species Assessment Map

COASTAL RESOURCES INC.

C. Milton Wright Stream Restoration Project

Appendix K:
Invasive Species Assessment Maps

Sheet 1 of 2

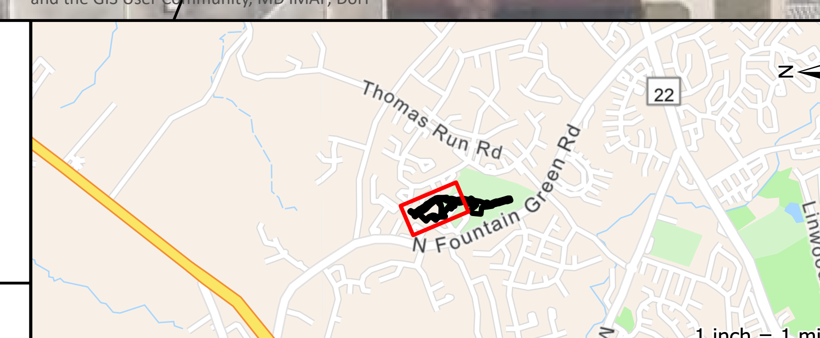
Harford County, Maryland
October 2025

Stream Centerline
LOD
Map Sheet
Invasive Plant Zone

N E S W

0 50 100
feet
1 inch = 100 feet

Map Center, NAD83
39.5633°, -76.3295°



COASTAL RESOURCES INC.

C. Milton Wright Stream Restoration Project

Appendix K:
Invasive Species Assessment Maps

Sheet 2 of 2

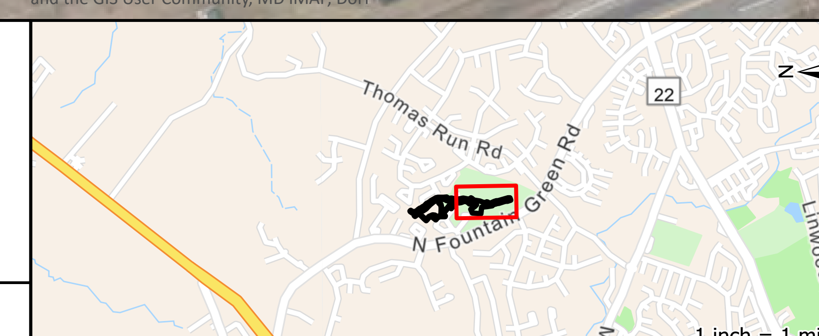
Harford County, Maryland
October 2025

- Paulownia tomentosa (Princesstree)
- Stream Centerline
- LOD
- Map Sheet
- Invasive Plant Zone

E
N S
W

0 50 100
feet
1 inch = 100 feet

Map Center, NAD83
39.5594°, -76.3289°



APPENDIX L: Invasive Species Summary Tables

C. Milton Wright Stream Restoration Invasive Plant Species Summary Table																				
Area (SF) of Invasive Species Within Mapped Zones																				
Invasive Species	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Zone 5**	**Zone 6**	**Zone 7**	**Zone 8**	**Zone 9**	**Zone 10**	**Zone 11**	**Zone 12**	**Zone 13**	**Zone 14**	**Zone 15**	**Zone 16**	**Zone 17**	**Zone 18**	**Zone 19**	**Zone 20**
Albizia julibrissin																		86		92
Alliaria petiolata				72																
Ampelopsis brevipedunculata	173												67			161	111			
Arthraxon hispidus				72		97	222		293	342		363	334		233		222	428	197	
Celastrus orbiculatus						193										54				92
Cirsium sp.		60				97	44	244												
Elaeagnus umbellata					132												222			
Glechoma hederacea							665	98	98		444								296	185
Hedera helix																	111			
Lespedeza cuneata	173	181			529	290		98	195	342	177	454				107				
Ligustrum sp.						193		147								54			197	277
Lonicera japonica	260	121	127		132	484		98		513	266	91	200	321	155	161	333	428	395	461
Lonicera maackii								98												277
Microstegium vimineum	433	603	956	1,443	199	2,419	111		1,463	1,711	1,331	182	334	1,071	621	536	333	428	493	1,384
Persicaria perfoliata		60	127	216																
Phragmites australis			127																	
Rosa multiflora	1,733	603	510	361	199	967		98	195	342	444	363	200	321	388	107	889	428	197	461
Rubus phoenicolasius	173	121	127		199	290		49			177			214	155	107	333	86	197	461
Vinca minor																				185

C. Milton Wright Stream Restoration Invasive Plant Species Summary Table										
Area (SF) of Invasive Species Within Mapped Zones										
Invasive Species	**Zone 21**	**Zone 22**	**Zone 23**	**Zone 24**	**Zone 25**	**Zone 26**	**Zone 27**	**Zone 28**	**Zone 29**	**Zone 30**
Albizia julibrissin										
Alliaria petiolata										
Ampelopsis brevipedunculata										
Arthraxon hispidus	619	3,595	542	476	1,557			131	2,674	2,233
Celastrus orbiculatus										
Cirsium sp.										
Elaeagnus umbellata					104	166				
Glechoma hederacea	206									
Hedera helix										
Lespedeza cuneata										
Ligustrum sp.						664	450			
Lonicera japonica	413	899	325	191		415	270	79		
Lonicera maackii						166	450			
Microstegium vimineum	2,476	2,696	542	476	1,038			657		
Persicaria perfoliata										
Phragmites australis										
Rosa multiflora	1,651	539	325	286		249	2,700	131		
Rubus phoenicolasius			434	191	52	249				
Vinca minor										

C. Milton Wright Stream Restoration Invasive Plant Points Summary Table		
Species Mapped as Individuals or Small Isolated Patches		
Point ID Number	**Species**	**Area (SF, estimated)**
1	*Paulownia tomentosa*	9

APPENDIX M: Invasive Species Management Plan

INVASIVE SPECIES MANAGEMENT PLAN

C. MILTON WRIGHT HIGH SCHOOL STREAM RESTORATION POST CONSTRUCTION

HARFORD COUNTY, MARYLAND

OCTOBER 2025

Prepared For:

Prepared By:

COASTAL RESOURCES INC.

25 Old Solomons Island Road, Annapolis, Maryland 21401

Table of Contents

List of Figures

List of Tables

List of Appendices

1.0 Introduction

The C. Milton Wright Stream Restoration project restored an unnamed perennial tributary to Bynum Run (the mainstem) and three contributing tributaries in Harford County, Maryland. The purpose of the project is to generate nutrient and sediment reductions within the project area to support the Harford County DPW Watershed Protection and Restoration Office in meeting TMDL goals as mandated in the county's Municipal Separate Storm Sewer System (MS4) permit. The project site is located at C. Milton Wright High School at 1301 N Fountain Green Road, in Bel Air (**Figure 1**). The project permanently impacted 3,845 linear feet of stream and 365 square feet of palustrine forested (PFO) wetlands. It also temporarily impacted 84 linear feet of stream and 1,979 feet of PFO wetlands. In addition to the restoration, an existing undersized culvert was replaced with a double-box culvert that permanently impacted 16 linear feet of stream.

As part of the conditions of the U.S. Army Corps of Engineers (USACE) Nationwide Permit for the project, the Harford County Department of Public Works is required to conduct invasive species monitoring and prepare an Invasive Species Eradication and Maintenance Plan to remove non-native invasive plant species within the project site if site visits document their presence. An invasive species assessment was conducted at the site on July 29 and July 30, 2025. The invasive species assessment was used to determine all possible recommended treatments for invasive species on the property. Twenty invasive species were documented within the study area, covering 30 mapped invasive area polygons and one additional standalone point (**Appendix A**). Recommendations for the management of existing invasive species will focus on the 19 species shown in **Table 1**. The invasive species Japanese stiltgrass (*Microstegium vimineum*) is nearly impossible to eradicate and is not recommended for treatment. It is recommended that management of invasive plants within the site primarily focus on those species whose area-wide distribution is patchier in nature and for which treatment options have a higher likelihood of success. Also, those invasive species whose presence either precludes the establishment of native plants or results in the death of native plants, should be most aggressively treated.

The following text includes a general guide to site specific treatment options for the common invasive plants found during the survey as provided in Montgomery County's Best Management Practices for Control of Non-Native Invasives (M-NCPPC, 2015), SHA's Integrated Vegetation Management Manual for Maryland Highways (SHA, 2003), Plant Invaders of Mid-Atlantic Natural Areas (2010/2022), University of Maryland Extension's Weed Identification and Management in Home Landscapes (UMDE, 2022), and Maryland Invasive Species Council Invasive Species of Concern in Maryland (MISC, 2025). The area in square feet for each species found within each mapped invasive zone is outlined in **Table 3**, which may be used to inform treatment plans to target areas that contain a higher coverage of invasive species. In addition to the species documented by mapped zones, one invasive plant point was mapped to represent an occurrence of princess tree (*Paulownia tomentosa*) that was not documented as part of a zone because it was an isolated individual. The species documented for the point and the square foot coverage are included in **Table 2**. Additionally, broad-leaf cat-tail (*Typha latifolia*) and narrow-leaf cat-tail (*Typha angustifolia*) are native but cattail species can be considered invasive if they dominate a site. While not included in the invasive species calculations or mapping, cat-tails were identified on site and should be monitored in the future to ensure they don't spread and colonize large areas.

Figure 1: Vicinity Map

Recommended treatment options will depend upon the type of plant (e.g., herbaceous or woody) and growing condition (e.g., wetland or upland), and could include mechanical removal (e.g., weed whacking, mowing), hand pulling, or herbicide applications. It is recommended that areas receiving treatment are monitored following treatment to evaluate the success of the eradication and management program.

Table 1: Summary of Invasive Species and Treatment Options

Scientific Name	Common Name	Treatment Options[1]			
		Mechanical Removal[2]	Hand Pull[3]	Herbicide Application[4]	Best Time of Year for Treatment
Albizia julibrissin	Mimosa	X		X	Early growing season (prior to seed formation)
Alliaria petiolata	Garlic mustard		X	X	Spring
Ampelopsis brevipedulnculata	Amur peppervine		X	X	Late growing season
Arthraxon hispidus	Small carpetgrass	X	X	X	Early growing season
Celastrus orbiculatus	Oriental bittersweet		X	X	Late growing season
Cirsium arvense	Canada thistle	X		X	Early growing season
Elaeagnus umbellata	Autumn olive	X		X	July through October
Glechoma hederacea	Ground ivy	X	X	X	Early growing season
Hedera helix	English ivy	X	X	X	Year round
Lespedeza cuneata	Chinese lespedeza			X	Early or mid-summer
Ligustrum sp.	Unknown privet	X	X	X	Late spring before flowering
Lonicera japonica	Japanese honeysuckle	X	X	X	Late growing season
Lonicera maackii	Amur honeysuckle	X	X	X	Early spring and late fall
Paulownia tomentosa	Princess tree	X	X	X	Prior to going to seed
Persicaria perfoliata	Mile-a-minute		X	X	June/July; August
Phragmites australis	Common reed		X	X	Late growing season
Rosa multiflora	Multiflora rose	X	X	X	Late growing season
Rubus phoenicolasius	Wineberry		X	X	Late growing season, no later than September
Vinca minor	Common Periwinkle	X	X	X	Not specified

[1]Although found at the site, Japanese stiltgrass is not included in Table 1 as eradication is nearly impossible and treatment is not recommended.

[2]Requires equipment used for tree and large shrub removal including chainsaws, brush hogs, weed whackers, etc.

[3]Includes the use of hand tools such as machetes, loppers, and pruning shears.

[4]Both triclopyr and glyphosate can be used along vegetated stream banks, wetland areas, and riparian zone, depending on the brand/formula. Herbicides should always be applied in accordance with the specific label instructions. Each herbicide formula has information about applying in or around water. Care should be taken to be conservative and use water-safe formulas in and around water.

2.0 Species Specific Treatment

Herbicide recommendations generally include use of triclopyr or glyphosate products. Both triclopyr and glyphosate can be used along vegetated stream banks, wetland areas, and riparian zone, depending on the brand/formula. Herbicides should always be applied in accordance with the specified label instructions. Each herbicide formula has information about applying in or around water. Care should be taken to be conservative and use water-safe formulas in and around water. Below is a list of species observed in the study area, including the recommended treatment options and schedule.

<u>Mimosa</u> – This deciduous tree can be controlled with a combination of mechanical and chemical methods. Trees can be cut at ground level and herbicide treatments using a glyphosate or triclopyr product can be effective for treating any regrowth.

<u>Garlic Mustard</u> – This biennial herb can be controlled by hand removal of plants including roots. Flowering plants can be cut low to the ground in spring to prevent seed production. Careful hand removal and bagging of plants with mature fruits can be done once fruits are present. Systemic herbicides containing glyphosate are effective but repeated treatments are usually needed due to large seed stores in the soil.

<u>Amur Peppervine</u> – This perennial vine can be controlled manually or chemically. Young plants can be removed by hand, and larger populations can be controlled using a brush-hog or by the application of systemic herbicides to cut vines or leaves to kill the entire plant including the roots.

<u>Small Carpetgrass</u> – This annual grass can be controlled chemically. An herbicide application of a 2% glyphosate solution can be effective for large areas where hand weeding is not practical.

<u>Oriental Bittersweet</u> – This deciduous woody vine can be controlled manually or chemically. Large populations should be treated with systemic herbicides and smaller populations can be removed by hand.

<u>Canada Thistle</u> – This perennial herbaceous plant can be controlled chemically using an aminopyralid or clopyralid product. Treatment is most effective when the plants are young, roughly five to 10 inches in height before flowering. If the thistle is flowering, the plants should be mowed, and a chemical treatment applied upon regrowth.

<u>Autumn Olive</u> – This perennial shrub can be controlled chemically. The use of triclopyr ester as basal bark or cut stump treatment can be effective. Foliar applications of a glyphosate-based herbicide or triclopyr-based herbicide can be implemented on seedlings and saplings July through October.

<u>Ground Ivy</u> – This perennial scrambling herbaceous plant can be controlled by hand-pulling or using a rake when the soil is damp. All roots must be removed. Large infestations can be controlled using systemic herbicides such as glyphosate.

<u>English Ivy</u> – This evergreen perennial climbing vine can be pulled by hand when soil is moist. Vines covering the ground can be uprooted and gathered using a heavy-duty rake, then cut close to the ground with pruning snips, Swedish brush axe, or other cutting tool. Gathered vines can be piled up and allowed to desiccate and rot which will occur quickly, in a matter of days. If needed, material can be bagged and disposed of in normal trash. Vines climbing up trees can be cut a few feet from the ground, for convenience, to kill upper portions and then apply systemic herbicide to lower cut portions.

<u>Chinese Lespedeza</u> – This perennial herbaceous plant can be controlled chemically. Populations can be effectively controlled with systemic herbicides when applied in early to mid-summer.

<u>Privets</u> – Privets are deciduous or semi-evergreen shrubs that can be controlled by cutting repeatedly or treated with a systemic herbicide. Herbicide can be sprayed on foliage or applied to bark or cut stems and stumps. Smaller plants can be dug out or pulled by hand or with the help of a mattock or heavy weed wrench.

Japanese Honeysuckle – This perennial vine can be treated manually or chemically. Small populations can be controlled by hand removal of trailing vines. For large areas, mowing twice a year may slow vegetative spread. However, mowing may increase re-sprouting and increase stem density. Japanese honeysuckle can be controlled with Vanquish, 2,4-D or glyphosate herbicides, and reapplication may be necessary.

Amur Honeysuckle – This bush honeysuckle can be hand-pulled when the plant is young. For larger plants, cutting the stems in the early spring and late fall and applying glyphosate to the leaves and cut stump should prevent regrowth.

Princess tree - This deciduous tree can be hand-pulled as young plants and treated with a combination of mechanical and chemical methods when larger. A glyphosate or triclopyr herbicide can be applied to stumps after tree cutting or can be used in a basal bark application.

Mile-a-Minute – This annual herbaceous vine can be treated manually, chemically, or biologically. In small infestations, plants can be pulled prior to going to seed. This is especially desirable where the plants are growing over desired plant species. Gloves and long sleeves should be used to avoid puncture by the many small spines on the plant stems. Mile-a-minute can also be treated with glyphosate herbicides at a rate of 1-3% mixed with water. Biological control using a small Asian weevil that appears to be host specific to Asiatic tearthumb has proven effective in some areas.

Common reed - This annual grass can be controlled chemically through use of systemic herbicides containing glyphosate, which move through the plant to kill the roots. Products must be labeled for wetland use. Low rates of herbicide (1.5-2%) mixed with water and a low toxicity surfactant approved for wetland use, can be applied to foliage using a backpack sprayer or power-driven hand sprayer. The cut-stem approach can also be used, which involves cutting between the nodes to expose a hollow portion of the stem. Using a squirt bottle with a bent and pointed tip filled with a 50:50 glyphosate and water plus a blue marking dye to help track applications, insert the tip into the stem and apply about ½ tsp. into the stem and around the cut edge. Multiple treatments may be needed.

Multiflora Rose - This perennial shrub can be controlled manually or chemically. Young plants can be pulled by hand. Mature plants can be controlled through frequent, repeated cutting or mowing. Several contact and systemic herbicides are also effective in controlling multiflora rose, including Vanquish. Follow-up treatments are likely to be needed.

Wineberry – This multi-stemmed shrub can be controlled manually or chemically. Young plants can be pulled by hand or a systemic herbicide like glyphosate or triclopyr can be used to treat the canes.

Lesser Periwinkle – This evergreen herbaceous vine can be hand-pulled as seedlings. A combination of mechanical and chemical treatment can be used for older plants or larger infestations, applying a glyphosate herbicide after cutting. Follow-up treatment may be necessary.

Table 2. Invasive Species Data for Mapped Points

C. Milton Wright High School Stream Restoration Invasive Plant Points Summary Table		
Species Mapped as Individuals or Small Isolated Patches		
Point ID	**Species**	**Area (SF, estimated)**
1	*Paulownia tomentosa*	9

Table 3. Invasive Species Data for Mapped Zones

C. Milton Wright High School Stream Restoration Invasive Plant Species Zone Summary Table										
Area (SF) of Invasive Species Within C. Milton Wright High School Stream Restoration Site (8.50 acres, 370,473 SF)										
Invasive Species	**Zone 1 8,664 SF**	**Zone 2 6,027 SF**	**Zone 3 6,372 SF**	**Zone 4 7,215 SF**	**Zone 5 6,617 SF**	**Zone 6 9,674 SF**	**Zone 7 2,218 SF**	**Zone 8 4,884 SF**	**Zone 9 9,752 SF**	**Zone 10 17,113 SF**
Albizia julibrissin	-	-	-	-	-	-	-	-	-	-
Alliaria petiolata	-	-	-	72	-	-	-	-	-	-
Ampelopsis brevipedunculata	173	-	-	-	-	-	-	-	-	-
Arthraxon hispidus	-	-	-	72	-	97	222	98	293	342
Celastrus orbiculatus	-	-	-	-	-	193	-	-	-	-
Cirsium arvense	-	60	-	-	-	97	44	244	-	-
Elaeagnus umbellata	-	-	-	-	132	-	-	-	-	-
Glechoma hederacea	-	-	-	-	-	-	665	98	98	-
Hedera helix	-	-	-	-	-	-	-	-	-	-
Lespedeza cuneata	173	181	-	-	529	290	-	98	195	342
Ligustrum sp.	-	-	-	-	-	193	-	147	-	-
Lonicera japonica	260	121	127	-	132	484	-	98	-	513
Lonicera maackii	-	-	-	-	-	-	-	98	-	-
Microstegium vimineum	433	603	956	1,443	199	2,419	111	-	1,463	1,711
Phragmites australis	-	-	127	-	-	-	-	-	-	-
Persicaria perfoliata	-	60	127	216	-	-	-	-	-	-
Rosa multiflora	1,733	603	510	361	199	967	-	98	195	342
Rubus phoenicolasius	173	121	127	-	199	290	-	49	-	-
Vinca minor	-	-	-	-	-	-	-	-	-	-
Total SF per Polygon	**2,946**	**1,748**	**1,975**	**2,164**	**1,390**	**5,031**	**1,043**	**1,026**	**2,243**	**3,251**
Percent Relative Cover per Zone	**34**	**29**	**31**	**30**	**21**	**52**	**47**	**21**	**23**	**19**

Table 3. Invasive Species Data for Mapped Zones

C. Milton Wright High School Stream Restoration Invasive Plant Species Zone Summary Table										
Area (SF) of Invasive Species Within C. Milton Wright High School Stream Restoration Site (8.50 acres, 370,473 SF)										
Invasive Species	**Zone 11 8,873 SF**	**Zone 12 9,084 SF**	**Zone 13 6,671 SF**	**Zone 14 10,707 SF**	**Zone 15 7,757 SF**	**Zone 16 5,364 SF**	**Zone 17 11,111 SF**	**Zone 18 8,560 SF**	**Zone 19 9,869 SF**	**Zone 20 9,230 SF**
Albizia julibrissin	-	-	-	-	-	-	-	86	-	92
Alliaria petiolata	-	-	-	-	-	-	-	-	-	-
Ampelopsis brevipedunculata	-	-	67	-	-	161	111	-	-	-
Arthraxon hispidus	-	363	334	-	233	-	222	428	197	-
Celastrus orbiculatus	-	-	-	-	-	54	-	-	-	92
Cirsium arvense	-	-	-	-	-	-	-	-	-	-
Elaeagnus umbellata	-	-	-	-	-	-	222	-	-	-
Glechoma hederacea	444	-	-	-	-	-	-	-	296	185
Hedera helix	-	-	-	-	-	-	111	-	-	-
Lespedeza cuneata	177	454	-	-	-	107	-	-	-	-
Ligustrum sp.	-	-	-	-	-	54	-	-	197	277
Lonicera japonica	266	91	200	321	155	161	333	428	395	461
Lonicera maackii	-	-	-	-	-	-	-	-	-	277
Microstegium vimineum	1,331	182	334	1,071	621	536	333	428	493	1,384
Phragmites australis	-	-	-	-	-	-	-	-	-	-
Persicaria perfoliata	-	-	-	-	-	-	-	-	-	-
Rosa multiflora	444	363	200	321	388	107	889	428	197	461
Rubus phoenicolasius	177	-	-	214	155	107	333	86	197	461
Vinca minor	-	-	-	-	-	-	-	-	-	185
Total SF per Polygon	**2,839**	**1,453**	**1,134**	**1,927**	**1,551**	**1,287**	**2,555**	**1,883**	**1,974**	**3,877**
Percent Relative Cover per Zone	**32**	**16**	**17**	**18**	**20**	**24**	**23**	**22**	**20**	**42**

Table 3. Invasive Species Data for Mapped Zones

C. Milton Wright High School Stream Restoration Invasive Plant Species Zone Summary Table										
Area (SF) of Invasive Species Within C. Milton Wright High School Stream Restoration Site (8.50 acres, 370,473 SF)										
Invasive Species	**Zone 21 20,631 SF**	**Zone 22 17,976 SF**	**Zone 23 10,838 SF**	**Zone 24 9,530 SF**	**Zone 25 5,188 SF**	**Zone 26 8,295 SF**	**Zone 27 9,001 SF**	**Zone 28 2,628 SF**	**Zone 29 17,824 SF**	**Zone 30 14,884 SF**
Albizia julibrissin	-	-	-	-	-	-	-	-	-	-
Alliaria petiolata	-	-	-	-	-	-	-	-	-	-
Ampelopsis brevipedunculata	-	-	-	-	-	-	-	-	-	-
Arthraxon hispidus	619	3,595	542	476	1,557	-	-	131	2,674	2,233
Celastrus orbiculatus	-	-	-	-	-	-	-	-	-	-
Cirsium arvense	-	-	-	-	-	-	-	-	-	-
Elaeagnus umbellata	-	-	-	-	104	166	-	-	-	-
Glechoma hederacea	206	-	-	-	-	-	-	-	-	-
Hedera helix	-	-	-	-	-	-	-	-	-	-
Lespedeza cuneata	-	-	-	-	-	-	-	-	-	-
Ligustrum sp.	-	-	-	-	-	664	450	-	-	-
Lonicera japonica	413	899	325	191	-	415	270	79	-	-
Lonicera maackii	-	-	-	-	-	166	450	-	-	-
Microstegium vimineum	2,476	2,696	542	476	1,038	-	-	657	-	-
Phragmites australis	-	-	-	-	-	-	-	-	-	-
Persicaria perfoliata	-	-	-	-	-	-	-	-	-	-
Rosa multiflora	1,651	539	325	286	-	249	2,700	131	-	-
Rubus phoenicolasius	-	-	434	191	52	249	-	-	-	-
Vinca minor	-	-	-	-	-	-	-	-	-	-
Total SF per Polygon	**5,364**	**7,730**	**2,168**	**1,620**	**2,750**	**1,908**	**3,870**	**999**	**2,674**	**2,233**
Percent Relative Cover per Zone	**26**	**43**	**20**	**17**	**53**	**23**	**43**	**38**	**15**	**15**

Monitoring of herbaceous and woody species should be conducted annually to determine if additional treatments are needed. Since pre-construction invasive species data are not available, Year 3 will be considered the baseline year for future comparison.

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APPENDIX A: INVASIVE SPECIES ASSESSMENT MAP

COASTAL RESOURCES INC.

C. Milton Wright Stream Restoration Project

Appendix K:
Invasive Species Assessment Maps

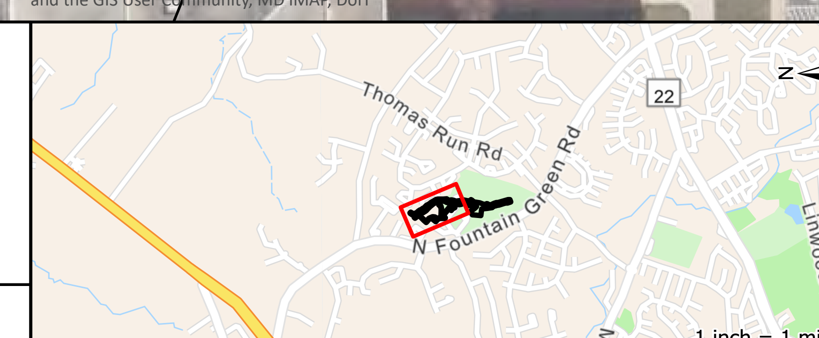
Sheet 1 of 2

Harford County, Maryland
October 2025

Stream Centerline
LOD
Map Sheet
Invasive Plant Zone

0 50 100
feet
1 inch = 100 feet

Map Center, NAD83
39.5633°, -76.3295°



COASTAL RESOURCES INC.

C. Milton Wright Stream Restoration Project

Appendix K:
Invasive Species Assessment Maps

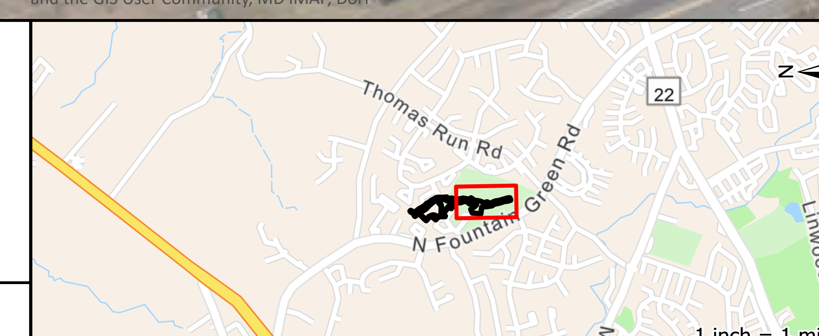
Sheet 2 of 2

Harford County, Maryland
October 2025

Paulownia tomentosa (Princesstree)
Stream Centerline
LOD
Map Sheet
Invasive Plant Zone

0 50 100
feet
1 inch = 100 feet

Map Center, NAD83
39.5594°, -76.3289°



APPENDIX N: Temporary Wetland Impact Area Mapping

COASTAL RESOURCES INC.

C. Milton Wright Stream Restoration Project

Appendix N:
Temporary Wetland Impact Monitoring Maps

Sheet 1 of 2

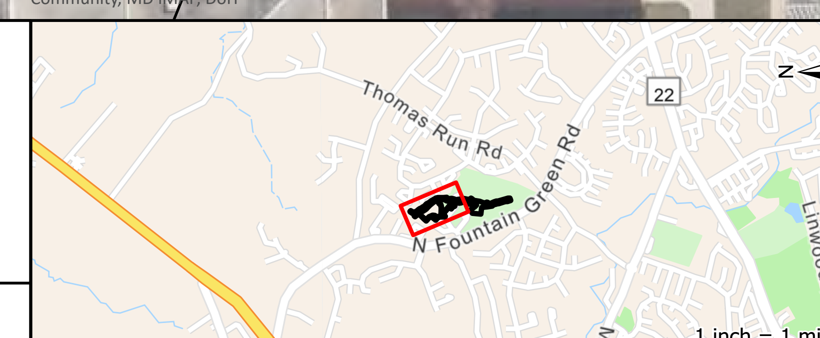
Harford County, Maryland
October 2025

LOD
Map Sheet
Temporary Wetland Impact Plot
Stream Centerline
Temporary Wetland Impact Area

N E S W

0 50 100
feet
1 inch = 100 feet

Map Center, NAD83
39.5633°, -76.3295°



C. Milton Wright Stream Restoration Project

Appendix N:
Temporary Wetland Impact Monitoring Maps

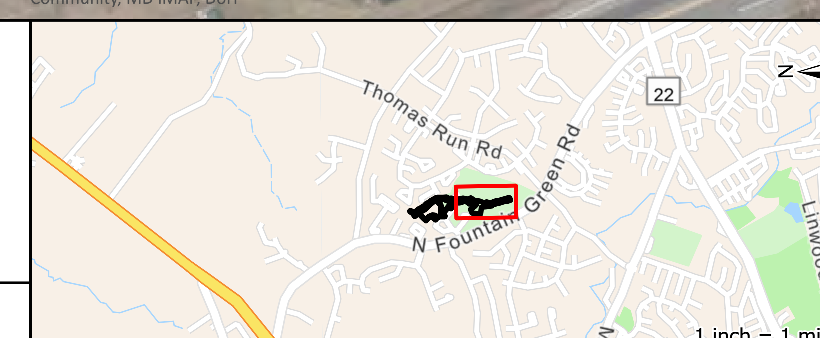
Sheet 2 of 2

Harford County, Maryland
October 2025

LOD
Map Sheet
Temporary Wetland Impact Plot
Stream Centerline
Temporary Wetland Impact Area

0 50 100
feet
1 inch = 100 feet

Map Center, NAD83
39.5594°, -76.3289°



APPENDIX O: Temporary Wetland Impact Area Datasheets

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: C. Milton Wright City/County: Harford Sampling Date: 8/21/25

Applicant/Owner: HACO State: MD Sampling Point: WET-1

Investigator(s): MW, TD Section, Township, Range: ______

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 1-2%

Subregion (LRR or MLRA): MLRA 148 Lat: 39.56434B7 Long: -76.3294506 Datum: NAD83

Soil Map Unit Name: Aldino silt loam, 3 to 8 % slopes NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? N Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? N (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No ✓	Is the Sampled Area within a Wetland? Yes ___ No ✓
Hydric Soil Present?	Yes ___ No ✓	
Wetland Hydrology Present?	Yes ___ No ✓	

Remarks:

Area temporarily impacted by construction

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ______

Water Table Present? Yes ___ No ✓ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: WET-1

Tree Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
= Total Cover			
50% of total cover: ___ 20% of total cover: ___			
Sapling/Shrub Stratum (Plot size: *)			
1. Viburnum prunifolium	25	✓	FACU
2. Viburnum dentatum	8		FAC
3. Rosa multiflora	15	✓	FACU
4. Lindera benzoin	5		FAC
5. Rubus phoenicolasius	4		FACU
6.			
7.			
8.			
9.			
= Total Cover	57		
50% of total cover: 28.5 20% of total cover: 11.4			
Herb Stratum (Plot size: *)			
1. Solidago altissima	8		FACU
2. Toxicodendron radicans	15	✓	FAC
3. Solidago rugosa	8		FAC
4. Parthenocissus quinquefolia	10		FACU
5. Lonicera japonica	15	✓	FACU
6. Dichanthelium clandestinum	2		FAC
7. Carex sp.	15	✓	N/A
8. Smilax rotundifolia	3		FAC
9. Cirsium arvense	3		FACU
10. Celastrus orbiculatus	8		FACU
11.			
= Total Cover	87		
50% of total cover: 43.5 20% of total cover: 17.4			
Woody Vine Stratum (Plot size: *)			
1. None			
2.			
3.			
4.			
5.			
= Total Cover			
50% of total cover: ___ 20% of total cover: ___			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	___	x 1 =	___
FACW species	___	x 2 =	___
FAC species	___	x 3 =	___
FACU species	___	x 4 =	___
UPL species	___	x 5 =	___
Column Totals:	___ (A)		___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No ✓

Remarks: (Include photo numbers here or on a separate sheet.)

plo
a: * entire impact area.

SOIL

Sampling Point: WET-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/3	100					SL	
10-12+	10YR 4/6	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Stratified Layers (A5)
__ 2 cm Muck (A10) **(LRR N)**
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Dark Surface (S7)
__ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
__ Thin Dark Surface (S9) **(MLRA 147, 148)**
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)
__ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
__ Umbric Surface (F13) **(MLRA 136, 122)**
__ Piedmont Floodplain Soils (F19) **(MLRA 148)**
__ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10) **(MLRA 147)**
__ Coast Prairie Redox (A16) **(MLRA 147, 148)**
__ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
__ Very Shallow Dark Surface (TF12)
__ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ____ No ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: C. m ton Wright City/County: Harford Sampling Date: 8/21/25

Applicant/Owner: HACO State: MD Sampling Point: WET-2

Investigator(s): MW, TP Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 1%

Subregion (LRR or MLRA): MLRA 148 Lat: 39.5641113 Long: -76.3294894 Datum: NAD83

Soil Map Unit Name: Aldino Silt loam, 3-8% slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? N Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? N (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No ✓	Is the Sampled Area within a Wetland? Yes ___ No ✓
Hydric Soil Present?	Yes ✓	No ___	
Wetland Hydrology Present?	Yes ✓	No ___	

Remarks:

Area temporarily impacted by construction

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): ___
Water Table Present?	Yes ___	No ✓	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No ✓	Depth (inches): ___

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WET-2

Tree Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. Liriodendron tulipifera	3	✓	FACU
2. Rubus phoenicolasius	2	✓	FACU
3. Rosa multiflora	3	✓	FACU
4.			
5.			
6.			
7.			
8.			
9.			
	8	= Total Cover	
50% of total cover: 4	20% of total cover: 1.6		

Herb Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. Solidago altissima	15		FACU
2. Impatiens capensis	25	✓	FACW
3. Dichanthelium clandestinum	12		FAC
4. Microstegium vimineum	40	✓	FAC
5. Euthamia graminifolia	5		FAC
6. Solidago rugosa	6		FAC
7. Elymus virginicus	2		FACW
8.			
9.			
10.			
11.			
	105	= Total Cover	
50% of total cover: 52.5	20% of total cover: 21		

Woody Vine Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. Lonicera japonica	4	✓	FACU
2. Celastrus orbiculatus	2	✓	FACU
3.			
4.			
5.			
	6	= Total Cover	
50% of total cover: 3	20% of total cover: 1.2		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 28.5 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No ✓

Remarks: (Include photo numbers here or on a separate sheet.)

* entire impact area

SOIL

Sampling Point: WET-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR4/1	80	7.5YR4/6	20	C	M-PL	SC	
4-7	10YR4/1	90	7.5YR4/6	10	C	M	SC	
7-12+	2.5Y5/3	85	7.5YR4/6	15	C	M	SC	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: C. Milton Wright City/County: Harford Sampling Date: 8/21/25

Applicant/Owner: HACO State: MD Sampling Point: WET-3

Investigator(s): MW TD Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 1-2%

Subregion (LRR or MLRA): MLRA 148 Lat: 39.5612199 Long: -76.3286678 Datum: NAD83

Soil Map Unit Name: Aldino silt loam, 3 to 8 % slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? N Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? N (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ___	Is the Sampled Area within a Wetland? Yes ✓ No ___
Hydric Soil Present?	Yes ✓	No ___	
Wetland Hydrology Present?	Yes ✓	No ___	

Remarks:

Area temporarily impacted by construction PEM1A

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): ___
Water Table Present?	Yes ___	No ✓	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No ✓	Depth (inches): ___

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: WET-3

Tree Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	

50% of total cover: ____ 20% of total cover: ____

Sapling/Shrub Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
		= Total Cover	

50% of total cover: ____ 20% of total cover: ____

Herb Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. Dichanthelium clandestinum	15	✓	FAC
2. Impatiens capensis	5		FACW
3. Juncus effusus	45	✓	FACW
4. Elymus virginicus	3		FACW
5. Carex vulpinoidea	10		OBL
6. Scirpus sp.	2		N/A
7. Carex lurida	5		OBL
8. Agrostis gigantea	4		FACW
9. Rosa multiflora	2		FACU
10. Carex frankii	5		OBL
11. Juncus tenuis	3		FAC
	99	= Total Cover	

50% of total cover: 49.5 20% of total cover: 19.8

Woody Vine Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
		= Total Cover	

50% of total cover: ____ 20% of total cover: ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (Include photo numbers here or on a separate sheet.)

* entire impact area

SOIL

Sampling Point: WET-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR4/2	90	7.5YR4/6	10	C	M/PL	SCL	
4-12+	10YR5/2	60	10YR5/8	3			C	
	10YR5/3	37						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: C. Milton Wright City/County: Harford Sampling Date: 8/21/25

Applicant/Owner: HACO State: MD Sampling Point: WET-4

Investigator(s): MW, TD Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): MLRA 148 Lat: 39.5606593 Long: -76.3286601 Datum: NAD83

Soil Map Unit Name: Neshaminy silt loam, 8-15% slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? N Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? N (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ___	Is the Sampled Area within a Wetland? Yes ✓ No ___	
Hydric Soil Present? Yes ✓ No ___		
Wetland Hydrology Present? Yes ✓ No ___		

Remarks:

Area temporarily impacted by construction PEM1E

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): *

Water Table Present? Yes ✓ No ___ Depth (inches): 8"

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0"

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

* ~1" SW in 15% of plot

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: WET-4

Tree Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
		= Total Cover	
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. Boehmeria cylindrica	7		FACW
2. Carex vulpinoidea	3		OBL
3. Carex lurida	2		OBL
4. Ludwigia palustris	70	✓	OBL
5. Scirpus sp.	5		N/A
6. Typha sp.	1		N/A
7. Impatiens capensis	2		FACW
8.			
9.			
10.			
11.			
	90	= Total Cover	
50% of total cover:	45	20% of total cover:	18

Woody Vine Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
		= Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks: (Include photo numbers here or on a separate sheet.)

*entire impact area

SOIL Sampling Point: WET-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/1	98	7.5YR4/6	2	C	PL	CL	
10-12+	7.5YR3/1	100					SC	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: C. Milton Wright City/County: Harford Sampling Date: 8/21/25

Applicant/Owner: HaCO State: MD Sampling Point: WET-5

Investigator(s): MW, TD Section, Township, Range: ____

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): MLRA148 Lat: 39.5605839 Long: -76.3286127 Datum: NAD83

Soil Map Unit Name: Neshaminy silt loam 8-15% slope NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? N Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? N (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ____ Hydric Soil Present? Yes ✓ No ____ Wetland Hydrology Present? Yes ✓ No ____	**Is the Sampled Area within a Wetland?** **Yes** ✓ **No** ____

Remarks:

Area temporarily impacted by construction PEM1A/B

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ____ Depth (inches): 1

Water Table Present? Yes ✓ No ____ Depth (inches): 10"

Saturation Present? (includes capillary fringe) Yes ✓ No ____ Depth (inches): 0"

Wetland Hydrology Present? Yes ✓ **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

~1" in ~5% of plot

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: WET-5

Tree Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. Juncus effusus	15	✓	FACW
2. Boehmeria cylindrica	30	✓	FACW
3. Carex lurida	5		OBL
4. Dichanthelium clandestinum	3		FAC
5. Impatiens capensis	6		FACW
6. Microstegium vimineum	4		FAC
7. Typha latifolia	3		OBL
8. Persicaria hydropiper	5		OBL
9. Carex vulpinoidea	6		OBL
10. Rumex sp.	3		N/A
11.			
	80 = Total Cover		
50% of total cover: 40	20% of total cover: 16		

Woody Vine Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0[1]

__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (Include photo numbers here or on a separate sheet.)

* entire impact area

SOIL

Sampling Point: WET-5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2	2.5Y4/1	90	5YR4/6	10	C	PL	SiCL	
2-6	2.5Y5/1	95	7.5YR3/4	5	C	M-PL	SiC	
6-10	10YR5/2	70	7.5YR4/4	30	C	M	SiCL	
10-12+	10YR3/1	100					CL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________________

Depth (inches): ______________________

Hydric Soil Present? Yes ✓ No ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: C. Milton Wright City/County: Harford Sampling Date: 8/21/25

Applicant/Owner: HaCO State: MD Sampling Point: WET-6

Investigator(s): NN, TD Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain bench Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 148 Lat: 39.5605344 Long: -76.3285673 Datum: NAD83

Soil Map Unit Name: Neshaminy silt loam, 8-15% slope NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? N Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? N (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	**Is the Sampled Area within a Wetland?**	**Yes** ✓ **No** ___
Hydric Soil Present?	Yes ✓ No ___		
Wetland Hydrology Present?	Yes ✓ No ___		

Remarks:

PSS1A

Area temporarily impacted by construction

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___ No ✓	Depth (inches): ___	
Water Table Present?	Yes ✓ No ___	Depth (inches): 13"	
Saturation Present? (includes capillary fringe)	Yes ___ No ✓	Depth (inches): ___	**Wetland Hydrology Present? Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: WET-6

Tree Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra	4		OBL
2. Cephalanthus occidentalis	15	✓	OBL
3. Ilex verticillata	2		FACW
4. Cornus amomum	1		FACW
5.			
6.			
7.			
8.			
9.			
	22 = Total Cover		
50% of total cover: 11	20% of total cover: 4.4		

Herb Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. Boehmeria cylindrica	70	✓	FACW
2. Juncus effusus	20		FACW
3. Persicaria virginiana	5		FAC
4. Carex lurida	10		OBL
5. Smilax rotundifolia	1		FAC
6. Impatiens capensis	4		FACW
7.			
8.			
9.			
10.			
11.			
	110 = Total Cover		
50% of total cover: 55	20% of total cover: 22		

Woody Vine Stratum (Plot size: *)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0[1]

__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (Include photo numbers here or on a separate sheet.)

* entire impact area

SOIL

Sampling Point: WET-6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR4/2	93	5YR4/6	7	C	M/PL	SiC	
4-10	10YR5/2	60	7.5YR4/6	40	C	M/PL	C	
10-12+	10YR4/1	80	5YR4/6	20	C	M/PL	C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ✓ **No** ___

Remarks:

APPENDIX P: Temporary Wetland Impact Photograph Log

Appendix P – C. Milton Wright Stream Restoration
Temporary Wetland Impact Monitoring Photo Log
Year 3

Photo 1: Looking NE at Temporary Wetland Impact Monitoring Plot WET-1 during Year 3.

Photo 2: Looking W at Temporary Wetland Impact Monitoring Plot WET-2 during Year 3.

Appendix P – C. Milton Wright Stream Restoration
Temporary Wetland Impact Monitoring Photo Log
Year 3

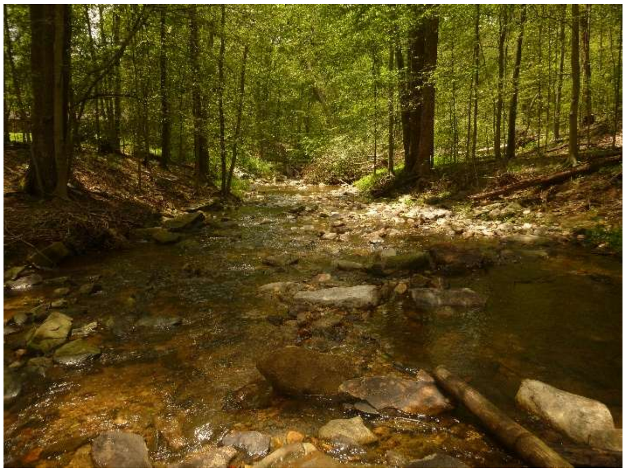
Photo 3: Looking NW at Temporary Wetland Impact Monitoring Plot WET-3 during Year 3.

Photo 4: Looking W at Temporary Wetland Impact Monitoring Plot WET-4 during Year 3.

Appendix P – C. Milton Wright Stream Restoration
Temporary Wetland Impact Monitoring Photo Log
Year 3

Photo 5: Looking E at Temporary Wetland Impact Monitoring Plot Wet-5 during Year 3.

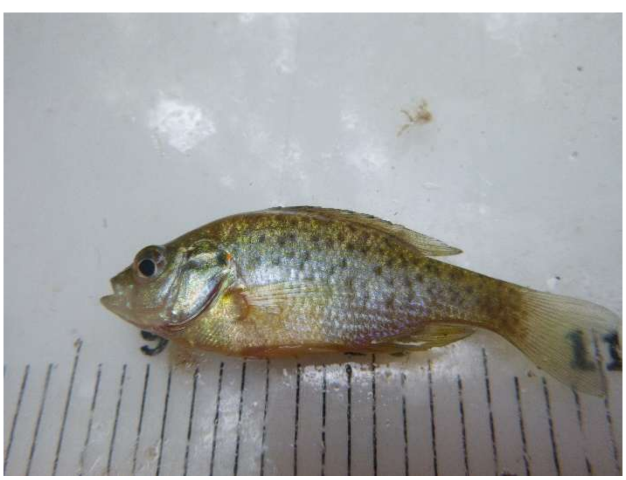
Photo 6: Looking W at Temporary Wetland Impact Monitoring Plot WET-6 during Year 3.



FOSTER BRANCH AND PLUMTREE RUN 2015–2025 BIOLOGICAL ASSESSMENT YEAR NINE FINAL REPORT

HARFORD COUNTY MARYLAND

AT THE RISQUE OF OUR LIVES AND FORTUNES 1773



VERSAR GLOBAL SOLUTIONS

November 19, 2025

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FOSTER BRANCH AND PLUMTREE RUN
2015-2025 BIOLOGICAL ASSESSMENT
YEAR NINE FINAL REPORT

Prepared for:

Harford County
Department of Public Works
Watershed Protection and Restoration Division
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Columbia, Maryland 21045

November 19, 2025

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TABLE OF CONTENTS

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LIST OF TABLES

LIST OF FIGURES

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1.0 INTRODUCTION

Harford County Department of Public Works has been monitoring the biological condition and physical habitat characteristics associated with completed and proposed stream restoration projects within Foster Branch and Plumtree Run (Figure 1-1) watersheds since 2015. Details specific to the stream restorations and stormwater retrofits can be found in the Plumtree Run Small Watershed Action Plan (BayLand Consultants & Designers, Inc. 2011) and Foster Branch Small Watershed Action Plan (BayLand Consultants & Designers, Inc. 2013). According to the Foster Branch Small Watershed Action Plan, the primary negative influence from development in the watershed has been sedimentation, particularly from unstable headwater streams; thus, Harford County's projects in the watershed are intended to stabilize stream channels. According to the Plumtree Run Small Watershed Action Plan, the primary negative influence from development in the watershed has been unmanaged stormwater runoff and unstable headwater streams that contribute to sedimentation and declines in water quality in the watershed; thus, Harford County's projects in the watershed include upland stormwater controls and projects to restore damaged streams.

In response to monitoring initiatives required by two permits (National Pollutant Discharge Elimination System and U.S. Army Corps of Engineers), Harford County Department of Public Works contracted with KCI Technologies, Inc. (KCI) to develop monitoring plans for the Foster Branch (Harford County 2016a) and Plumtree Run (Harford County 2016b) watersheds. The initial monitoring stations in the Foster Branch watershed were established upstream and downstream of proposed project locations. Two stream restoration projects had been completed prior to the start of monitoring in 2015; one stream restoration project was completed in the watershed during the period between 2015 and 2021. All other restoration projects in the watershed were proposed but not implemented as of 2021 (KCI 2021a). According to the report, the downstream-most station, FOST-1, was located within a section of restored stream from a project completed by Harford County prior to the start of monitoring in 2015. The initial monitoring stations in the Plumtree Run watershed were established throughout the watershed to characterize stream conditions prior to the execution of future restoration projects and the implementation of best management practices (KCI 2021b). According to the report, the downstream-most station, PLUM-1, was located approximately one mile downstream of a section of restored stream from a project completed by Harford County prior to the start of monitoring in 2015. All other restoration projects in the watershed were proposed but not implemented as of 2021 (KCI 2021b).

Harford County has contracted with two companies to conduct monitoring within the two focus watersheds during an eleven-year span from 2015 through 2025, to comply with requirements of the small watershed monitoring plans. Monitoring efforts in both watersheds concluded in 2025. The field sampling protocols and analysis approaches followed standard methods for consistency throughout the eleven-year program. Field crews of KCI staff established and monitored five stations in each watershed during six annual monitoring periods from 2015 through 2021 (with a gap during 2018). Each monitored station included a single 75-meter reach of the mainstem of the named stream. Staff with Versar Global Solutions (formerly Versar, Inc.; Versar) conducted biological and physical habitat monitoring during the 2023, 2024, and 2025 annual monitoring periods at the downstream-most station of the initial set of stations in each watershed (Figure 1-1). Harford County did not administer monitoring of either watershed during 2018 or 2022.

The report of the 2025 monitoring period provides summaries of the methods and results of the biological and physical habitat monitoring conducted by Versar during 2025. The monitored Foster Branch station (FOST-01; Figure 1-1 and Figure 1-2) is located downstream of Trimble Road on the mainstem of Foster Branch at the head of tide within the reach that was the focus of the stream restoration completed in 2014. The station is co-located with the U.S. Geological Survey (USGS) stream gage 01585075 (https://waterdata.usgs.gov/monitoring-location/01585075/). Land use in the Foster Branch watershed upstream of the station, as classified by the Maryland Department of Planning in 2010 (available from www.mdp.state.md.us), is predominantly urban, with approximately one-third classified as forest. The monitored Plumtree Run station (PLUM-01; Figure 1-1 and Figure 1-3) is located on the mainstem of Plumtree Run immediately upstream of Plumtree Road. The station is upstream of the USGS stream gage 01581752 (https://waterdata.usgs.gov/monitoring-location/01581752/). Land use in the Plumtree Run watershed upstream of the station is predominantly urban, with minimal classifications of agriculture, forest, and other land use types, as classified by the Maryland Department of Planning in 2010.

The primary goals of Harford County, regarding the stream monitoring programs, are to characterize baseline stream conditions prior to the implementation of additional restoration efforts, document changes in ecological conditions that may be associated with restorations in the watersheds, and document ecological and habitat changes after future projects are completed in the watersheds. Analysts will use data collected from long-term monitoring to assess the stability of the restoration efforts, identify trends in physical habitat and biological community condition, and attempt to correlate changes in standard and measurable stream condition metrics with applicable restoration projects in the same watershed.

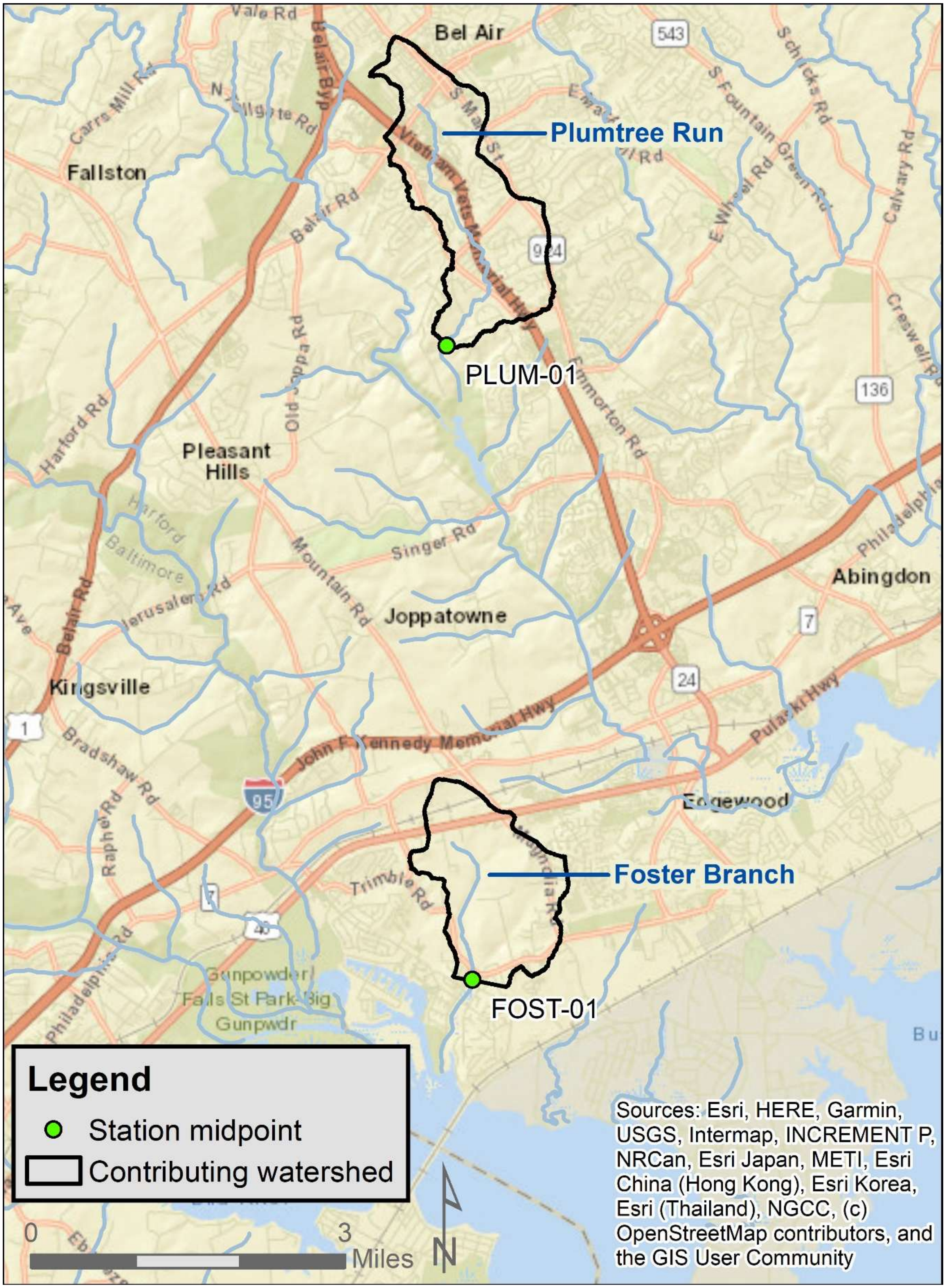

Figure 1-1. Site map of Foster Branch and Plumtree Run sampling station midpoints and contributing catchments

Figure 1-2. Site map of station FOST-01

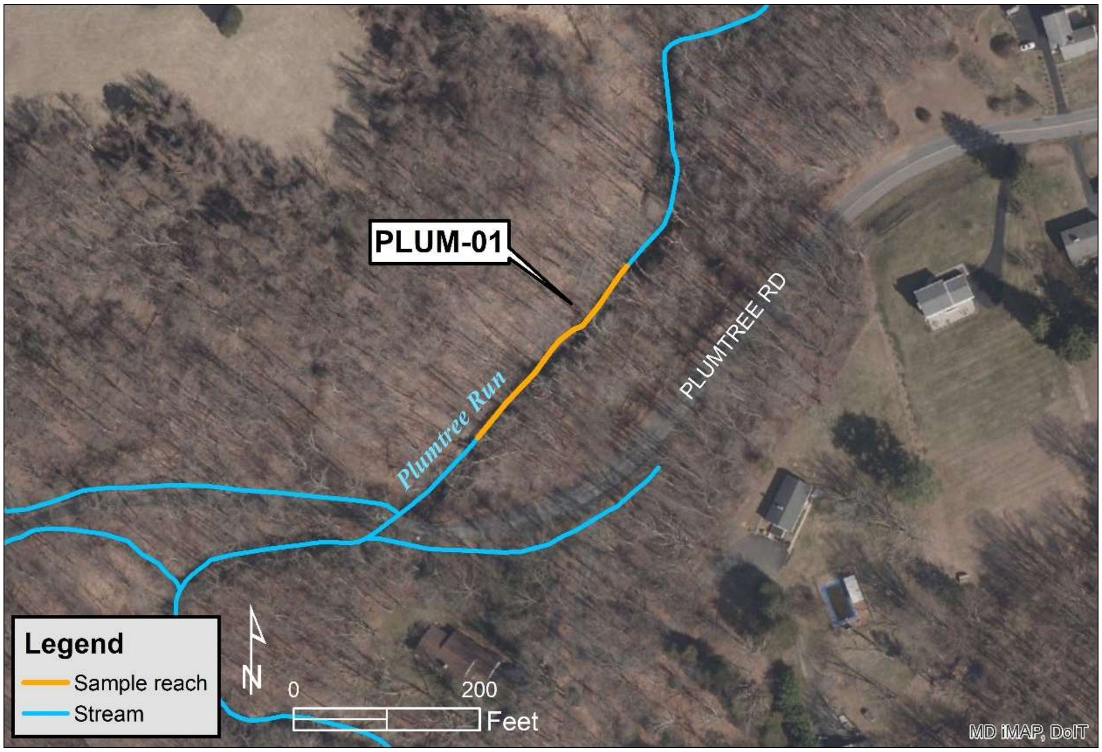

Figure 1-3. Site map of station PLUM-01

2.0 METHODS

Versar staff followed standard monitoring protocols during site visits in the spring and summer of 2025 to collect the data consistent with Harford County's eleven-year biology monitoring program. Monitoring field efforts included collecting measurements of physical *in situ* water quality parameters, conducting physical habitat assessments, and collecting samples for benthic macroinvertebrate, fish, crayfish, herpetofauna, and freshwater mussel to inform biological condition assessments for each of the stations. The sampling methods were consistent with the protocols established for the Maryland Department of Natural Resources' (DNR) Maryland Biological Stream Survey (MBSS; Harbold et al. 2024). The MBSS methods were developed and calibrated specifically to Maryland's ecophysiographic regions and stream types. To comply with MBSS protocols, a station is defined as a 75-meter reach of a stream, an index is a scale for ranking environmental quality for a specific type of organism (e.g., fish), and an index period refers to the sampling season that applies to the target index.

2.1 LAND USE TYPES IN CATCHMENT AREAS

A catchment area includes all lands that drain water to a given point (e.g., on a stream). Analysts can use tools in a computer program to digitally delineate the drainage area and use the result with other digital data to investigate the factors in the catchment that might influence conditions at the down-gradient receiving point. For the current reporting period, analysts determined the catchment areas for each monitored reach using the USGS StreamStats v. 4.17.0 tool and the midpoint for each station, which was provided by Harford County, as the receiving point for the program. Analysts used the two resulting catchment areas and the Harford County 2010 land use data, published by the Maryland Department of Planning (available from www.mdp.state.md.us), to derive the areas of each documented land use type within the respective catchment areas. Analysts also calculated the cumulative areas of the land use types within each catchment area as a percentage of the total area of the catchment to aid interpretation of the results.

2.2 WATER QUALITY ASSESSMENT

Staff collected data to assess water quality conditions by collecting *in situ* measurements of relevant parameters at stations FOST-01 and PLUM-01 during the spring (March 1 – April 30) and summer (June 1 – September 30) index periods of the reporting year. Parameters measured by field crew included water temperature, dissolved oxygen, specific conductivity, pH, and turbidity. Field personnel collected *in situ* measurements at the upstream extent of the 75-meter segment before sampling activities began; crews were careful to avoid disturbing the ambient stream conditions. Field crews employed a YSI ProDSS multiparameter sonde to collect the measurements. Versar staff maintained and calibrated the multiparameter sondes per manufacturer guidelines routinely throughout the year, which ensured sonde functionality and accuracy.

2.3 PHYSICAL HABITAT ASSESSMENT

Versar staff assessed the physical conditions at stations FOST-01 and PLUM-01 during the spring index period and summer index period sampling events. Staff documented conditions at each station with two photographs taken from the midpoint of the sampling reach, with one upstream and one downstream view. Crew members measured physical stream characteristics and other habitat indicators, such as remoteness, percent shading, and bank stability, according to the protocol for MBSS's Physical Habitat Index (PHI; Paul et al. 2002) to document the physical habitat conditions at each station. Field crew members worked together and discussed the scoring of all habitat parameters. The discussions reduced sampler bias in the field and facilitated reliable scoring of all metrics.

During the spring index period, field crews characterized the vegetation types in the riparian zone and estimated the zone width along each bank (up to 50 meters from the stream). The crew noted the severity and types of buffer breaks (e.g., unnatural areas and manmade features) in the riparian zones. At each station, the crews noted the local land use type visible from the station, the extent and type of stream channelization, and the stream gradient. Crews also recorded the distance between the station and the nearest road and assigned a rating for the amount of trash observed, based on MBSS protocols. During the summer index period, the field crew qualitatively assessed instream habitat, epifaunal substrate, velocity/depth diversity, pool/glide/eddy quality, and riffle/run quality and ranked each assessment (on a 0-to-20 scale), based on visual observations at each station. The crew visually estimated the percentage of embeddedness of riffles and the percentage of shading of the stream station. The field crew also documented the extent and severity of bank erosion and bar formation. The crew counted the number of large woody debris and root wads within the stream channel and noted the presence of stream features such as substrate types, morphological characteristics, and beaver ponds. The crew located and measured the maximum water depth within the segment and the wetted width and thalweg depth at four transects along the length of the segment.

Field crews collected data for all habitat parameters needed for PHI calculations. The PHI method incorporates a standard set of habitat parameters specific to the Coastal Plain, Piedmont, or Highlands region of Maryland and applies the results to region-specific equations to derive the final score. Field crews document all habitat parameters using rating scales during each field visit, which allows analysts to calculate PHI scores. Metrics and equations applicable to the Coastal Plain region were relevant to the FOST-01 station, and a separate set of metrics and equations applicable to the Piedmont region were relevant to the PLUM-01 station (Table 2-1). For the PHI calculation process, metrics included ecophysiographic-specific habitat parameters for which field crews assigned a score, ranging from 0 to 20, except for woody debris and root wads (total count) and shading percentage (0 to 100). Analysts used a model spreadsheet to calculate and scale the separate metric scores and then derived a composite score for each metric (within a range of 0 to 100). Analysts then derived an average metric score as the final PHI score for each station. Each final PHI score corresponds to a narrative rating based on standard categories for the ranges of scores as presented in Table 2-2. The ranked scores and narrative ratings allow for comparisons with other stream habitat assessments in Maryland.

Table 2-1. Physical Habitat Index metrics applicable to the Coastal Plain and Piedmont regions of Maryland	
Coastal Plain Region Metrics	**Piedmont Region Metrics**
Instream Habitat	Instream Habitat
Epifaunal Substrate	Epifaunal Substrate
Bank Stability	Bank Stability
Percent Shading	Percent Shading
Remoteness	Remoteness
Number Woody Debris/Root Wads	Number Woody Debris/Root Wads
	Embeddedness
	Riffle Quality

Table 2-2. Physical Habitat Index scoring categories and corresponding narrative ratings	
Score	**Narrative Rating**
81 – 100	Minimally Degraded
66 – 80.9	Partially Degraded
51 – 65.9	Degraded
0 – 50.9	Severely Degraded

2.4 BIOLOGICAL CONDITION ASSESSMENT

2.4.1 Benthic Macroinvertebrate Sampling

Benthic macroinvertebrate sampling followed MBSS protocols (Harbold et al. 2024) and occurred during the spring index period of the reporting year. At each 75-meter reach, field crews used a 600-micron mesh "D" net to collect benthic macroinvertebrate organisms from habitats likely to support the greatest taxonomic diversity. The habitats often included riffle with cobble and gravel, woody debris such as logs and root wads, submerged aquatic vegetation, and other habitats such as leafy debris and undercut banks. In riffles and undercut banks, sampling consisted of placing the net downstream, gently rubbing surficial substrates by hand, and disrupting deeper substrates using vigorous foot action. For woody debris, root mats, and submerged aquatic vegetation, field personnel swept the net through the sample area and agitated the woody debris to dislodge organisms. The crew sampled leaf packs by collecting a moderate handful of partially decomposed leaves, placing the leaves in the sample bucket, washing larger leaves to transfer attached organisms into the sample bag, and then removing the larger leaves from the overall sample. The field crew continued to move upstream and collect subsamples from 20 locations with the most productive habitat types. Each subsample covered approximately one square foot. The field crew combined the materials from each subsample to create one composite sample in a sieve bucket and rinsed the sample bucket in the stream to remove excess silt. The crew examined large woody debris, rocks, leaves, and sticks found in the sample, transferred any attached benthic organisms from the debris into the sample, and returned the cleaned large debris to the stream. Herpetofauna and fish were also removed from the composite sample, but crayfish were retained. The remaining sample material was immediately preserved in 95% ethanol in the field, stored in sealed containers, and transported to the Benthic Laboratory at Versar's Columbia office.

2.4.1.1 Benthic Macroinvertebrate Sample Processing and Identification

Trained laboratory staff processed benthic macroinvertebrate samples according to MBSS laboratory methods (Resource Assessment Service 2024). Sorting consisted of spreading the sample across a numbered, gridded tray of 100 grids, selecting random grids for inspection, extracting all benthic organisms found within the selected grid, segregating the organisms by genus or species as feasible, and iteratively enumerating the organisms in the grid subsample. The process continued until the 100th organism was extracted and identified and the grid that contained the 100th organism found was fully inspected. The method resulted in an organism count of 100 to 120 organisms per sample. In the event of a low-density sample (a sample in which fewer than 100 organisms were found), technicians continued to inspect all grids and record the total number of organisms present in the sample. The technician recorded the number of grids sorted for each sample on the laboratory bench sheet. Trained taxonomists identified the taxa to the lowest practical taxonomic level for most organisms. Taxonomists identified members of the subclass Oligochaeta and the phylum Nematomorpha to the family level and assigned all members of the phylum Nematoda to a Nematoda category. Staff identified individual organisms of early instars or those that appeared to be damaged to the lowest practical taxonomic level. Organisms of the family Chironomidae were slide mounted and identified to genus level when possible. Taxonomists logged all results on a bench sheet and entered the data into an Excel spreadsheet for analysis.

2.4.1.2 Benthic Macroinvertebrate Data Analysis

Analysts entered all data collected from the spring sampling event into Excel spreadsheets developed specifically for MBSS Benthic Index of Biotic Integrity (BIBI) calculations. The BIBI incorporates metrics for taxa richness, composition measures, tolerance to perturbation, trophic classification, organism habits, abundance, remoteness, and shading (Southerland et al. 2005). Specific metrics are used to calculate the BIBI applicable to each ecophysiographic region in Maryland. Analysts employed spreadsheets to organize the data for import into an R computer program. Analysts used R programs applicable to the Coastal Plain and Piedmont regions for data from the FOST-01 and PLUM-01 stations, respectively. The specific metrics used to calculate the BIBI for samples collected from the Coastal Plain and Piedmont regions and the ratings assigned to each metric are presented in Table 2-3. The raw values for each metric correspond to a score of 1, 3, or 5, based on the standard ranges of values developed for each metric. The calculated mean value of all applicable metric scores from each station represents the MBSS BIBI score for the station. The MBSS Index of Biotic Integrity (IBI) scores and associated narrative ratings are presented in Table 2-4; the IBI scores and rankings apply to MBSS methods for benthos and fish.

Table 2-3. Benthic Index of Biotic Integrity metrics and scoring categories applicable to the Coastal Plain and Piedmont regions of Maryland

Coastal Plain Region Metrics				Piedmont Region Metrics			
	Score (top) and Corresponding Raw Data Values				Score (top) and Corresponding Raw Data Values		
Metric	**5**	**3**	**1**	**Metric**	**5**	**3**	**1**
Total Number of Taxa	≥ 22	21 – 14	< 14	Total Number of Taxa	≥ 25	24 – 15	< 15
Number of EPT* Taxa	≥ 5	4 – 2	< 2	Number of EPT* Taxa	≥ 11	10 – 5	< 5
Number of Ephemeroptera Taxa	≥ 2	1	0	Number of Ephemeroptera Taxa	≥ 4	3 – 2	< 2
Percent Intolerant to Urban	≥ 28	< 28 – 10	< 10	Percent Intolerant to Urban	≥ 51	< 51 – 12	< 12
Percent Ephemeroptera	≥ 11	< 11 – 0.8	< 0.8	Percent Chironomidae	≤ 24	> 24 – 63	> 63
Number of Scraper Taxa	≥ 2	1	0	Percent Clingers	≥ 74	< 74 – 31	< 31
Percent Climbers	≥ 8	< 8 – 0.9	< 0.9				

* EPT = Ephemeroptera, Plecoptera, and Tricoptera

Table 2-4. Index of Biotic Integrity scoring categories and corresponding narrative ratings

Score	Narrative Rating
4.0 – 5.0	Good
3.0 – 3.9	Fair
2.0 – 2.9	Poor
1.0 – 1.9	Very Poor

2.4.2 Fish Sampling

Fish sampling followed MBSS protocols (Harbold et al. 2024) and occurred during the summer index period. Field crews employed double-pass electrofishing techniques in each 75-meter reach. Prior to sampling, field personnel placed block nets at the 0-meter and 75-meter extents of the segment and at the mouths of any tributaries entering the main channel to prevent fish ingress to and egress from the sampling area. Field crews used direct-current backpack electrofishing units to sample all habitats within the entire reach of each station. The crew applied a consistent effort over two passes. For both stations, the crew employed three or four units simultaneously to effectively sample based on maximum stream width and relevant MBSS protocols. Trained taxonomists identified the captured fish from each pass to species level. Crews counted the fish, weighed the fish in aggregate, checked each individual fish for anomalies, and released the fish to the stream. Crews retained American eels caught during the first pass and held the fish in a live well downstream of the sampling reach to prevent matriculation back into the monitored segment during the second pass. Crews photographically documented any fish that could not be identified to species level; if deemed necessary by the field taxonomist, individual fish that could not be identified were retained, preserved in 10% formalin, and transported to Versar's office for species confirmation in a laboratory.

2.4.2.1 Fish Data Analysis

Analysts entered all data collected from the summer sampling event into Excel spreadsheets developed specifically for MBSS Fish Index of Biotic Integrity (FIBI) calculations. The FIBI incorporates metrics for water quality, habitat impairment, taxa richness, composition measures, tolerance to perturbation, trophic classification, organism habits, and abundance (Southerland et al. 2005). Specific metrics are used to calculate the FIBI applicable to each ecophysiographic region in Maryland. Analysts employed spreadsheets to organize the data for import into R computer programs applicable to the Coastal Plain and Piedmont regions for data from the FOST-01 and PLUM-01 stations. The specific metrics used to calculate the FIBI for samples collected from the Coastal Plain and Piedmont regions and the ratings assigned to each metric are presented in Table 2-5. The raw values from each metric correspond to a score of 1, 3, or 5, based on the standard ranges of values developed for each metric. The calculated mean value of all applicable metric scores from each station represents the MBSS FIBI score for the station. The MBSS IBI scores and associated narrative ratings are presented in Table 2-4.

2.4.3 Supplemental Surveys

During the spring and summer index periods, crews collected supplemental data to document the presence of herpetofauna, crayfish, freshwater mussels, and invasive plants at each monitoring station, per MBSS guidance (Harbold et al. 2024). The field crews acquired herpetofauna organisms, if feasible, through incidental collection and searches of upland areas adjacent to the 75-meter sampling reach. Trained taxonomists identified all collected animal specimens to species, documented the organisms with photographs, and released the animals. Crews retained any crayfish collected during electrofishing efforts until the end of each pass and noted crayfish collected outside of electrofishing efforts as incidental captures. Crews also noted crayfish burrows found adjacent to the sampling reach and attempted to excavate the burrow to collect burrowing specimens in the area. If found, freshwater mussels were photographed for identification and returned to the stream where they were found. Shells from dead freshwater mussels found during the surveys were transported to Versar's Columbia office to serve as voucher specimens. Field crews conducted surveys for invasive plants throughout the riparian area adjacent to each station during the summer index period. Crews recorded the common names of any invasive species found and estimated relative abundance.

Table 2-5. Fish Index of Biotic Integrity metrics and scoring categories applicable to the Coastal Plain and Piedmont regions of Maryland

Coastal Plain Region Metrics				Piedmont Region Metrics			
Metric	Score (top) and Corresponding Raw Data Values			Metric	Score (top) and Corresponding Raw Data Values		
	5	3	1		5	3	1
Abundance per Square Meter	≥ 0.72	< 0.72 – 0.45	< 0.45	Abundance per Square Meter	≥ 1.25	< 1.25 – 0.25	< 0.25
Number of Benthic Species, Adjusted	≥ 0.22	< 0.22 – 0.01	0	Number of Benthic Species, Adjusted	≥ 0.26	< 0.26 – 0.09	< 0.09
Percent Tolerant	≤ 68	> 68 – 97	> 97	Percent Tolerant	≤ 45	> 45 – 68	> 68
Percent Generalist, Omnivores, Invertivores	≤ 92	> 92 – 99.9	100	Percent Generalist, Omnivores, Invertivores	≤ 80	> 80 – 99.9	100
Percent Round-bodied Suckers	≥ 2	< 2 – 0.1	0	Biomass per Square Meter	≥ 8.6	8.5 – 4	< 4
Percent Abundance of Dominant Taxa	≤ 40	40 – 69	> 69	Percent Lithophilic Spawners	≥ 61	60 – 32	< 32

2.4.4 Maryland Designated Water Uses and Water Quality Standards

The Maryland Department of the Environment has designated use classifications for surface waters of the state and established acceptable water quality standards for each use type that are intended to protect the quality of the waters and support the designated use (https://mde.maryland.gov/programs/Water/TMDL/WaterQualityStandards/Pages/wqs_designated_uses.aspx). The water quality criteria are published in the Code of Maryland Regulations (COMAR) 26.08.02.03-.03 - Water Quality. Analysts compare *in situ* water quality measurements collected from the two monitoring stations during each reporting period to the applicable Maryland water quality criteria as an element of the evaluation of habitat conditions at each station.

Foster Branch is located within COMAR Sub-Basin 02-13-08: Gunpowder River Area, and the waterways in the sub-basin are classified as Use I waters. Specific designated uses that apply to Use I streams include growth and propagation of fish and aquatic life, water supply for industrial and agricultural use, water contact sports, fishing, and leisure activities involving direct water contact. Water quality criteria for Use I waters relevant to the Foster Branch monitoring program include the following:

- pH - 6.5 to 8.5;
- Dissolved oxygen - may not be less than 5 milligrams per liter (mg/L) at any time;
- Turbidity - maximum of 150 Nephelometric Turbidity Units (NTU) and maximum monthly average of 50 NTU; and
- Temperature - maximum of 90 degrees Fahrenheit (˚F; 32 degrees Celsius [˚C]) or ambient temperature of the surface water, whichever is greater.

Plumtree Run is located within COMAR Sub-Basin 02-13-07: Bush River Area, and the waterways in the sub-basin are classified as Use IV-P waters. Specific designated uses that apply to Use IV-P streams include public water supply, supporting adult trout for put-and-take fishing, growth and propagation of fish and aquatic life, water supply for industrial and agricultural use, water contact sports, fishing, and leisure activities involving direct water contact. Water quality criteria for Use IV-P waters relevant to the Plumtree Run monitoring program include the following:

- pH - 6.5 to 8.5;
- Dissolved oxygen - may not be less than 5 mg/L at any time;
- Turbidity - maximum of 150 NTU and maximum monthly average of 50 NTU; and
- Temperature - maximum of 75˚F (23.9˚C) or ambient temperature of the surface water, whichever is greater.

The State of Maryland has not yet published water quality criteria for specific conductivity in surface waters; however, research has shown that specific conductivity levels greater than certain thresholds may prove detrimental to biological stream communities (Morgan et al. 2007; Morgan et al. 2012). The thresholds are relevant to specific types of biological communities; for instance, a threshold of 247 microSiemens per centimeter (µS/cm) applies to benthic macroinvertebrates, and a threshold of 171 µS/cm applies to fish communities.

2.5 QUALITY ASSURANCE/QUALITY CONTROL

Versar employs a robust quality assurance and quality control program through all facets of project completion. Biological condition assessment methods were designed to be consistent and comparable with the methods used by MBSS (Harbold et al. 2024). Field crews participated in annual training for MBSS sampling protocols, offered by the Maryland DNR, to ensure that all staff fully comprehend the required protocols. Field crews were led by staff members who attended the training sessions and passed topic-specific written and laboratory practical exams and field audits (when required) by MBSS training protocols. Audits were conducted by Maryland DNR Quality Control Officers for all personnel who received certifications in benthic macroinvertebrate sampling, physical habitat assessment, fish crew leader, and fish taxonomy. In the field, certified field crew leaders supervise all crew activities to verify compliance with MBSS protocols, and two trained field crew leaders review all field data sheets to ensure completeness and accuracy of all collected data.

Versar’s Benthic Laboratory staff are fully qualified to process benthic samples in compliance with MBSS protocols. Staff members participate in MBSS training and receive certification from the Maryland DNR in benthic macroinvertebrate processing and subsampling methods (Resource Assessment Service 2024) and maintain all required benthic macroinvertebrate taxonomic certifications from the Society for Freshwater Science. In-house taxonomists perform quality assurance checks throughout the process to verify consensus on all taxonomic identifications.

After field and laboratory data were entered into the appropriate spreadsheets, Versar’s Senior Laboratory Manager and Senior Ecologist reviewed the data for completeness and accuracy. Analysts compiled the data and calculated the IBI metric scores and final IBI results using an R program designed for MBSS metrics.

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3.0 RESULTS AND DISCUSSION

Results of the 2025 monitoring period are presented as summaries of the assessments of land use, water quality, physical, and biological conditions for each sampling station. Analysts also qualitatively compared the most recent data to data from previous surveys to investigate potential trends; interpretations of the results of the qualitative trends analysis are presented in the relevant subsections.

3.1 FOSTER BRANCH STATION FOST-01

To monitor physical habitat and resident biology conditions at the Foster Branch station FOST-01, field crews conducted surveys and sampling for benthic macroinvertebrates on March 28, 2025, and surveys and sampling for fish on July 16, 2025. Sampling conditions at the station during benthic macroinvertebrate sampling, as documented by upstream and downstream photographs, are presented in Figure 3-1. Sampling conditions during fish sampling, as documented by upstream and downstream photographs, are presented in Figure 3-2.

Figure 3-1. Photographs of upstream (left) and downstream (right) sampling conditions at the Foster Branch station FOST-01 during the spring sampling event on March 28, 2025

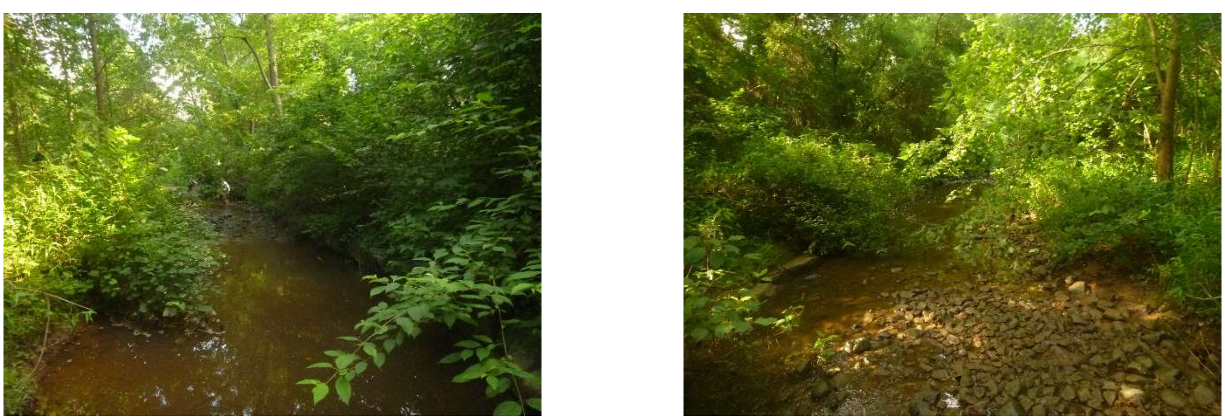

Figure 3-2. Photographs of upstream (left) and downstream (right) sampling conditions at the Foster Branch station FOST-01 during the summer sampling event on July 16, 2025

3.1.1 Land Use Types in the Catchment Area

Results from calculations of the percentages of Harford County land use types within the FOST-01 catchment area are presented in Table 3-1. The FOST-01 catchment area contains approximately two-thirds urban and one-third forest land use types.

Table 3-1. Land use within the FOST-01 catchment area

Station	Urban	Agriculture	Forest	Other
FOST-01	65.7%	1.5%	31.3%	1.5%

3.1.2 Water Quality Assessment

Results from *in situ* water quality measurements collected during the spring and summer index periods of 2025 at the Foster Branch station FOST-01 are presented in Table 3-2. Water quality conditions documented at the station during 2025 were similar to conditions documented during the summer sampling periods of 2015 through 2024 (KCI 2021a; Versar 2023; Versar 2024); note that monitoring was not conducted in 2018 and 2022.

Table 3-2. *In situ* water quality measurements collected at station FOST-01 during 2025

Station	Season/Year	Temperature (˚C)	Dissolved Oxygen (mg/L)	pH	Specific Conductivity (µS/cm)	Turbidity (NTU)
FOST-01	Spring 2025	8.2	11.57	7.39	492	8.75
	Summer 2025	23.5	6.80	7.66	257	19.8

Note: Colored cells indicate values that exceed published thresholds (Morgan et al. 2007; Morgan et al. 2012)
Unit codes: ˚C = degrees Celsius; mg/L = milligrams per liter; µS/cm = microSiemens per centimeter; NTU = nephelometric turbidity units

Most of the water quality measurements documented during the monitoring at station FOST-01 during 2025 were within the applicable limits, but one parameter had levels that exceeded recommended limits for aquatic health (see Section 2.4.4). The measurements of temperature, dissolved oxygen, pH, and turbidity were within COMAR standards for Use I streams. The specific conductivity readings documented during the spring (492 µS/cm) and summer (257 µS/cm) sampling events exceeded the threshold values recommended by research in Maryland for benthic macroinvertebrates and fish communities (Morgan et al. 2007; Morgan et al. 2012; see Table 3-2).

Instream conductivity levels are influenced by runoff from impervious surfaces, such as roads, sidewalks, parking lots, and roof tops. Increased inorganic ion concentrations in streams, measured as conductivity, in urban settings typically result from de-icing materials applied to paved surfaces, accumulations in stormwater management facilities (Casey et al. 2013), runoff over impervious surfaces, passage through pipes, and exposure to other infrastructure (Cushman 2006). Elevated conductivity levels may not directly affect stream biota, but chloride, metals, and nutrient constituents of conductivity may be present at levels that can cause biological impairment.

3.1.3 Physical Habitat Assessment

Results from MBSS PHI calculations with data collected from the FOST-01 station during 2025 are provided in Table 3-3. Physical conditions at the station scored 73.86 during 2025, which corresponds with a narrative rating of Partially Degraded. The results from 2025 suggest an improvement relative to previously documented conditions during the period from 2015 through 2024 (KCI 2021a; Versar 2023; Versar 2024); note that monitoring was not conducted in 2018 and 2022. Scores from calculations of PHI derived from measured metrics have been variable, but the trend over the eleven-year span of the monitoring study shows a general improvement; the score in 2025 was more than 23 points higher than the score in 2015. Improvements in shading percentage, bank stability, and instream habitat have accounted for the increase in PHI scores over the duration of the monitoring study.

Table 3-3. Physical habitat assessment rating at station FOST-01 during 2025

Station	Season/Year	Score	Narrative Rating
FOST-01	Summer 2025	73.86	Partially Degraded

3.1.4 Benthic Macroinvertebrate Condition Assessment

Results from the MBSS BIBI calculations with data collected from the FOST-01 station during 2025 are provided in Table 3-4. Biological conditions for benthic macroinvertebrates at the station resulted in a score of 3.00 on the BIBI scale during 2025, which corresponds to a narrative rating of Fair. The BIBI score from 2025 was higher than all but one of the BIBI scores documented during the period from 2015 through 2024 (KCI 2021a; Versar 2023; Versar 2024); note that monitoring was not conducted in 2018 and 2022. The BIBI results indicate a relatively stable benthic macroinvertebrate assemblage that shows minor fluctuations over time. As noted in Section 3.1.2, specific conductivity measurements exceeded the threshold value for benthic macroinvertebrates during the spring and summer index period sampling events, which suggests that water quality conditions present throughout the year at the FOST-01 station, as well as stream instability resultant of flashy, high flows, could be suppressing sensitive species and limiting the benthic macroinvertebrate assemblage recovery.

Table 3-4. Benthic macroinvertebrate metrics and scores at station FOST-01 during spring 2025				
Metric	**Value**	**Score**	**BIBI Score**	**Narrative Rating**
Total Number of Taxa	22	5	3.00	Fair
Number of EPT* Taxa	2	3		
Number of Ephemeroptera Taxa	0	1		
Percent Intolerant to Urban	1.31	1		
Percent Ephemeroptera	0	1		
Number of Scraper Taxa	2	5		
Percent Climbers	9.15	5		
Notes: BIBI = Benthic Index of Biotic Integrity * EPT = Ephemeroptera, Plecoptera, and Trichoptera				

3.1.5 Fish Community Assessment

Results from the MBSS FIBI calculations with data collected from the FOST-01 station during 2025 are provided in Table 3-5. Based on FIBI metrics, biological conditions for fish at the station resulted in a score of 3.67 during 2025, which corresponds to a narrative rating of Fair. The results were similar to conditions documented during the period from 2015 through 2024 (KCI 2021a; Versar 2023; Versar 2024); note that monitoring was not conducted in 2018 and 2022. The survey documented the presence of 13 species of fish during the summer sampling event of 2025 (Table 3-6). The high diversity of fish species and moderate percentage of tolerant species supported the FIBI score for the station.

Table 3-5. Fish index metrics and scores at station FOST-01during summer 2025				
Metric	**Value**	**Score**	**FIBI Score**	**Narrative Rating**
Abundance per Square Meter	0.29	1	3.67	Fair
Number of Benthic Species, Adjusted	1.06	5		
Percent Tolerant	37.35	5		
Percent Generalist, Omnivores, Invertivores	86.75	5		
Percent Round-bodied Suckers	1.20	3		
Percent Abundance of Dominant Taxa	42.17	3		
Note: FIBI = Fish Index of Biotic Integrity				

Table 3-6. Fish species collected at station FOST-01during summer 2025			
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Sunfish hybrid	*Lepomis spp*	Creek chub	*Semotilus atromaculatus*
White sucker	*Catostomus commersonii*	Eastern blacknose dace	*Rhinichthys atratulus*
Creek chubsucker	*Erimyzon oblongus*	Green sunfish	*Lepomis cyanellus*
Bluegill	*Lepomis machrochirus*	Eastern mosquitofish	*Gambusia holbrooki*
Least brook lamprey	*Lampetra aepyptera*	Tessellated darter	*Etheostoma olmstedi*
Redbreast sunfish	*Lepomis auritus*	American eel	*Anguilla rostrata*
Largemouth bass	*Micropterus salmoides*		

3.1.6 Supplemental Surveys

Results from the supplemental surveys conducted during the spring and summer sampling periods of 2025 indicate that few animals were present in the vicinity of the station FOST-01. Results from herpetofauna surveys found no species during the spring index period sampling event of the reporting year. The field crew found one species of herpetofauna within the stream during the summer index period sampling event: adult pickerel frog, *Lithobates palustis*. The field crew collected two species of crayfish, *Faxonius limosus* and *Procambarus acutus*, during the summer electrofishing surveys. The field crew did not find crayfish burrows during the spring sampling event but noted the presence of crayfish burrows during the summer sampling event; no specimens were obtained from excavations. The burrows were most likely established by individuals of the *Cambarus diogenes* species, which is the only species of burrowing crayfish documented by MBSS crews in Harford County. Field crews did not encounter freshwater mussels during the spring or summer index period sampling events. Crews noted evidence of high flow events within and surrounding the sampling segment. The apparent conditions demonstrated that the station had experienced flashy, high flows, which can disrupt stream habitats preferred by stream herpetofauna, freshwater mussels, and crayfish.

The field crews documented ten invasive plant species within and surrounding the sampling reach of station FOST-01 during 2025 (Table 3-7). Invasive plant presence and extent was similar to conditions documented during the period from 2015 through 2024 (KCI 2021a; Versar 2023; Versar 2024); note that monitoring was not conducted in 2018 and 2022.

Table 3-7. Invasive plants documented at station FOST-01 during 2025			
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Bush clover	*Lespedeza sp.*	Privet	*Ligustrum sp.*
Oriental bittersweet	*Celastrus orbiculatus*	Japanese honeysuckle	*Lonicera japonica*
Phragmites	*Phragmites sp.*	Multiflora rose	*Rosa multiflora*
English ivy	*Hedera helix*	Japanese stiltgrass	*Microstegium vimineum*
Ground ivy	*Glechoma hederacea*	Wormwood	*Artemisia annua*

3.2 PLUMTREE RUN STATION PLUM-01

To monitor physical habitat and resident biology conditions at the Plumtree Run station PLUM-01, field crews conducted surveys and sampling for benthic macroinvertebrates on March 28, 2025, and surveys and sampling for fish on July 15, 2025. Sampling conditions during benthic macroinvertebrate sampling, as documented by upstream and downstream photographs, are presented in Figure 3-3. Sampling conditions during fish sampling, as documented by upstream and downstream photographs, are presented in Figure 3-4.

Figure 3-3. Photographs of upstream (left) and downstream (right) sampling conditions at the Plumtree Run station PLUM-01 during the spring sampling event on March 28, 2025

Figure 3-4. Photographs of upstream (left) and downstream (right) sampling conditions at the Plumtree Run station PLUM-01 during the summer sampling event on July 15, 2025

3.2.1 Land Use Types in the Catchment Area

Results from calculations of the percentages of Harford County land use types within the PLUM-01 catchment area are provided in Table 3-8. The PLUM-01 catchment area contains approximately four-fifths urban land use. The remaining area contains approximately equal amounts of agriculture, forest, and other land use types.

Table 3-8. Land use within the PLUM-01 catchment area

Station	Urban	Agriculture	Forest	Other
PLUM-01	85.2%	6.6%	4.2%	4.0%

3.2.2 Water Quality Assessment

Results from *in situ* water quality measurements collected during the spring and summer index periods of 2025 at the Plumtree Run station PLUM-01 are presented in Table 3-9. Water quality conditions at the station during 2025 were similar to conditions documented during the period from 2015 through 2024 (KCI 2021a; Versar 2023; Versar 2024); note that monitoring was not conducted in 2018 and 2022.

Table 3-9. *In situ* water quality measurements collected at station PLUM-01 during 2025

Station	Season/Year	Temperature (˚C)	Dissolved Oxygen (mg/L)	pH	Specific Conductivity (µS/cm)	Turbidity (NTU)
PLUM-01	Spring 2025	7.2	13.11	8.0	780	2.4
	Summer 2025	23.2	8.43	7.84	272	2.0

Note: Colored cells indicate values that exceed published values (Morgan et al. 2007; Morgan et al. 2012)
Unit codes: ˚C = degrees Celsius; mg/L = milligrams per liter; µS/cm = microSiemens per centimeter; NTU = nephelometric turbidity units

Most of the water quality measurements documented during 2025 at PLUM-01 were within the applicable acceptable limits, but one parameter had levels that exceeded recommended limits for aquatic health (see Section 2.4.4). The measurements of temperature, dissolved oxygen, pH, and turbidity were within COMAR standards for Use IV-P streams. The specific conductivity readings of 780 and 272 µS/cm (Table 3-9) recorded during the spring and summer index period sampling events, respectively, exceeded the tolerance thresholds documented by Morgan et al. (2007 and 2012) for benthic macroinvertebrates and fish communities in Maryland.

3.2.3 Physical Habitat Assessment

Results from the MBSS PHI calculations with data collected from the PLUM-01 station during 2025 are provided in Table 3-10. Physical conditions at the station resulted in a score of 63.17 during 2025, which corresponded to a narrative rating of Degraded. The results were similar to conditions documented during 2015 through 2024 (KCI 2021a; Versar 2023; Versar 2024); note that monitoring was not conducted in 2018 and 2022. Scores from calculations of PHI derived from measured metrics have remained stable over the eleven-year span of the monitoring study; scores have ranged from a low of 58.3 (Degraded) in 2019 to a high of 71.2 (Partially Degraded) in 2016.

Table 3-10. Physical habitat assessment rating at station PLUM-01 during 2025

Station	Season/Year	Score	Narrative Rating
PLUM-01	Summer 2024	63.17	Degraded

3.2.4 Benthic Macroinvertebrate Condition Assessment

Results from the MBSS BIBI calculations with data collected from the PLUM-01 station during 2025 are provided in Table 3-11. Biological conditions for benthic macroinvertebrates at the station resulted in a score of 1.33 on the BIBI scale during 2025, which corresponds to a narrative rating of Very Poor. The results were similar to conditions documented during 2015 through 2024 (KCI 2021a; Versar 2023; Versar 2024); note that monitoring was not conducted in 2018 and 2022. Staff with the Maryland DNR MBSS crew collected a replicate sample from station PLUM-01 as part of a recertification audit. The results of BIBI analysis on the replicate sample included a final BIBI score of 1.67. Results from the replicate sample BIBI calculations are presented in Table 3-12. As noted in Section 3.2.2, specific conductivity measurements exceeded the threshold for benthic macroinvertebrates during the spring and summer index period sampling events, which suggests that water quality conditions present throughout the year at the PLUM-01 station could be limiting the benthic macroinvertebrate assemblage.

Table 3-11. Benthic macroinvertebrate metrics and BIBI score at station PLUM-01 during spring 2025

Metric	Value	Score	BIBI Score	Narrative Rating
Total Number of Taxa	20	3	1.33	Very Poor
Number of EPT* Taxa	4	1		
Number of Ephemeroptera Taxa	0	1		
Percent Intolerant to Urban	1.75	1		
Percent Chironomidae	78.07	1		
Percent Clingers	26.32	1		

Notes: BIBI = Benthic Index of Biotic Integrity
* EPT = Ephemeroptera, Plecoptera, and Trichoptera

Table 3-12. Replicate MBSS benthic macroinvertebrate metrics and scores at station PLUM-01 during spring 2025				
Metric	**Value**	**Score**	**BIBI Score**	**Narrative Rating**
Total Number of Taxa	24	3	1.67	Very Poor
Number of EPT* Taxa	5	3		
Number of Ephemeroptera Taxa	1	1		
Percent Intolerant to Urban	3.33	1		
Percent Chironomidae	88.33	1		
Percent Clingers	22.50	1		
Notes: BIBI = Benthic Index of Biotic Integrity * EPT = Ephemeroptera, Plecoptera, Trichoptera				

3.2.5 Fish Community Assessment

Results from the MBSS FIBI calculations with data collected from the PLUM-01 station during 2025 are provided in Table 3-13. Based on FIBI metrics, biological conditions for fish at the station resulted in a score of 2.67 during 2025, which corresponds to a narrative rating of Poor. The score result was the lowest score recorded for the station during the monitoring study to date. The survey documented the presence of 13 species of fish during the summer sampling event of 2025 (Table 3-14). Despite an increase in species diversity and abundance, a decrease in the biomass per square meter and an increase in the percentage of pollution-tolerant organisms accounted for the decline in FIBI score at the station in 2025 relative to prior years of the monitoring study.

Table 3-13. Fish index metrics and scores at station PLUM-01 during summer 2025				
Metric	**Value**	**Score**	**FIBI Score**	**Narrative Rating**
Abundance per Square Meter	0.91	3	2.67	Poor
Number of Benthic Species, Adjusted	1.23	5		
Percent Tolerant	70.72	1		
Percent Generalist, Omnivores, Invertivores	84.12	3		
Biomass per Square Meter	3.96	1		
Percent Lithophilic Spawners	34.23	3		
Note: FIBI = Fish Index of Biotic Integrity				

Table 3-14. Fish species collected at station PLUM-01 during summer 2025			
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
White sucker	*Catostomus commersonii*	Creek chub	*Semotilus atromaculatus*
Bluntnose minnow	*Pimephales notatus*	Eastern blacknose dace	*Rhinichthys atratulus*
Longnose dace	*Rhinichthys cataractae*	Blue Ridge sculpin	*Cottus caeruleomentum*
Tessellated darter	*Etheostoma olmstedi*	Cutlip minnow	*Exoglossum maxillingua*
Rosyside dace	*Clinostomus funduloides*	Common shiner	*Luxilus cornutus*
Green sunfish	*Lepomis cyanellus*	Pumpkinseed sunfish	*Lepomis gibbosus*
Fallfish	*Semotilus corporalis*		

3.2.6 Supplemental Surveys

Results from the supplemental surveys conducted during the spring and summer sampling periods of 2025 indicate that there were few animals present in the vicinity of station PLUM-01. Results from herpetofauna surveys found no species during the spring index period sampling event. The field crew documented three species of herpetofauna at the station during the summer index period sampling event: adult northern green frogs, *Rana clamitans melanota*; an adult pickerel frog, *Lithobates palustris*; and adult northern two-lined salamanders, *Eurycea bislineata*, were found in the stream at station PLUM-01. The field crew collected two species of crayfish, *Faxonius virilis* and *Cambaris bartonii*, during the summer electrofishing surveys. The crews did not find crayfish burrows or freshwater mussels during the spring or summer index period sampling events. The lack of stable, instream habitats preferred by stream herpetofauna, freshwater mussels, and crayfish, and conductivity levels that exceeded the thresholds of tolerance for aquatic organisms at the station likely explains the absence of representative species at station PLUM-01.

The field crews documented 13 invasive plant species within and surrounding the sampling reach of station PLUM-01 during 2025 (Table 3-15). Invasive plant presence in 2025 was similar to conditions documented during 2023 and 2024 (Versar 2023; Versar 2024, respectively), but greater than the number of species documented annually from 2015 through 2021 (KCI 2021b); note that monitoring was not conducted in 2018 and 2022. Although relatively more total species of invasive plants were found in 2023 and 2024, the composition of invasive species has remained fairly consistent throughout the years of monitoring.

Table 3-15. Invasive plants documented at station PLUM-01 during 2025

Common Name	Scientific Name	Common Name	Scientific Name
Garlic mustard	*Allaria petiolata*	Beefsteak	*Perilla sp.*
Multiflora rose	*Rosa multiflora*	Japanese stiltgrass	*Microstegium vimineum*
Princess tree	*Paulownia tomentosa*	Japanese barberry	*Berveris thunbergii*
Oriental bittersweet	*Celastrus orbiculatus*	Japanese honeysuckle	*Lonicera japonica*
Wineberry	*Rubus phoenicolasius*	English ivy	*Hedera helix*
Wormwood	*Artemisia absinthium*	Privet	*Ligustrum vulgare*
Ground ivy	*Glechoma hederacea*		

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4.0 CONCLUSIONS

Assessments of the biological conditions of fish and benthic macroinvertebrate communities and habitats at the two long-term monitoring stations in the Foster Branch and Plumtree Run watersheds in Harford County, Maryland, from nine paired spring-summer monitoring events during the eleven-year monitoring study suggest that the influence of urban stressors continue to suppress and negatively affect the benthic and fish communities of both watersheds. Some of the biological conditions observed might also have been influenced by the existence of restored stream segments in both watersheds prior to the start of the monitoring program; however, estimates of the influences of the projects exclusively are not supported by the program design. The results of the eleven-year program will achieve Harford County's goal of establishing a baseline that analysts can use as a component of evaluations of the potential effects, effectiveness, and stability of future restoration efforts in the watersheds. A Shapiro Normality Test was performed on BIBI, FIBI, and PHI data from each station; based on these results, analysts selected either a T-Test, for normally distributed data, or a Wilcoxon Rank Sum Test, for non-normally distributed data, to test for statistical differences over time.

Conditions and population characteristics documented during the 2025 reporting period at station FOST-01, in the Coastal Plain ecoregion, indicated fair health for benthic and fish communities in a partially degraded habitat. The habitats at the station supported 22 benthic species, but the population diversity was dominated by pollution-tolerant species, and the overall community health was fair, as rated by the BIBI metrics. The trend in BIBI scores over the duration of the monitoring study to date suggest that benthic community health has slightly improved over time, though the trend is not significant (Figure 4-1; Tables 4-1 and 4-2). The fish community at the station comprised 13 species, but the abundance was low, and the overall conditions reflected fair health, as rated by the FIBI metrics. The trend in FIBI scores over the duration of the monitoring study to date suggests a decline in fish community health, though the trend is not significant (Figure 4-2; Tables 4-1 and 4-2). The narrative rating for the fish community at station FOST-01 was good in all monitored years prior to 2025, which reflected a strong and diverse community despite sub-optimal habitat availability. The overall PHI assessment result from 2025 documented partially degraded conditions for the habitat available for aquatic biota. The trend in PHI scores over the duration of the monitoring study to date demonstrate that measures of physical habitat have significantly improved over time ($p = 0.036$; Figure 4-3; Tables 4-1 and 4-2). Improvements in shading percentage, bank stability, and instream habitat, attributed to the restoration constructed within the sampling reach, have accounted for the increase in PHI scores over the duration of the monitoring study. Results of PHI scores compiled during the period from 2015 through 2025 (nine scores) suggest that measured habitat conditions at the station have stabilized and are improving over time, on average, with respect to biology over the eleven-year duration of the monitoring study. Water quality thresholds (Morgan et al. 2007; Morgan et al. 2012) for specific conductivity continued to be exceeded at the Foster Branch station, based on measurements collected during the spring and summer sampling events. Field crews noted evidence of flashy, high flows at the station during the spring and summer sampling events; high flows can disrupt stream habitats and create unstable environments for biota. If high flows are prevalent at the station, habitats needed for species survival might not be available for viable communities to be established. Multiple stressors are likely suppressing the potential for survival and improvement of benthic community condition at the station, as reflected in poor health of the benthic communities during the majority of the nine years of monitoring. The consistently fair health ratings for the fish populations at the station throughout the monitoring period suggest that the fish have found sufficient resources in the stream network to survive, despite the degradation of the environment.

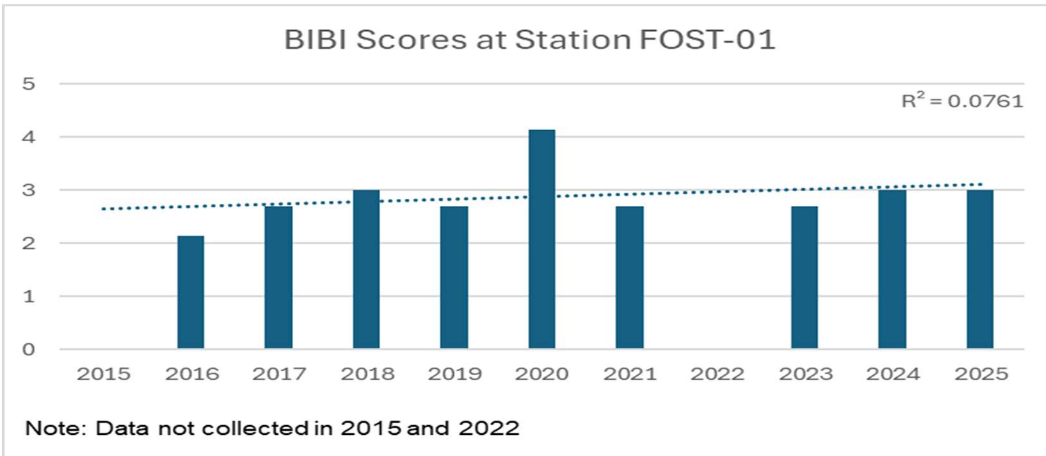

Figure 4-1. MBSS BIBI scores at station FOST-01, with trendline, from 2015 through 2025

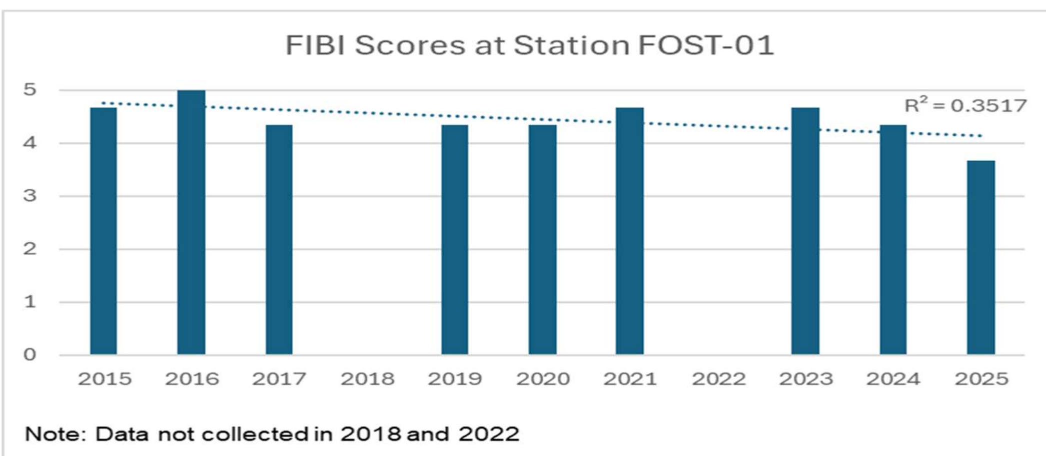

Figure 4-2. MBSS FIBI scores at station FOST-01, with trendline, from 2015 through 2025

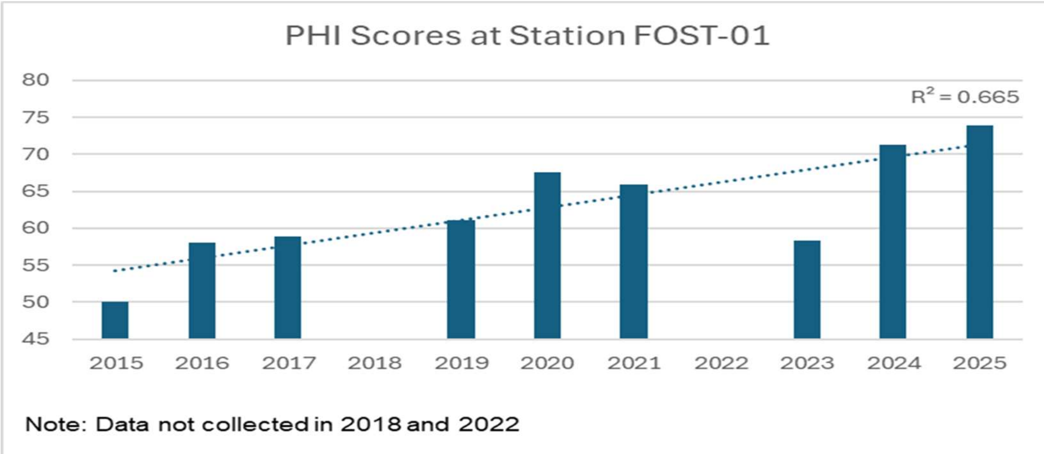

Figure 4-3. MBSS PHI scores at station FOST-01, with trendline, from 2015 through 2025

Table 4-1. Summary of BIBI, FIBI, and PHI scores and narrative ratings for conditions at station FOST-01 during the period from 2015 through 2025

Year	BIBI Score	Narrative Rating	FIBI Score	Narrative Rating	PHI Score	Narrative Rating
2015	N.S.		4.67	Good	50.00	Severely Degraded
2016	2.14	Poor	5.00	Good	58.10	Degraded
2017	2.71	Poor	4.33	Good	58.90	Degraded
2018	3.00	Fair	N.S.		N.S.	
2019	2.71	Poor	4.33	Good	61.12	Degraded
2020	4.14	Good	4.33	Good	67.59	Partially Degraded
2021	2.71	Poor	4.67	Good	65.91	Degraded
2023	2.71	Poor	4.67	Good	58.27	Degraded
2024	3.00	Fair	4.33	Good	71.34	Partially Degraded
2025	3.00	Fair	3.67	Fair	73.86	Partially Degraded

Notes: Harford County did not conduct monitoring at station FOST-01 during 2022.
N.S. = Not Sampled; BIBI = Benthic Index of Biotic Integrity; FIBI = Fish Index of Biotic Integrity; PHI = Physical Habitat Index.

Table 4-2. Summary of statistical results for BIBI, FIBI, and PHI scores at station FOST-01 during the period from 2015 through 2025			
Metric	**Shapiro Normality Test**	**T-Test**	**Wilcoxon Rank Sum Test**
BIBI	0.022	NA	0.410
FIBI	0.179	0.237	NA
PHI	0.812	0.036	NA
Note: Green shaded cells indicate normally distributed data; blue shaded cells indicate statistical significance NA = Not Applicable; BIBI = Benthic Index of Biotic Integrity; FIBI = Fish Index of Biotic Integrity; PHI = Physical Habitat Index.			

Conditions documented during the 2025 reporting period at station PLUM-01indicated poor to very poor community conditions for benthos and fish in a degraded habitat. The habitats at the station supported 20 benthic species, but the moderate population diversity was the only parameter that had a score that was not in the lowest category; the overall community health was very poor, as rated by the BIBI metrics. Analysis results of a replicate sample collected by Maryland DNR staff, employed as a quality control test, showed very similar findings. The trend in BIBI scores over the duration of the monitoring study to date suggests declining benthic community health, though not significantly (Figure 4-4; Tables 4-3 and 4-4). The fish community at the station comprised 13 species, but the biomass was low, and the overall condition reflected poor health, as rated by the FIBI metrics. The trend in FIBI scores over the duration of the monitoring study to date suggests a decline in fish community health, though the trend is not significant (Figure 4-5; Tables 4-3 and 4-4). The pattern of successive FIBI scores shows little variability, which demonstrates that the fish community at station PLUM-01 is largely stable despite stresses from sub-optimal habitat availability. The overall PHI assessment result from 2025 indicated degraded habitat conditions, which continues a pattern of either partially degraded or degraded conditions prevalent throughout the eleven-year span. The trend in habitat conditions at the station since restoration activities were completed (prior to 2015) reflects an overall slight decline, though not significant, towards further degradation and does not yet show an indication of an apparent improvement (Figure 4-6; Tables 4-3 and 4-4). Water quality thresholds (Morgan et al. 2007; Morgan et al. 2012) for specific conductivity continued to be exceeded at the Plumtree Run station. Multiple stressors are inhibiting the potential for full benthic colonization and survival at the station, as reflected in persistent poor or very poor health of the benthic communities during the eleven-year span. The assessed health ratings for the fish populations throughout the monitoring period have been variable and generally exhibited declines in the second half of the eleven-year period compared to the first half.

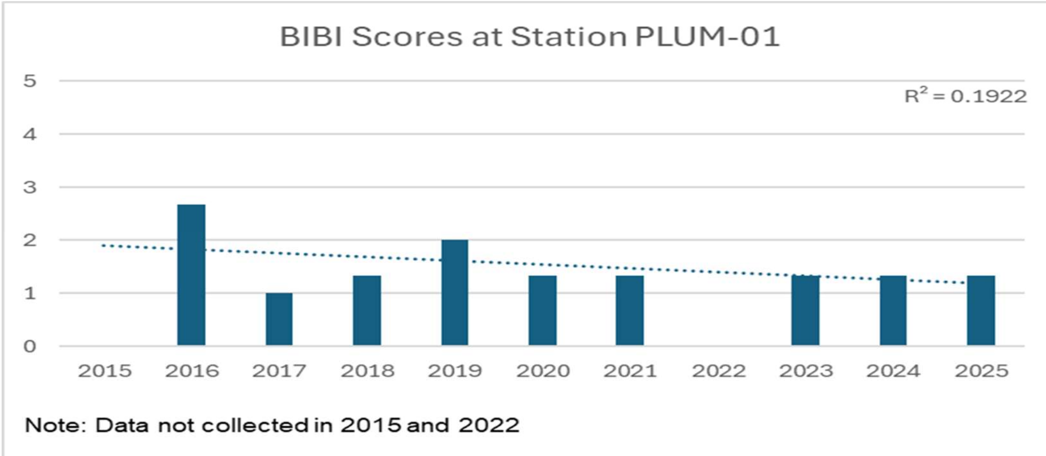

Figure 4-4. MBSS BIBI scores at station PLUM-01, with trendline, from 2015 through 2025

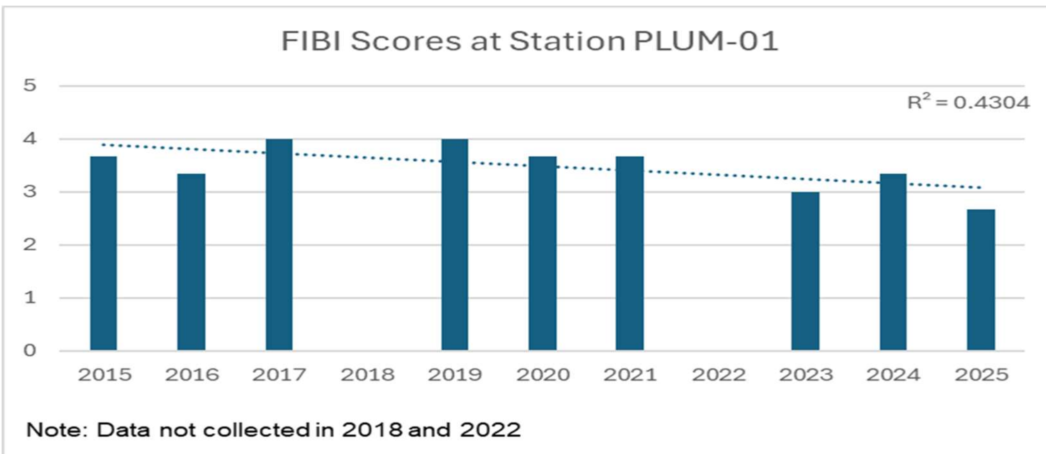

Figure 4-5. MBSS FIBI scores at station PLUM-01, with trendline, from 2015 through 2025

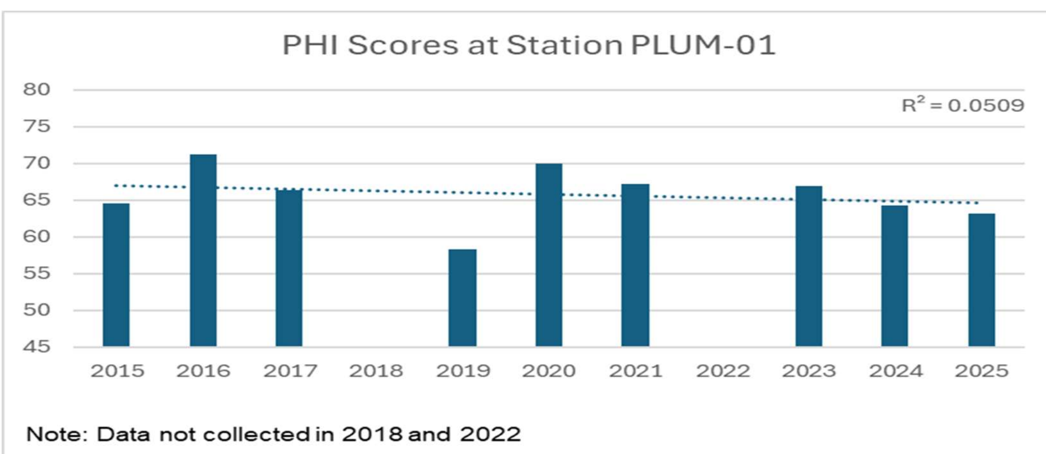

Figure 4-6. MBSS PHI scores at station PLUM-01, with trendline, from 2015 through 2025

Table 4-3. Summary of BIBI, FIBI, and PHI scores and narrative ratings for conditions at Station PLUM-01 during the period from 2015 through 2025

Year	BIBI Score	Narrative Rating	FIBI Score	Narrative Rating	PHI Score	Narrative Rating
2015	N.S.		3.67	Fair	64.60	Degraded
2016	2.67	Poor	3.33	Fair	71.20	Partially Degraded
2017	1.00	Very Poor	4.00	Good	66.40	Partially Degraded
2018	1.33	Very Poor	N.S.		N.S.	
2019	2.00	Poor	4.00	Good	58.30	Degraded
2020	1.33	Very Poor	3.67	Fair	70.00	Partially Degraded
2021	1.33	Very Poor	3.67	Fair	67.20	Partially Degraded
2023	1.33	Very Poor	3.00	Fair	66.85	Partially Degraded
2024	1.33	Very Poor	3.33	Fair	64.26	Degraded
2025	1.33	Very Poor	2.67	Poor	63.17	Degraded

Notes: Harford County did not conduct monitoring at station PLUM-01 during 2022.
N.S. = Not Sampled; BIBI = Benthic Index of Biotic Integrity; FIBI = Fish Index of Biotic Integrity; PHI = Physical Habitat Index.

Table 4-4. Summary of statistical results for BIBI, FIBI, and PHI scores at station PLUM-01 during the period from 2015 through 2025

Metric	Shapiro Normality Test	T-Test	Wilcoxon Rank Sum Test
BIBI	0.002	NA	1.000
FIBI	0.406	0.359	NA
PHI	0.795	0.388	NA

Note: Green shaded cells indicate normally distributed data
NA = Not Applicable; BIBI = Benthic Index of Biotic Integrity; FIBI = Fish Index of Biotic Integrity; PHI = Physical Habitat Index.

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October 2025

Church Creek Elementary School Stream Restoration Year 2 Post-Construction Monitoring Report

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Table of Contents

1 Introduction

Harford County Department of Public Works (DPW) Watershed Protection and Restoration Office tasked Biohabitats with conducting post-construction monitoring for the stream restoration portion of the Church Creek Elementary School Stormwater Management and Stream Restoration project that was designed and permitted by A. Morton Thomas and Associates (AMT). The goals of the stream restoration project, as stated in the 100% Stream Design Report prepared by AMT in June 2018, are to utilize natural design techniques to reduce streambank erosion, re-connect the stream with its historic floodplain (and historic wetland area), create areas for improved aquatic habitat, and ultimately enhance water quality.

The stream restoration project area was a mostly forested site located in Belcamp, Maryland behind Church Creek Elementary School, and is bound by Church Creek Road, Riverside Parkway, Riverside Bike Path, and Declaration Circle. The stream channel (referred to as Tributary 9) within the project area is within the Bush River watershed (02130701) and part of the larger Chesapeake Bay watershed. The extents of the stream restoration are from the start of Tributary 9, at an outfall conveying stormwater runoff from commercial areas north of MD543, downstream to the culvert conveying Tributary 9 beneath Church Creek Road (Figure 1). The stream restoration construction was determined to be substantially complete during an October 26, 2023 final inspection site meeting. As-builts of the constructed stream were submitted with the year 1 report in 2024.

Biohabitats' post-construction monitoring will fulfill the post-construction monitoring requirements required per the U.S. Army Corps of Engineers (USACE) permit conditions – permit no. NAB-2017-61738 (HA DPW/Church Creek Elementary School Stream Restoration/Bay TMDL) and the Maryland Department of the Environment (MDE) Letter of Authorization (LOA) – permit no. 17-NT-0397/201761738. In some cases, multiple permit requirements will be addressed through a single monitoring task. Biohabitats is currently scoped to conduct year 1 and 2 of the stream-based post-construction monitoring. A summary and timeline of the proposed monitoring tasks is displayed in Table 1.

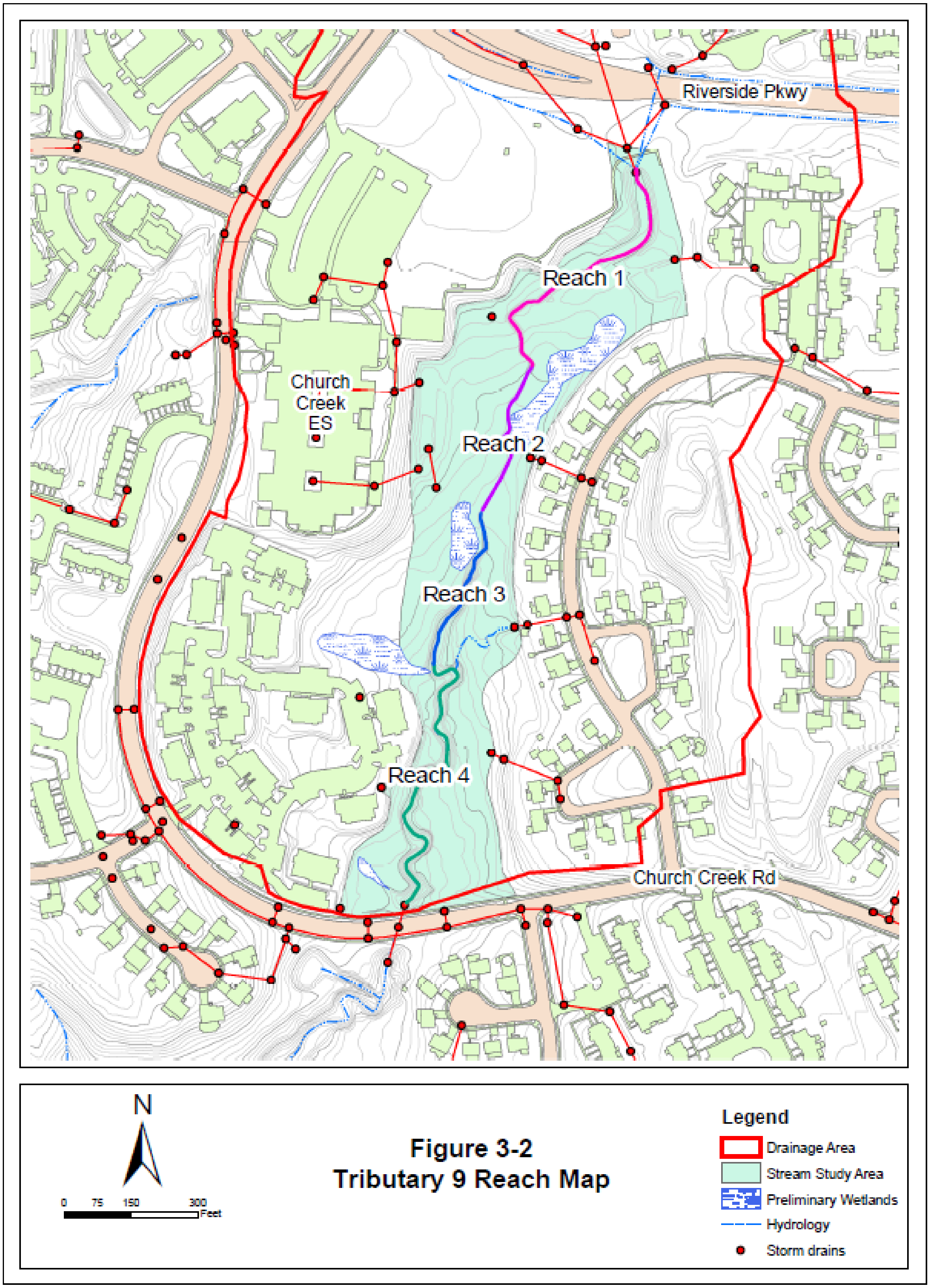

Figure 1: Church Creek Stream Restoration Project Area Map (prepared by AMT in 100% Stream Design Report June 2018)

Table 1: Required Monitoring Frequency per USACE and/or MDE permit conditions

Monitoring Parameter	***Permit & Permit Condition (MDE #/USACE #)***	***Year 1***	***Year 2***	***Year 3****	***Year 4***	***Year 5 (MDE Only)****
Geo-Referenced Photos	*USACE 5.v. & 6.v.*	*X*	*X*	*X*		
Functional Lift and Stability Assessment	*USACE 6.vi. & xii.*	*X*	*X*	*X*		
Habitat Assessment	*County request*	*X*	*X*	*X*		
Plan view graphic	*USACE 6.xiii.a.*	*X*		*X*		
Cross-Section Monuments & Surveying	*MDE 19; USACE 6.xiii.b.*	*X*		*X*		*X*
Longitudinal Profile Survey	*MDE 19; USACE 6.xiii.c.*	*X*		*X*		*X*
Visual Observations and Photo-Documentation	*MDE 19, USACE 6.ix.*	*X*		*X*		*X*
Bed Material Visual Observation	*MDE 19*	*X*		*X*		*X*
Vegetation Survey	*MDE 19, USACE 6.viii.*	*X*		*X*		*X*
WOTUS & Wetland Delineation	*USACE 6.x*			*X*		
*MDE LOA - If project is determined to be stable at end of year 3, the Authorized Person may request an exception from the year 5 stream monitoring requirement.						

Biohabitats performed the 2022 pre-construction monitoring (geo-referenced photographs, invasive species survey, and habitat assessments) of the Church Creek Elementary School stream restoration and used those results as a baseline and reference for post-construction monitoring. The functional assessment will be evaluated compared to AMT's baseline Functional Assessment (referred herein as the Church Creek stream functional assessment; Appendix A) which was completed during the design phase and submitted with the Joint Permit Application (JPA).

The following year 2 post-construction monitoring tasks were performed during a one-day field visit in August 2025 to evaluate conditions of the approximately 2,000 linear feet of Tributary 9 and adjacent riparian zone within the stream restoration project area:

1. Geo-Referenced Photographs;
2. Functional Lift and Stability Assessment; and
3. Habitat Assessment

The following report summarizes the methods and results of year 2 post-construction monitoring and will be used as comparison in future monitoring years. Where applicable, comparisons are made based on year 1 and pre-construction monitoring to document achievement of design objectives. Additionally, any additional areas of concern observed while onsite are relayed in this report.

2 Field Investigations

A field visit to the project site occurred on August 26, 2025, to document the condition of the restored Tributary 9 and its adjacent riparian area. The methods and results of the year 2 site inspection are discussed in depth below.

2.1 Geo-Referenced Photographs

During 2022 pre-construction monitoring, Biohabitats established 10 photograph stations, approximately one photo every per 200 linear feet across the project site, to allow for comparison between pre- and post-construction conditions. These stations provide a general overview of site conditions. Photo-stations were monumented with 2-foot sections of rebar and a cap, pink spray paint, and located with Global Positioning System (GPS) locations. These photo stations were revisited in year 1, with Stations 1 and 2 being replaced due to monument removal during construction.

In the current monitoring year, these 10 stations were revisited. However, due to the growth of vegetation, several photo station monuments were unable to be located. In these cases, the year 2 photo was reproduced based on referencing the GPS'd location and visible cues and notes from the year 1 photographs. It is expected that photos in future monitoring years will also be based on relative location but can be reliably reproduced based on previous photos. A map of the photo-stations locations is shown below (Figure 2).

A photo-documentation log with detailed captions is attached in Appendix B. Year 1 and 2 photos have been formatted to allow for side-by-side comparison. Compared to pre-construction conditions, the stream banks and floodplain connection appear improved, although much of the original forest was removed for construction. Compared to year 1 post-construction monitoring, vegetative establishment has vastly improved. In many photos, the herbaceous vegetation now obscures sightlines to the stream and structures which are stable with minimal change. Areas of concern are noted in Section 2.4. Photos and more detailed visual assessments will be retaken in future monitoring years to provide a visual of stream stability and vegetative establishment.

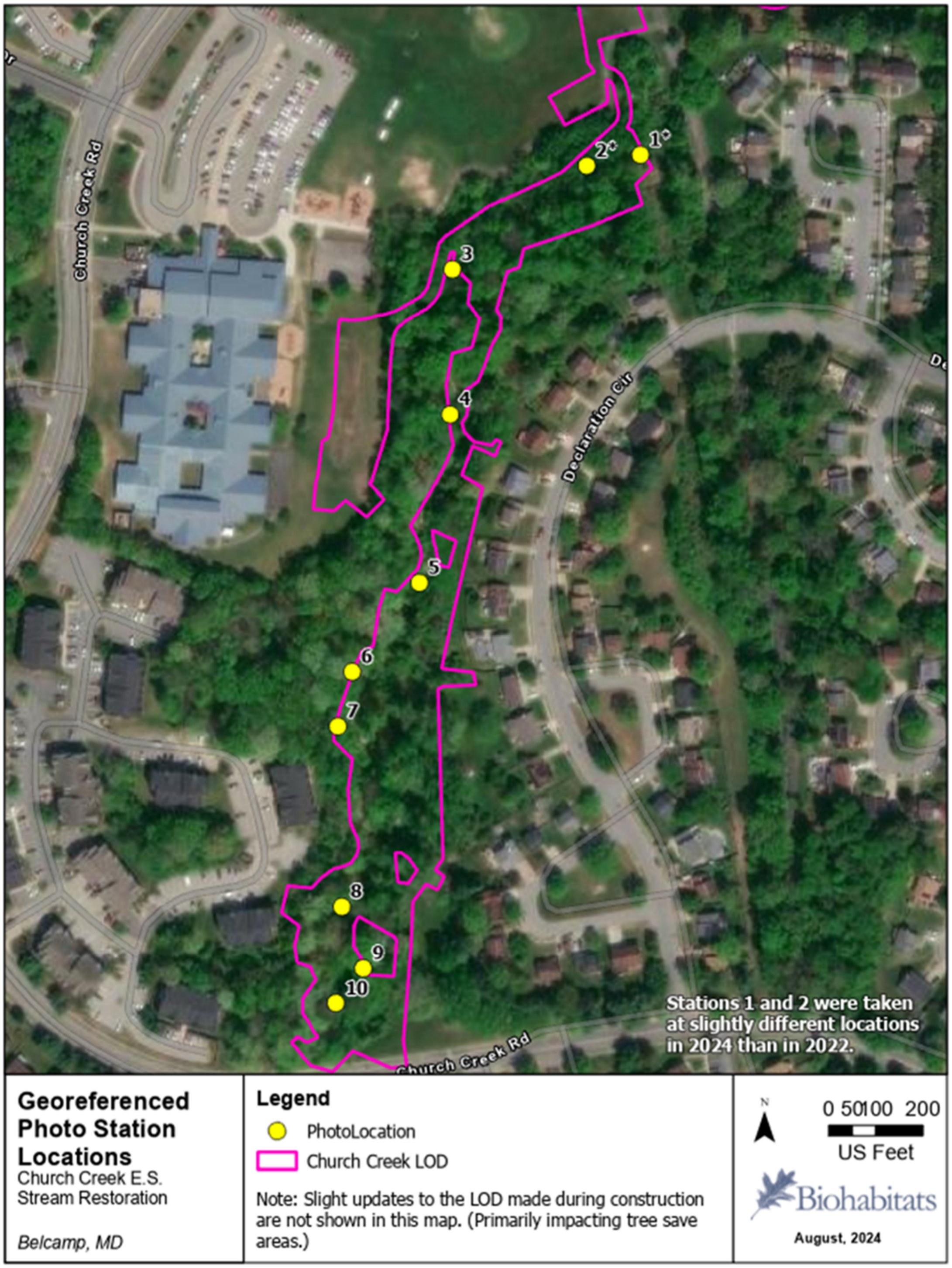

Figure 2: Geo-Referenced Photo Station Locations

2.2 Functional Lift and Stability Assessment

Biohabitats reevaluated the functional lift and stability of the stream restoration as compared to AMT's baseline functional assessment completed during the design phase (Table 2; Appendix B). The restoration design proposed to improve Hydraulics and Geomorphology, thus the parameters and associated measurement methods for post-construction functional monitoring includes the following based on AMT's stream functional assessment with minor deviations (see Table 2 below):

- Determine floodplain connectivity uplift based on calculating the average Bank Height Ratio (BHR) and Entrenchment Ratio (ER) for the restoration using data collected during the cross-section survey.
- Determine the channel evolution through visual observations and cross-section and longitudinal profiles survey data to confirm stage/channel type.
- Determine lateral stability by performing a Bank Erosion Hazard Index (BEHI) assessment following the Bank Assessment for Non-point source Consequences of Sediment (BANCS) Method (Rosgen, 2006).

As approved by the County, year 1 and 3 functional assessment included more detailed measurements, while the year 2 (2025) assessment comprised of a more rapid, visual comparison to determine any significant changes from the more detailed year 1 results. A summary of the year 2 functional assessment results as compared to AMT's pre-construction assessment, proposed conditions, and year 1 results are shown below in Table 3.

Table 2: Summary of AMT's Functional Stream Function Assessment Performed During Design

Level – Category	Parameter	Measurement Method
1- Hydrology	*Not altered by design nor rated. It was discussed to illustrate the degree to which hydrology has been altered by the watershed development.*	
2 - Hydraulics	Floodplain Connectivity	Bank Height Ratio (BHR)
		Entrenchment Ratio (ER)
3 - Geomorphology	Channel Evolution	Stage/Channel Type
	Lateral Stability	BANC Assessment (BEHI & NBS)
4 - Physiochemical	*Not rated, but discussed to illustrate the degree to which water quality and chemistry has been altered by the watershed development.*	
5 - Biological	*Not rated, but discussed to illustrate the degree to which biological potential has been altered by the watershed development.*	

Table 3: Year 2 Functional Lift and Stability Assessment Results

Level and Category	Parameter	Measurement Method	Pre-Restoration Value/Rating	Proposed Condition Value/Rating	Year 1 Conditions Value/Rating	Year 2 Conditions Value/Rating
1 - Hydrology	Bankfull Discharge	Regional Curve	N/A	N/A	N/A	N/A
		Bankfull Validation	N/A	N/A	N/A	N/A
2 - Hydraulics	Floodplain Connectivity	Bank Height Ratio	NF (5.56)	FUNCT (1.2)	FAR (1.1-6.3)	FAR (1.1-6.3)
		Entrenchment Ratio	NF (1.26)	FUNCT (1.4)	FUNCT (1.96)	FUNCT (1.96)
3 - Geomorphology	Channel Evolution	Stage/ Channel Type	NF (Degrading/ Widening “F” Channel)	FUNCT (Quasi-Equilibrium “Bc” Channel)	FUNCT (Quasi-Equilibrium “Bc” Channel)	FUNCT (Quasi-Equilibrium “Bc” Channel)
	Lateral Stability	Lateral Erosion Rate- Very High BEHI Curve	NF (High NBS)	FUNCT (Low-Moderate BEHI/NBS)	FUNCT (Low-Moderate BEHI/NBS)	FUNCT (Low-Moderate BEHI/NBS)
4 - Physicochemical	N/A	N/A	N/A	N/A	N/A	N/A
5 - Biology	Impervious Cover	Impervious Cover Model	N/A	N/A	N/A	N/A

Under hydraulics, year 1 BHR and ER were based on measurements taken from six cross sections. The average bank height ratio was about 2.7, ranging from 1.1 to 6.3. During year 1, the functional assessment rating was set as functioning-at-risk due to parts of the stream meeting the proposed BHR but others not due to site and design constraints. Based on the same cross sections, the average entrenchment ratio was about 1.96 in year 1, which meets the functional lift goal and rated as functioning. The year 2 rapid visual assessment observed no changes at the cross sections and their associated in-stream structures or in the floodprone and bankfull widths. Thus the BHR and ER ratings for year 2 were deemed the same as in year 1 - functioning-at-risk and functioning, respectively.

Under geomorphology, the channel type was physically designed to restore the stream from a degrading “F” channel to a quasi-equilibrium “Bc” channel. The stream was constructed as designed and is improved in shape and size from original conditions. The stream is also now classified as perennial, an improvement from pre-restoration classification as an intermittent channel. During the August 26th site visit, baseflow was low or not present, particularly in the downstream end of the stream where it appears that the streambed may not be intersecting the groundwater table. However, this is one site visit during the summer occurred following approximately two weeks without rain. Stream flow classification will be observed again during year 3 monitoring that will require multiple visits, potentially spread over an extended period of time.

While a detailed BANCS assessment was not conducted to measure lateral stability, visual observations did not indicate any significant erosional changes. However, two areas of note are near STAs 5+90 and 15+30. The right bank near STA 5+90 is located near a fallen tree, so should continue to be monitored for future changes. Additionally, the left bank by STA 15+30 rated as Very High in year 1 appears the same and potentially increased in size. This is near an actively eroding section of bank due to an uphill seep. Areas noted as High in year 1 monitoring were revisited. Many are now deemed low or moderate due to increased bank vegetative protection and appear to have naturally stabilized with minimal active erosion. Most of the stream yields Low-Moderate BEHI and Near Bank Stress (NBS) ratings, thus no change from year 1's rating of Functional.

Based on the year 2 field assessment, the restoration project continues to meet most proposed condition parameters. All categories deemed as not functioning in pre-restored conditions and are now functioning or functioning-at-risk post-restoration conditions.

2.3 Habitat Assessment

Biohabitats conducted a post-construction aquatic habitat assessment at each design reach (Reaches 1 through 4 as shown in Figure 1) on August 26, 2025, at the request of Harford County. The Environmental Protection Agency's Rapid Bioassessment Protocol (RBP) for low-gradient streams was used based on the stream flow classification improving from intermittent pre-restoration to perennial post-construction (Appendix C). The pre-construction assessment, conducted by Biohabitats in 2022, used the Modified EPA Rapid Bioassessment Protocol, Habitat Assessment for Low Gradient Ephemeral/Intermittent Streams (Appendix C). Thus, the overall scores cannot be directly compared from pre-construction to post-construction monitoring although some criteria do overlap between forms (e.g., "epifaunal substrate/available cover", "pool substrate characterization", "bank stability", and "vegetation protection").

Tables listing the individual post-construction scores for each reach are displayed below in Tables 4 to 7. Each parameter has a maximum score of 20, with Bank Stabilization, Vegetative Protection, and Riparian Vegetative Zone having a maximum of 10 per bank. Brief analysis is also provided for any changes in scoring from year 1 to 2.

Overall, all reaches improved in overall score, but most scores were generally similar to year 1. Several categories such as "riparian vegetative zone" and "channel alteration" originally scored low due to site and design constraints. The most significant improvement for all reaches was in vegetative protection and/or riparian vegetation zone. After two growing seasons, the vegetation establishment was improved and provided greater protection and buffer zone width. The mulch access path near the upstream end of the restoration is also beginning to naturalize. While sedimentation and erosional areas were observed, in most cases, there was limited change from year 1 conditions. On the day of monitoring, there was low to no baseflow observed within the channel, particularly in the downstream limits of the project.

Reach 1 saw the most improvement, mostly due to increased vegetative establishment on the left bank. While in 2024, much of the downstream end of the reach was relatively bare, after an additional year of growth, both banks were covered by a mix of native and invasive vegetation, improving the left bank vegetative protection and riparian vegetative zone scores from marginal to optimal.

Table 4: Reach 1 Habitat Assessment Results

Reach 1 Post-Construction Habitat Assessment				
Habitat Parameter	**2024 Score (Rating)**		**2025 Score (Rating)**	
Epifaunal Substrate/Available Cover	17		17	
Pool Substrate Characterization	18		18	
Pool Variability	10		10	
Sediment Deposition	15		16	
Channel Flow Status	16		16	
Channel Alteration	10		10	
Channel Sinuosity	7		7	
Bank Stabilization (LB)	10		10	
Bank Stabilization (RB)	10		10	
Vegetative Protection (LB)	8		8	
Vegetative Protection (RB)	4		8	
Riparian Vegetative Zone (LB)	4		10	
Riparian Vegetative Zone (RB)	10		10	
Total Score	**139**		**150**	
Color Key	*Optimal*	*Suboptimal*	*Marginal*	*Poor*

Reach 2 was slightly higher with slightly greater vegetative establishment on the right bank. While minor sedimentation still exists, there was no enlargement over the past year and many bars were vegetated, indicating little material movement.

Table 5: Reach 2 Habitat Assessment Results

Reach 2 Post-Construction Habitat Assessment				
Habitat Parameter	**2024 Score (Rating)**		**2025 Score (Rating)**	
Epifaunal Substrate/Available Cover	17		17	
Pool Substrate Characterization	17		17	
Pool Variability	5		5	
Sediment Deposition	16		17	
Channel Flow Status	14		14	
Channel Alteration	10		10	
Channel Sinuosity	7		7	
Bank Stabilization (LB)	10		10	
Bank Stabilization (RB)	10		10	
Vegetative Protection (LB)	8		8	
Vegetative Protection (RB)	6		8	
Riparian Vegetative Zone (LB)	7		7	
Riparian Vegetative Zone (RB)	10		10	
Total Score	**137**		**140**	
Color Key	*Optimal*	*Suboptimal*	*Marginal*	*Poor*

The overall habitat assessment rating for Reach 3 increased slightly contributed to riparian vegetation establishment positively affecting "bank stabilization" and "vegetation protection." At the same time, "pool variability" and "channel flow status" was lowered for Reach 3 due to low flow and very low water depth in many pools. Even with flow, most pools would have been shallow in depth and similar in size. Some appear to be slowly filling in with gravel-sized material. While erosional spots exist, overall, most areas did not significantly degrade over the year, indicating overall bank stability.

Table 6: Reach 3 Habitat Assessment Results

Reach 3 Post-Construction Habitat Assessment		
Habitat Parameter	**2024 Score (Rating)**	**2025 Score (Rating)**
Epifaunal Substrate/Available Cover	17	17
Pool Substrate Characterization	17	17
Pool Variability	10	7
Sediment Deposition	19	19
Channel Flow Status	10	9
Channel Alteration	10	10
Channel Sinuosity	7	7
Bank Stabilization (LB)	7	8
Bank Stabilization (RB)	7	8
Vegetative Protection (LB)	7	8
Vegetative Protection (RB)	5	8
Riparian Vegetative Zone (LB)	7	7
Riparian Vegetative Zone (RB)	10	10
Total Score	**133**	**135**

Color Key: *Optimal* | *Suboptimal* | *Marginal* | *Poor*

Similar to reaches 2 and 3, Reach 4 slightly increased in overall rating. The downstream-most reach, Reach 4 had minimal to no flow and was observed as having less flow than when the year 1 habitat assessment was conducted in 2024. Otherwise, most of the reach saw no significant change nor increase in bar formation or erosion, an increase in riparian vegetation establishment on the right bank, and more coarse material in the pool substrate.

Table 7: Reach 4 Habitat Assessment Results

Reach 4 Post-Construction Habitat Assessment		
Habitat Parameter	**2024 Score (Rating)**	**2025 Score (Rating)**
Epifaunal Substrate/Available Cover	16	16
Pool Substrate Characterization	15	16
Pool Variability	5	5
Sediment Deposition	13	16
Channel Flow Status	6	4
Channel Alteration	9	9
Channel Sinuosity	10	10
Bank Stabilization (LB)	9	9
Bank Stabilization (RB)	9	9
Vegetative Protection (LB)	8	8
Vegetative Protection (RB)	6	8
Riparian Vegetative Zone (LB)	7	7
Riparian Vegetative Zone (RB)	7	7
Total Score	**120**	**124**

Color Key: *Optimal* | *Suboptimal* | *Marginal* | *Poor*

2.4 Areas of Concern and Recommended Actions

The following observations were noted during the year 2 walk-through. A more thorough visual inspection will occur in year 3 monitoring.

LIVE STAKES
To address localized areas of erosion and/or bare stream banks, the County installed a total of 200 black willow (*silax nigra)* live stakes throughout the restoration in early 2025. Live stakes were installed typically in 2 rows ranging from 5 to 30 feet in length. Live stakes were installed at approximately stations 6+00, 8+00, and 11+50, and in several targeted areas between stations 13+75 to 16+50. During year 2 monitoring, live stakes were observed to have leaf growth in their first growing season.

STA 5+75 TREE THROW
Just downstream of CV-07 near STA 5+75, a group of trees have fallen on the left bank (See Figures 3 and 4). The resulting tree throw pulled up part of the bank and bed immediately downstream of the cross vane's left sill tie-in. The cross vane appears to be unimpacted and stable. Besides the bank upheaval, there is currently limited impact to the stream profile. The root mass is lifted above the water level and the trunks on the upland bank. The upheaval may have deepened the pool and exposed the left bank, but it may stabilize as sediment from the roots falls back to the stream. The area should be monitored but remedial action may not be needed given the lack of structural impact to the cross vane.

Figure 3: Tree throw from upstream side

Figure 4: Tree throw from downstream side

STA 14+00 STEP POOL STRUCTURE EROSION

At the step pools SP-06 and SP-07, there was observed structural erosion called out in year 1 monitoring. The erosion appears to have worsened in year 2 with new erosion observed at SP-08 as well (Figures 5 and 6). End around erosion was observed around the step structures and undercutting of the banks. One structure on the left bank had a cavity of about 2 feet deep and 1 feet wide from the edge of the boulder tie-in to the exposed bank (Figure 5). There was little to no base flow at the time of monitoring, indicating that erosion likely occurs during flashy storm events. Remedial action is recommended to fill the voids and re-stabilize the structures and re-establish vegetated banks.

Figure 5: End around erosion around step boulder

Figure 6: Erosion by step pool structures

STA 15+25 BANK EROSION

There is upland outfall drainage (labeled as 18” RCP on as-builts) or a hillside seep near STA 15+25 causing severe erosion on the left bank. Noted in year 1, conditions have visibly deteriorated in the past year. While the source of the water needs to be confirmed, it is eroding the soil beneath the coir fiber matting on the left bank - currently up to 3 feet from eroded surface to approximated original bank surface. Remedial action is recommended to confirm the cause of erosion, stabilize the bank, and prevent future erosion.

Figure 2: Severe bank erosion from hillside seep. 2024 conditions on left, 2025 conditions on right. Biohabitats team member standing near uphill extent of erosion.

STA 16+75 DOWNED TREE

A recently fallen tree was observed at the outfall near as-built STA 16+75. Maintenance had occurred to cut the tree, but the logs remain scattered around either bank. See Figures 9 and 10 for photos. No impact to the stream or plantings were observed. No remedial action is recommended, although cleanup of the debris can be undertaken if desired by the County.

Figure 3: Downed tree and remains on left bank

Figure 4: Woody debris piled up on left bank

OTHER OBSERVATIONS

Previously noted cobble-gravel bars were still evident where the flow pattern had pushed the bed material to one side of the stream. However, no significant change was observed between years and may be product of the stream form naturalizing.

Stream baseflow was low during year 2 monitoring. However, this is one site visit during the summer occurred following approximately two weeks without rain. One section in Reach 4 from around STA 13+75 to STA 17+80 had no baseflow. Iron flocculate and algal growth was observed in the stream and pools, indicative of the low flow rate (Figures 11 and 12). Although unsightly, the iron floc is likely due to natural occurrence of dissolved iron in the system. Its persistence however means that it is not naturally broken up or washed away by stream flow. This suggests that the stream regularly has a low flow rate.

Figure 5: Green algae in dry downstream pool

Figure 6: Iron flocculate near downstream end.

Additionally, near the downstream culvert and imbricated boulder walls, sandy sediment continues to aggregate likely due to backwatering from the culvert (Figure 13).

Figure 7: Sandy sediment buildup in downstream end.

3 Conclusion

This stream restoration and associated stormwater BMP projects were watershed restoration projects identified in the Small Watershed Action Plan for Declaration Run and Riverside Watersheds (URS, 2014). The goal of the approximately 2,000 linear feet stream restoration of Church Creek was to reduce streambank erosion, re-connect the stream with its historic floodplain (and historic wetland area), create areas for improved aquatic habitat and ultimately enhance water quality. Based on the year 2 post-construction monitoring results, the Church Creek Elementary School stream restoration project is meeting or trending towards meeting those goals.

The functional lift and stability assessment indicates that the project has shown uplift from pre-restoration conditions and met nearly all the proposed conditions. The restoration remained functioning as intended from year 1 to year 2 and most areas of previous concern are now stable or naturalized.

The habitat assessment was completed for the four reaches. While the stream flow classification was uplifted from intermittent pre-restoration to perennial post-construction, baseflow was low in both years of monitoring. In some sections between STA 13+75 to STA 17+80, during the August 26th year 2 site visit, no baseflow was present. While the low baseflow may have decreased some assessment results, overall, all reaches improved slightly in their habitat rating in year 2. Most erosional and depositional areas appeared unchanged from year 1, and bank vegetation saw greater establishment and growth after another growing season.

While a vegetative assessment was not conducted in year 2 monitoring, field observations found that there was improved establishment and aerial coverage compared to year 1. Previously bare areas were now populated by herbaceous vegetation. However, the non-native invasive Chinese bushclover (*Lespedeza cuneata*) was noted as a dominant species in the herbaceous strata, particularly in the downstream reaches. Woody plantings seemed to be thriving in the upstream-most section of the stream, although it was noted that there was a cluster of callery pear (*Pyrus calleryana*) saplings that had likely dispersed from mature trees adjacent the project area.

In 2025, the County installed a total of 200 black willow (*silax nigra)* live stakes throughout the restoration targeting eroded and/or exposed sections of stream bank for stabilization. During year 2 monitoring, live stakes were observed to have leaf growth in their first growing season. At approximately stations 14+00 and 15+25, Biohabitats observed increased erosion at a series of step-pool structures and along the bank, respectively. Remedial action is recommended to prevent further erosion or instability. Outside of these spots, the stream restoration is stable and functioning with a few areas noted for continued monitoring. More detailed post-construction monitoring will occur in year 3 and the results will be compared to years 1 and 2 to document stream stability and function. If the eroded areas are addressed and the project determined to be stable and functioning, the USACE permit monitoring requirements should be met and still conclude at the end of year 3 monitoring. In addition, the County may request from MDE an exception for the year 5 stream monitoring requirements.

APPENDIX A: FUNCTIONAL LIFT AND STABILITY ASSESSMENT

CHURCH CREEK ELEMENTARY SCHOOL
STREAM RESTORATION PROJECT
STREAM FUNCTIONAL ASSESSMENT

1.0 FUNCTIONAL PYRAMID ASSESSMENT

The functional pyramid is a hierarchical framework defining stream functions as they relate to each other. Stream restoration seeks to restore stream functions lost due to impacts and stressors placed on streams. As defined by Harman, et al., 2012, higher level functions are supported by lower level functions in the form of a pyramid. Hydrology is the base level. No other stream function can occur without hydrology. With each level, additional functions are enabled. Biology (level 5) cannot be restored without addressing the supporting levels of Hydrology (level 1), Hydraulics (level 2), geomorphology (Level 3), and physiochemical (level 4). Figure 1 illustrates the functional pyramid concept.

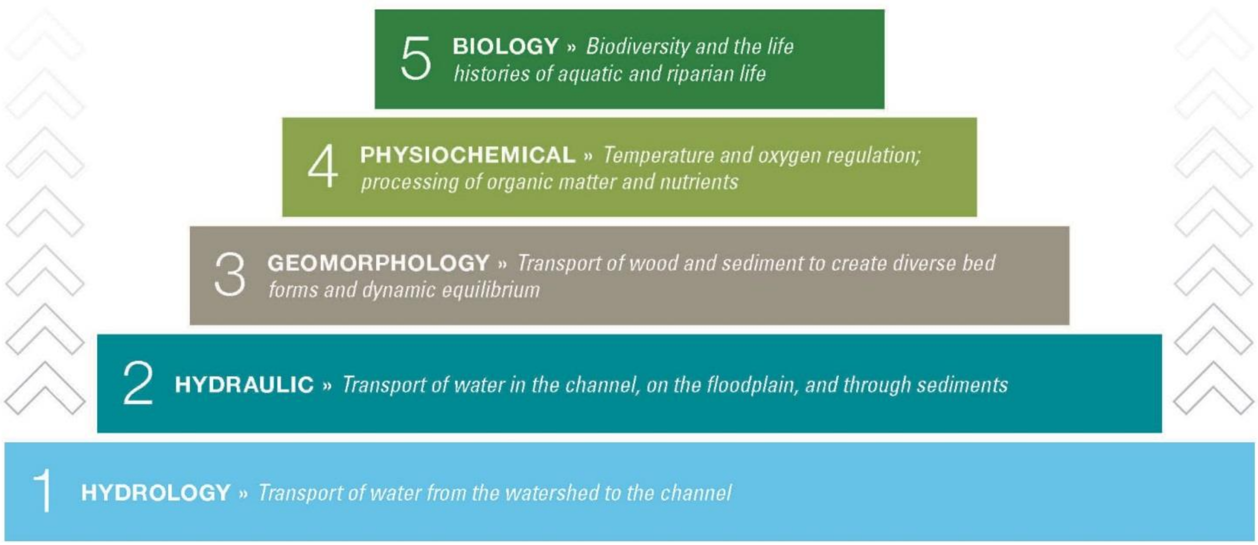

Figure 1 Stream Functional Pyramid (Harman et al., 2012)

The publication, *A Function-Based Framework for Stream Restoration Assessment and Restoration Projects* (Harman et al., 2012) outlines the application of the functional pyramid hierarchy to stream restoration projects. This publication provides a framework for applying the functional pyramid approach to reach-scale stream restoration projects by providing function-based parameters representing each level of the pyramid, measurement measures for each function-based parameter, and where possible, performance standards the measurement methods. The framework allows for the assessment of the level of function for the existing stream condition and the degree to which functions can be restored in the proposed condition.

The project goals and objectives guide the selection of the reach-scale function-based assessment parameters. The first step is to identify appropriate assessment parameters and to determine the quality of existing functions and subsequent restoration potential. At least one measurement method was selected to quantify each of the existing function-based parameters with the exception of Physicochemical, which was not assessed. The primary functional assessment parameters are

Hydraulics and Geomorphology. Table 1 lists the selected assessment parameters and measurement methods.

Table 1 Summary of Function Based Assessment Parameters

Level - Category	Parameter	Measurement Method
1- Hydrology	Bankfull Discharge	Regional Curve, Bankfull Validation
2- Hydraulics	Floodplain Connectivity	Bank Height Ratio, Entrenchment Ratio
3- Geomorphology	Channel Evolution	Evolutionary Stage, Channel Type
	Lateral Stability	Lateral Erosion Rate (BANCS)
4- Physicochemical	N/A	N/A
5- Biology	Impervious Cover	Impervious Cover Model

Each of the selected assessment parameters were rated as either Functioning, Functioning-at-Risk, or Not-Functioning based on a set of performance standards. The performance standards are based on existing assessment methodologies. The assessment parameters and performance standards are described below.

1.1 Level 1 - Hydrology

Hydrology is the volume and rate that water is delivered from the watershed to the stream channel. Hydrology is at the base of the functional pyramid (Level 1) and supports all other functions. Watershed hydrology is driven by climate, land use, soils, and by the degree to which stormwater management practices have been implemented in developed watersheds. As the proposed stream restoration project occurs at the reach scale, the project will not alter watershed hydrology. Hydrology as an assessment parameter is not rated but will serve to illustrate the degree to which hydrology has been altered by watershed development.

The hydrology parameter is bankfull discharge. For this assessment, bankfull discharge is measured in two ways: from regional curves and from bankfull validation based on information from the geomorphic assessment and hydrologic modeling.

A comparison of the regional curve bankfull discharge to the geomorphic derived bankfull discharge indicates the degree that watershed development has altered the volume and rate that water is delivered to the stream.

The restoration reach has a drainage area of 0.11 square miles. For this drainage area, the bankfull discharge curve yields a flow of 15.9 cubic feet per second (cfs) using the USFWS regional curve for the Piedmont region of Maryland (McCandless and Everett, 2002).

The geomorphic assessment along the restoration reach found stable and evident bankfull indicators along Reach 2. Bankfull discharge was calculated using Manning’s equation based on channel geometry from the geomorphic assessment, channel roughness using Leopold’s D50 determination from the Wolman pebble counts, and measured slope from the geomorphic survey. This calculation yielded a bankfull discharge of 65.9 cfs.

The difference between the regional curve bankfull discharge and the bankfull discharge based on the geomorphic assessment indicates that watershed development has greatly increased the runoff volume associated with bankfull discharge. The regional curves were developed using 23 study reaches with drainage areas ranging from 1.5 to 102 square miles and limited watershed development. Only one study reach had a watershed exceeding 20% impervious cover (21.4%). Twelve of the 23 study reaches had watersheds that had less than 5% impervious cover. As the restoration reach has a drainage area significantly smaller (0.11 sq. mi.) and an impervious significantly higher than the regional curve study reaches (40% to 58%), caution should be used in interpreting the regional curve results.

As stated earlier, a reach level project will not alter watershed hydrology. As such, hydrology as an assessment parameter is not rated but will serve as an indicator of the degree to which hydrology has been altered by watershed development. Table 2 summarizes the results of the hydrology level functional assessment.

Table 2 Hydrology Assessment Parameter Results

Level - Category	Parameter	Measurement Method	Existing Condition		
			Value	Rating	Level Rating
1- Hydrology	Bankfull Discharge	Regional Curve	15.9 cfs	N/A	N/A
		Bankfull Validation	65.9 cfs		

1.2 Level 2 - Hydraulics

Stream hydraulics relates to the forces that the flow of water exerts on the channel and floodplain, and how the flow interacts with sediments. Harmon et al. (2012) provides three parameters for describing hydraulic function. These parameters are floodplain connectivity, flow dynamics, and groundwater/surface water interchange. Floodplain connectivity was chosen as the primary hydraulic function parameter for this assessment.

Floodplain connectivity describes how often stream flow accesses the adjacent floodplain (Harman et al., 2012). Access to the adjacent floodplain minimizes the amount of energy and shear force concentrated within the channel banks during elevated flow events. Increased runoff due to high levels of watershed urbanization can lead to channel enlargement and incision reducing floodplain connectivity. Two methods to measure floodplain connectivity are bank height ratio (BHR) and entrenchment ratio (ER). These ratios were calculated as part of the geomorphic assessment. BHR, a direct measure of channel incision, is the ratio of the distance from top of bank to the thalweg (Dtob) divided by the distance from bankfull height to the thalweg (Dbf), as described in the equation:

$$\mathbf{BHR} = \boldsymbol{D_{tob}/D_{bf}}$$

A BHR of 1.0 indicates that all flows above bankfull enter the floodplain. A BHR of greater than 1.0 indicates the degree of incision. A BHR of 2.0 or greater indicates a highly incised stream.

Entrenchment ratio (ER) is a measure of the available floodplain width. It is calculated as the ratio of the floodprone width (Wfp), which is the water surface at two times the maximum bankfull depth, compared to the bankfull width (Wbf), as described in the equation:

$$\mathbf{ER} = \boldsymbol{W_{fp}/W_{bf}}$$

The greater the ER value, the greater the availability of floodplain area for energy dissipation. Taken together, BHR and ER work well in terms of quantifying floodplain connectivity. Performance standards for BHR and ER were adapted from Harman et al. (2012) and are presented in Table 3.

Table 3 Floodplain Connectivity Performance Standards

Parameter	Measurement Method	Existing Condition		
		Functioning	Functioning-At-Risk	Not-Functioning
Floodplain Connectivity	Bank Height Ratio	1.0 to 1.2	1.2 to 1.5	> 1.5
	Entrenchment Ratio*	> 1.4	1.4 to 1.2	< 1.2

*from performance standard for B and Bc Stream Types

The average BHR and ER for the restoration reach were determined to be 5.56 and 1.26, respectively. This indicates an incised and entrenched stream. The average Bank Height Ratio was rated as Not-Functioning, with the average Entrenchment Ratio rated as borderline Functioning-At-Risk. The overall hydraulics level was rated as Not-Functioning. Table 4 summarizes the result of the hydraulics level functional assessment.

Table 4 Hydraulics Assessment Parameter Results

Level - Category	Parameter	Measurement Method	Existing Condition		
			Value	Rating	Level Rating
2- Hydraulics	Floodplain Connectivity	Bank Height Ratio	5.56	Not Functioning	Not Functioning
		Entrenchment Ratio	1.26	Functioning-At-Risk	

1.3 Level 3 – Geomorphology

Geomorphology refers to the interaction of flowing water with the streambed and banks, riparian vegetation, and available sediment supply to create planform and cross sectional features such as meanders, riffles, pools, bars, etc. These features provide critical habitat for macroinvertebrates, fish, and other stream life. Streams that are neither aggrading nor degrading and maintain a stable cross-sectional area over time are considered to be in a state of dynamic equilibrium.

Numerous geomorphic parameters and measurement methods can be used to assess geomorphic function. Harmon et al (2012) provides a comprehensive list of suitable geomorphic parameters.

This assessment utilized channel evolution and lateral stability as geomorphology function parameters.

Channel evolution describes the process by which stream channels change over time in response to direct physical alteration or changes in flow regime and/or sediment supply. Channel evolution models generalize these changes as a succession of evolutionary stages that can help explain current conditions and predict future channel geomorphology. Numerous channel evolution models have been developed or expanded on over the last several decades. For the most part, these models have depicted streams as single thread, meandering channels (Schumm et al., 1984; Simon and Hupp, 1986).

Recent work by researchers have challenged the concept of the single thread channel being the end stage stream type by showing that, prior to European settlement, stream valleys in the Eastern United States were characterized by swampy shrub-scrub meadows and shallow multi-thread streams (Walter and Merritts, 2008). Cluer and Thorne (2014) expanded on the earlier channel evolution models by inserting additional precursor and late stages (anastomosing) to better represent stream conditions, as well as incorporating short circuits and dead ends where channels may not follow a linear path of stage succession (Figure 2). The Cluer and Thorne (2014) model best represents urbanized and altered streams and was utilized as the channel evolution model for this assessment.

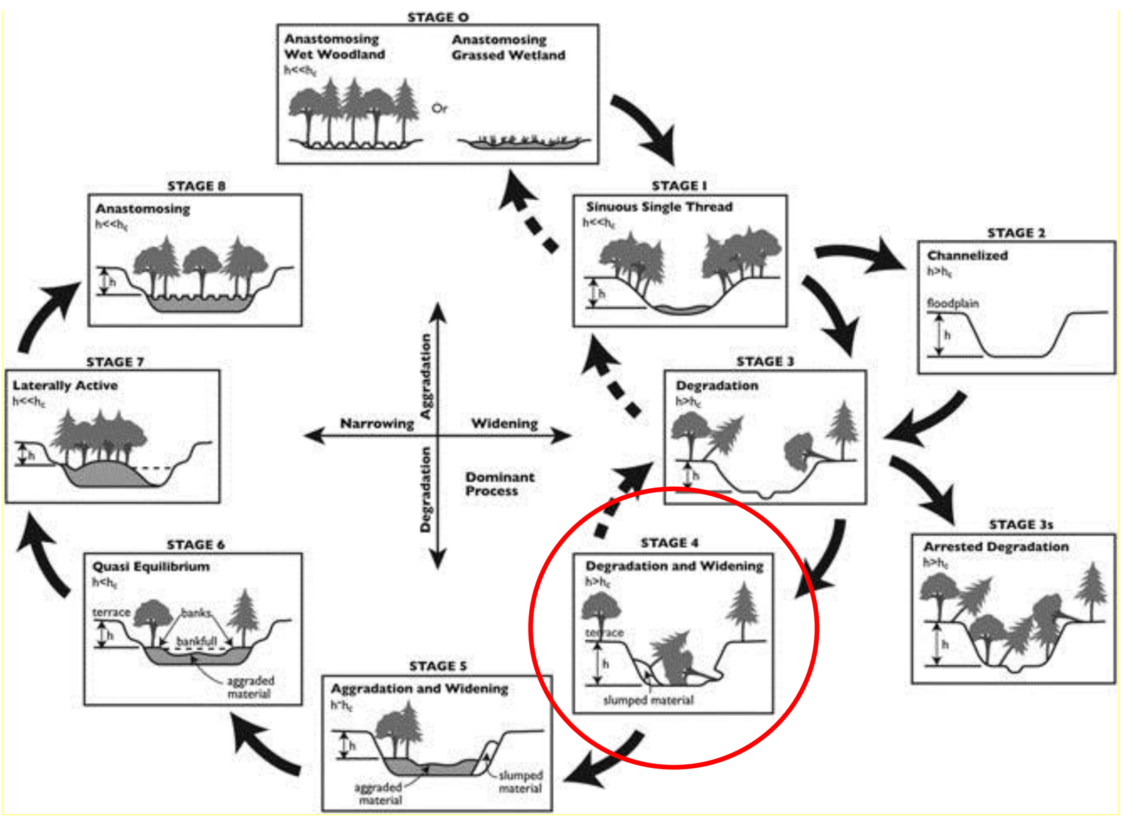

Figure 2 Channel Evolution Model (Cluer and Thorne, 2014)

Based on the Cluer and Thorne (2014) model, the restoration reach best fits as being in *Stage 4 – Degradation and Widening.* Without significant changes in watershed conditions or direct intervention, the channel is likely to remain an “F” channel for an extended period of time. The active nick points (incision) migrating upstream along the channel will continue to generate excessive sediment loads causing additional degradation and widening along the stream.

Performance standards for several channel evolution scenarios are presented in Harmon et al. (2012). All of the evolutionary scenario performance standards where the channel evolution indicates it will persist as an “F” channel are characterized as Not-Functioning.

Lateral stability is a function of hydraulic forces (shear stresses) acting on the channel bed, bank sediments, and riparian vegetation, as well as the ability of these elements to resist those forces. In a stable channel, streambank erosion should be in balance with streambank deposition. The Bank Assessment for Non-point source Consequences of Sediment (BANCS) Method (Rosgen, 2009) was selected as the measurement method for lateral stability. This method uses two sub-assessments in combination, the Bank Erosion Hazard Index (BEHI) and Near Bank Stress (NBS) classification, which are plotted against the USFWS Erosion Rate Curve (USFWS, 2005). These sub-assessments analyze hydraulic force, bank sediment, riparian vegetation, and cross section geometry. The BANCS assessment was completed as part of the restoration reach geomorphic assessment.

The BEHI assessment consists of simple measurements and visual observations of streambanks, including bank cover, depth of root mass, channel composition, and bank slope. The results are reported as a rating from very low to extreme. There are several methods for estimating NBS from simple reconnaissance level observations to detailed numerical calculations. As the restoration reach is a relatively straight and uniform channel, the reconnaissance level assessment was used. As with BEHI, NBS is rated from very low to extreme.

Performance standards for lateral stability are based the USFWS Erosion Rate Curve (Figure 4). Functional assessment categories were superimposed on the erosion rate curve based on best professional judgement. The overall reach had a very high BEHI score and it was assessed as having a high NBS score. Based on the erosion rate curves and functional assessment categories, the reach was rated as Not-Functioning.

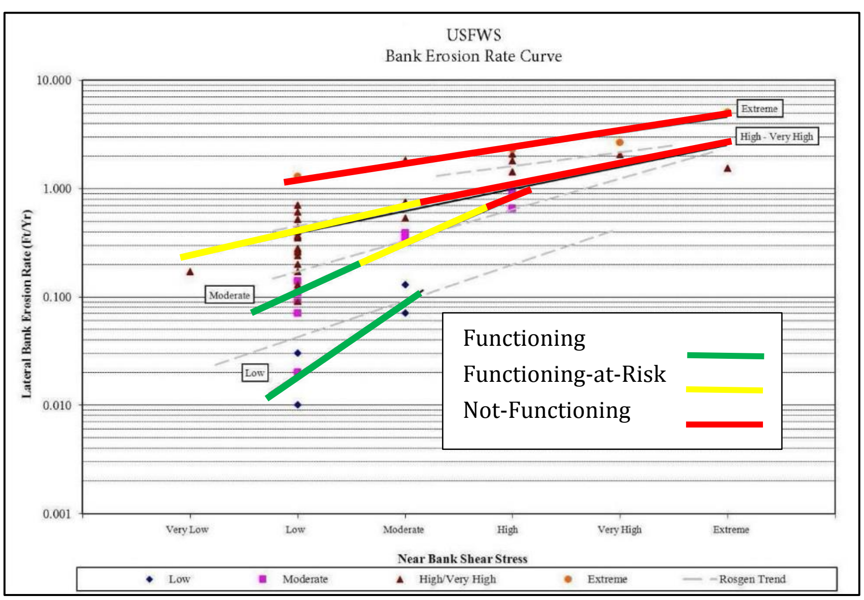

Figure 3 Bank Erosion Rate Curve (USFWS, 2005)
(with superimposed functional assessment categories)

The geomorphology level functional assessment parameters of Channel Evolution and the Lateral Stability each received a rating of Not-Functioning. As such, the geomorphology level functional assessment received an overall rating of Not-Functioning (Table 5).

Table 5 Geomorphology Assessment Parameter Results

Level - Category	Parameter	Measurement Method	Existing Condition		
			Value	Rating	Level Rating
3- Geomorphology	Channel Evolution	Stage/ Channel Type	Degradation and Widening/ “F” Channel	Not Functioning	Not-Functioning
	Lateral Stability	Lateral Erosion Rate – Very High BEHI Curve	High NBS	Not-Functioning	

1.4 Level 4 – Physiochemical

The physicochemical category refers to the general water quality and water chemistry components of the water flowing in the stream. One of the objectives of the project is to reduce the level of nutrients and sediments in the stream. Excess nutrients and sediments are a leading cause of water quality impairments in the Chesapeake Bay. The primary nutrients causing these impairments are nitrogen and phosphorus. The primary source of sediments in developed environments is from streambank erosion. However, the stream restoration activities will not reduce the significant volume of uncontrolled urban stormwater runoff and associated pollutants delivered from the upstream drainage area. As such, physicochemical will not be rated in terms of functional improvement.

1.5 Level 5 – Biology

Hydrologic, hydraulic, geomorphic, and physicochemical functions taken collectively support biological function, which represents the top tier of the functional pyramid. Typically, biological parameters such as macroinvertebrates or fish surveys would be selected to assess the biological function of a stream reach. Research has shown that biological stream quality is correlated with watershed alteration, as measured by the percent of impervious cover. Increasing impervious cover directly impacts hydrology, increasing the frequency and volume of stormwater runoff, resulting in impacts to hydraulics, geomorphology, water quality and ultimately the biological quality of the stream.

Impervious cover was determined for the contributing drainage area to assess the degree of watershed alteration. At the upstream end of the project (MD 543 outfall), impervious cover was calculated to be 58%. At the downstream end of the project (Church Creek Road), impervious cover was calculated to be 40% at. the This would indicate significant watershed alteration. The Center for Watershed Protection (CWP) developed the Impervious Cover Model (ICM) (Schueler et al.,

2009) relating stream quality to watershed imperviousness. Figure 4 illustrates the ICM assessment in terms of an upper boundary on stream quality due to watershed alteration.

Like Hydrology and Physicochemical parameters, Biology as an assessment parameter is not rated but will serve to illustrate the degree to which biological potential has been altered by watershed development (Table 6).

The ICM categorizes the current watershed impervious cover as non-supporting, indicating that watershed conditions are unlikely to support healthy biological communities.

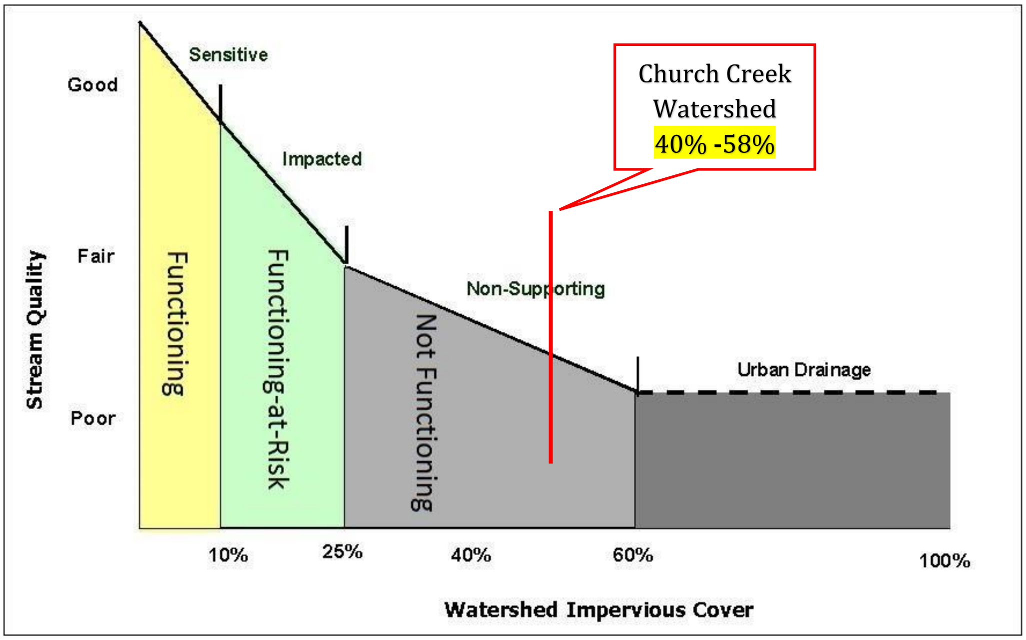

Figure 4 Impervious Cover Model (Schueler et al., 2009)

Table 6 Biology Assessment Parameter Results

Level - Category	Parameter	Measurement Method	Existing Condition		
			Value	Rating	Level Rating
5- Biology	Impervious Cover	Impervious Cover Model	40% - 58% (Non-supporting)	N/A	N/A

1.6 Summary of Existing Functional Conditions

Table 7 summarizes the overall existing condition functional assessment parameters and ratings for the restoration reach.

Table 7 Existing Functional Pyramid Assessment Results

Level - Category	Parameter	Measurement Method	Existing Condition		
			Value	Rating	Level Rating
1- Hydrology	Bankfull Discharge	Regional Curve[1]	15.9 cfs	N/A	N/A
		Bankfull Validation	65.9 cfs	N/A	

Level - Category	Parameter	Measurement Method	Existing Condition		
			Value	Rating	Level Rating
2- Hydraulics	Floodplain Connectivity	Bank Height Ratio[2]	5.56	Not Functioning	Not Functioning
		Entrenchment Ratio[2]	1.26	Not Functioning	
3- Geomorphology	Channel Evolution	Stage[3]/ Channel Type	Degradation and Widening/ "F" Channel	Not Functioning	Functioning at Risk
	Lateral Stability	Lateral Erosion Rate[4] – Very High BEHI Curve	High NBS	Functioning At Risk	
4- Physicochemical	N/A	N/A	N/A	N/A	N/A
5- Biology	Impervious Cover	Impervious Cover Model[5]	40% - 58% (Non-supporting)	N/A	N/A

[1] McCandless, 2003; [2] Harman et al., 2012 ;[3] Cluer and Thorne, 2013; [4] Hutzell and Starr, 2015; [5] Schueler et al., 2009

1.7 Proposed Functional Improvements

The restoration design seeks to improve Hydraulics and Geomorphology functions. The restoration design will improve the hydraulic functions by reducing the Bank Height Ratio to 1.2 and increasing the Entrenchment Ratio to 1.4. The restoration will improve geomorphic function by creating a Bc type channel and reducing the lateral erosion rates to the equivalent of a BEHI curve of low to moderate with an NBS of low to moderate. Table 8 summarizes the proposed functional improvements.

Table 8 Proposed Functional Pyramid Assessment Results

Level - Category	Parameter	Measurement Method	Existing Condition			Proposed Condition		
			Value	Rating	Level Rating	Value	Rating	Level Rating
1- Hydrology	Bankfull Discharge	Regional Curve[1]	15.9 cfs	N/A	N/A	15.9	N/A	N/A
		Bankfull Validation	65.9 cfs	N/A		65.9	N/A	
2- Hydraulics	Floodplain Connectivity	Bank Height Ratio[2]	5.56	Not Functioning	Not Functioning	1.2	Functioning	Functioning
		Entrenchment Ratio[2]	1.26	Not Functioning		1.4	Functioning	
3- Geomorphology	Channel Evolution	Stage[3]/ Channel Type	Degradation and Widening/ "F" Channel	Not Functioning	Not-Functioning	Quasi-Equilibrium "Bc" Channel	Functioning	Functioning
	Lateral Stability	Lateral Erosion Rate[4] – Very High BEHI Curve	High NBS	Not-Functioning		Low-Moderate BEHI/NBS	Functioning	
4- Physicochemical	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5- Biology	Impervious Cover	Impervious Cover Model[5]	40% - 58% (Non-supporting)	N/A	N/A	40% - 58% (Non-supporting)	N/A	N/A

[1] McCandless, 2003; [2] Harman et al., 2012 ;[3] Cluer and Thorne, 2013; [4] Hutzell and Starr, 2015; [5] Schueler et al., 2009

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APPENDIX B: GEO-REFERENCED PHOTOGRAPHS

Church Creek Elementary School Stream Restoration
Year 2 Post-Construction Monitoring August 2025
Geo-Referenced Photographs

YR1 2024 Post-Construction Monitoring

YR2 2025 Post-Construction Monitoring

Photo Station 01 (2024): Top of restored stream, near first structure. Steep right bank (looking downstream) and more gradual left bank. Boneset is dominant vegetative species.

Photo Station 01 (2025): Top of restored stream, near first structure. Steep right bank (looking downstream) and more gradual left bank. Boneset is dominant vegetative species.

Photo Station 02 (2024): From top of right bank at the edge of the mulch path looking across the stream. Pool is partially filled with water with low baseflow on day photo was taken.

Photo Station 02 (2025): From top of right bank at the edge of the naturalizing mulch path looking across the stream. Structure obscured by tall vegetation.

Church Creek Elementary School Stream Restoration
Year 2 Post-Construction Monitoring August 2025
Geo-Referenced Photographs

YR1 2024 Post-Construction Monitoring

Photo Station 03 (2024): From the right bank looking across the stream. Area of low herbaceous establishment although trees are appear healthy. Soil is compacted with gravel at surface.

YR2 2025 Post-Construction Monitoring

Photo Station 03 (2025): From the right bank looking across the stream. Mix of native and invasive herbaceous cover. Soil is compacted with gravel at surface.

Photo Station 04 (2024): From the right bank looking across the stream. Existing forested wetlands remain on right bank floodplain. Potential forested wetland creation across stream on the left bank with evidence of past surface ponding.

Photo Station 04 (2025): From the right bank looking across the stream. Evidence of drainage channels in right bank floodplain/wetland. Potential forested wetland creation across stream on the left bank with evidence of past surface ponding.

Church Creek Elementary School Stream Restoration
Year 2 Post-Construction Monitoring August 2025
Geo-Referenced Photographs

YR1 2024 Post-Construction Monitoring

Photo Station 05 (2024): From the right bank, close to the channel looking upstream. Low vegetative establishment on the left bank, with a mulch construction path in the background.

YR2 2025 Post-Construction Monitoring

Photo Station 05 (2025): From the right bank, close to the channel looking upstream. Mixed native and invasive herbaceous establishment on both banks.

Photo Station 06 (2024): From top of right bank looking at stream, slightly upstream. Drainage channel still present on right of photo on the left bank but is repaired and vegetated. Houses on Declaration Circle in the background.

Photo Station 06 (2025): From top of right bank looking at stream, slightly upstream. Drainage channel still present on right of photo on the left bank that remains repaired and vegetated. Planted tree in forefront now dead. Houses on Declaration Circle in the background.

YR1 2024 Post-Construction Monitoring

Photo Station 07 (2024): From right bank looking at channel. Wide floodplain bench on the left bank. Vegetative establishing but some bare patches near tree plantings; near forested wetland on right bank. Drainage channel on the left hillslope is causing some erosion.

Photo Station 08 (2024): From left bank looking at stabilized banks and repaired right bank stormwater outfall. Gravel sediment bar in middle of channel is common across the stream.

YR2 2025 Post-Construction Monitoring

Photo Station 07 (2025): From right bank looking at channel. Wide floodplain bench on the left bank. Mixed native and invasive vegetative establishment; near forested wetland on right bank. Drainage channel on the left hillslope is causing erosion.

Photo Station 08 (2025): From left bank looking at stabilized banks and repaired right bank stormwater outfall. Instream bars now vegetated and common across stream. Large tree fall at outfall, but has been cut. Debris remains in pile on both banks.

Church Creek Elementary School Stream Restoration
Year 2 Post-Construction Monitoring August 2025
Geo-Referenced Photographs

YR1 2024 Post-Construction Monitoring | YR2 2025 Post-Construction Monitoring

Photo Station 09 (2024): From top of left bank looking down at step pool structures and realigned channel.

Photo Station 09 (2025): From top of left bank looking down at step pool structures and realigned channel. Structures obscured by Japanese clover (*Lespedeza striata*).

Photo Station 10 (2024): At last structure looking downstream. Imbricated boulder wall on either side of the channel. A cobble lined drainage channel is entering from the right bank (labelled as a wetland on plans).

Photo Station 10 (2025): From last structure looking downstream. Imbricated boulder wall on either side of the channel. A cobble lined drainage channel is entering from the right bank (labelled as a wetland on plans). Low flow in stream with high algae and iron flocculant growth. Finer deposition near culvert.

01_Overview Photo: Incised and eroded, intermittent stream channel. Channel has top widths ranging from 13-16 feet and a bottom width ranging 7-11 feet.

02_Overview Photo: Incised and eroded, intermittent stream channel. Channel has top widths ranging from 13-16 feet and a bottom width ranging 7-11 feet. A remanent 8" PVC pipe is in the channel, and a drainage channel is entering from the left bank causing erosion at the confluence.

03_Overview Photo: At a meander of the incised and eroded intermittent stream channel. At the meander, channel has top widths ranging from 20-30 feet and bottom width ranging 10-15 feet.

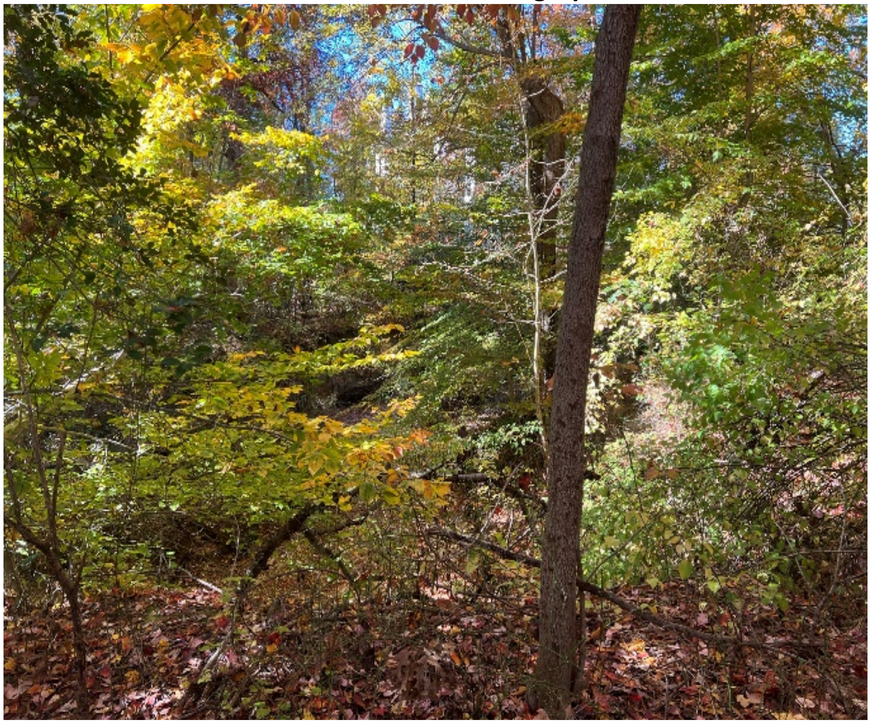
04_Overview Photo: Relatively less incised and eroded intermittent stream channel compared to entire restoration project limits. Forested wetland on right bank floodplain. Channel has top width ranging from 9 to 11 feet and bottom width of approximately 9 feet.

05_Overview Photo: Deeply incised and actively eroding intermittent channel. Channel top width is approximately 36 feet and bottom width is approximately 15 feet. Total bank height averages 10 feet.

06_Overview Photo: Deeply incised and actively eroding intermittent channel with two eroded drainages entering channel from the left bank. Channel top width is approximately 36 feet and bottom width is approximately 15 feet. Total bank height averages 10 feet.

07_Overview Photo: Two meander bends along a deeply incised and actively eroding intermittent channel. Channel top width is approximately 36 feet and bottom width is approximately 15 feet. Total bank height averages 10 feet. Forested wetland on right bank at upstream meander. Erosion occurring at interface of wetland with stream bank.

08_Overview Photo: Deeply incised and eroded intermittent channel. Damaged stormwater outfall with actively eroding channel entering right bank. Channel top width is approximately 42 feet and bottom width is approximately 12 feet. Stream banks are often vertical, exceeding 10 feet in height.



09_Overview Photo: Deeply incised and eroded intermittent channel at two meander bends. Channel has widened and deposition is occurring along the margins of the channel. Channel top width is approximately 42 feet and bottom width o approximately 12 feet. Stream banks are often vertical, exceeding 10 feet in height.

10_Overview Photo: Deeply incised and eroded intermittent channel with eroded drainage entering from left bank and forested wetland on right bank. Channel has widened and deposition is occurring along the margins of the channel. Channel top width is approximately 42 feet and bottom width is approximately 12 feet. Stream banks are often vertical, exceeding 10 feet in height.

APPENDIX C: HABITAT ASSESSMENT RBP FORMS

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Reach 1	LOCATION Church Creek E.S.	
STATION #________ RIVERMILE________	STREAM CLASS	
LAT ________ LONG ________	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS		
FORM COMPLETED BY AV, SR	DATE 8/26/25 TIME 8:46 AM PM	REASON FOR SURVEY YR2 POST-CON

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

R/L based on
looking DS

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 150

Looking DS

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Reach 2	LOCATION Church Creek ES
STATION #________ RIVERMILE________	STREAM CLASS
LAT ____________ LONG ____________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY Av, SR	DATE 8/26/26 TIME 9:33 AM PM — REASON FOR SURVEY YR2 POST-CON

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 14	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 140

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Reach 3	LOCATION Church Creek E.S.
STATION # ______ RIVERMILE ______	STREAM CLASS
LAT ______ LONG ______	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY AV, SR	DATE 8/26/25 TIME 9:59 AM PM — REASON FOR SURVEY YR 2 POST-CON

Shallow, filling in

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 19	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 9	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 135

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Reach 4	LOCATION Church Creek E.S.
STATION #________ RIVERMILE________	STREAM CLASS
LAT ________ LONG ________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY AV, SR	DATE 8/26/25 TIME 10:54 AM PM — REASON FOR SURVEY YR 2 POST-CON

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 4	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

no change, no enlargement

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 9	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 124

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

Reach 1

STREAM NAME	LOCATION Church Creek E.S.
STATION # ____ RIVERMILE ____	STREAM CLASS
LAT ____ LONG ____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY TC AV	DATE 2024/07/26 TIME 11:57 AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 4 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 139

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

Reach 2

STREAM NAME	LOCATION Church Creek E.S.
STATION # ______ RIVERMILE ______	STREAM CLASS
LAT ______ LONG ______	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY TL AV	DATE 2024/07/26 TIME 11:39 AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 14	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 137

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

Reach 3

STREAM NAME	LOCATION Church Creek E.S.
STATION #________ RIVERMILE________	STREAM CLASS
LAT ____________ LONG ____________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY AV TC	DATE 2024/07/26 TIME 10:55 AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 17	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 19	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 133

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

Reach 4

STREAM NAME	LOCATION Church Creek E.S.
STATION # ________ RIVERMILE ________	STREAM CLASS
LAT ________ LONG ________	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY TC AV	DATE 2024/07/26 TIME 10:34 AM PM — REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 9	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 8 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 120

Appendix 1: Modified Environmental Protection Agency Rapid Bioassessment Protocol (EPA RBP)
Habitat Assessment Field Data Sheet (Low Gradient Ephemeral/Intermittent Streams)

RAPID HABITAT ASSESSMENT: LOW GRADIENT Ephemeral/Intermittent >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

Station ID/ Stream Name	Reach 1 Church Creek			**LAT (DD)**	39.476494
Reach Length (m)		Date	2022/10/27	**LONG (DD)**	-76.245766

HABITAT PARAMETER	CATEGORY			
	Optimal	**Sub-optimal**	**Marginal**	**Poor**
1. SUBSTRATE/ DIVERSITY **AVAILBLE COVER FOR AMPHIBIANS CRAYFISH** **SCORE:** 6	*Greater than 50% of substrate consisting of mix of snags, tree roots or other stable habitat providing cover for amphibians and aquatic or terrestrial invertebrates. LWD in moderate to advanced stage of decay and within- active channel; Substrate roughness capable of trapping lots of organic matter. If moss covered, rate high.*	*30 to 50% cover and mix of diverse stable habitat; well suited for full cover potential; adequate habitat for maintenance of populations; presence of additional LWD in the form of new fall. Substrate roughness still capable of trapping organic matter.*	*10 to 30% mix of stable cover; habitat availability less than desirable; substrate frequently disturbed or removed. LWD low in density and/or may be new fall or in early decay stage. Some areas suitable for trapping organic matter. If lg. wood is absent, score low.*	*Less than 10% stable cover; lack of habitat is obvious; substrate unstable or lacking. Few areas suitable for trapping organic matter.*
	Rate in Channel and Toe of Banks			
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. POOL SUBSTRATE CHARACTER-IZATION **In dry channels, pool areas should still be observable** **SCORE:** 7	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged (or remnant) aquatic vegetation are common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged (or remnant) vegetation are present.	All mud or clay or sand bottom; little or no root mat; no submerged (or remnant) vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. CHANNEL ALTERATION **SCORE:** 14	Channelization or dredging absent of minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging (>than past 20 years) may be present, but no evidence of recent channelization.	Channelization may be extensive; embankments or shoring structures present on both banks; 40 to 80% of the stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. SEDIMENT DEPOSITION **SCORE:** 10	Little or no enlargement of "islands" or point bars and less than 20% of the bottom affected by fine sediment deposition. Leaf packs and woody debris with minimal silt covering.	Some new increase in bar formation mostly from sand, or fine sediment; 20 to 50% of the bottom is affected; slight deposition in pools. Leaf packs with moderate silt covering.	Moderate deposition of new sand, or fine sediment on old and new bars; 50 to 80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent. Leaf packs with heavier silt covering.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. CHANNEL SINUOSITY **SCORE:** 6	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	the bends in the stream increase the stream length up to 2 times longer than if it was in a straight line.	Channel is straight; waterway has been channelized for a long distance.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Appendix 1: Modified Environmental Protection Agency Rapid Bioassessment Protocol (EPA RBP)
Habitat Assessment Field Data Sheet (Low Gradient Ephemeral/Intermittent Streams)

RAPID HABITAT ASSESSMENT: LOW GRADIENT >>>>>>>>>>>>>>>>>>>>>>>>>>			**Reviewers Initials**	TC SR AV
	Optimal	**Sub-optimal**	**Marginal**	**Poor**
6. BANK STABILITY (score each bank) *determine left/ right by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems (<5% of bank affected).	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LEFT: 4	10 9	8 7 6	5 4 3	2 1 0
RIGHT: 4	10 9	8 7 6	5 4 3	2 1 0
7. BANK VEGETATIVE PROTECTION **SCORE:**	More than 90% of the stream-bank surfaces and immediate riparian zones covered by vegetation including trees, understory shrubs, and non-woody plants (herbs, grasses, ferns, mosses); vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces are covered by vegetation, but one class of plants is not well represented; disruption evident, but not affecting plant growth potential to extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces are covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less that one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces are covered by vegetation; disruption of streambank vegetation very high; vegetation has been removed to 2 inches or less in average stubble height.
		If assessed in winter or early spring look for remnants of herbs, and saplings.		
LEFT: 2	10 9	8 7 6	5 4 3	2 1 0
RIGHT: 2	10 9	8 7 6	5 4 3	2 1 0
8. WIDTH OF UNDISTURBED VEG. ZONE (undisturbed veg. Is trees, shrubs, and non-woody macro-phytes)	Width of undisturbed vegetative zone is >18 meters; human activities (parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted this zone.	Zone width is between 12 and 18 meters; human activities have only minimally impacted this zone.	Zone width is between 6 and 12 meters; human activities have impacted the zone a great deal.	Width of zone is less than 6 meters; little or no undisturbed vegetation due to man-induced activities.
LEFT: 10	10 9	8 7 6	5 4 3	2 1 0
RIGHT: 10	10 9	8 7 6	5 4 3	2 1 0

TOTAL: (max=160)	**Max Pool Depth (if water is present; otherwise "NA")** 46.8 **cm** **Average Channel Width (Toe of Banks)** 2.44 **m**	**Total from front** 43 **+ Total from back** 32 **=** 75 **Score Percentage= Total Score /160 X 100** 47 **%**

Average Width Intact Rip Vegetative Zone (m)	**Left** 45.72 **m**	**Right** 30.48 **m**
→ What is the dominant vegetation type in the reach? ☑ **Deciduous** ☐ **Coniferous (pine/cypress)** ☐ **Mixed (>10%)**	**Estimated age of forest:** ✓ ***>50 yrs*** ___ ***25-50 yrs*** ___ ***5-25 yrs*** ___ ***<5 yrs*** **Number of strata** ***(e.g, canopy, subcanopy, shrub, herb (4 max))*** 4	

Stream Surface Shading (%) (average of lower, middle, upper reach)	**Indicate % based on cloudless day in <u>summer</u> at noon. Fill in square that applies.**		
☐ **Fully exposed (0-25%)**	☐ **Partly shaded (25-50%)**	☑ **Partly exposed (50-75%)**	☐ **Fully shaded (75-100%)**
-or- % Canopy (Densiometer)		**Compass Bearing (facing downstream) (0-360°)**	

Appendix 1: Modified Environmental Protection Agency Rapid Bioassessment Protocol (EPA RBP)
Habitat Assessment Field Data Sheet (Low Gradient Ephemeral/Intermittent Streams)

RAPID HABITAT ASSESSMENT: LOW GRADIENT Ephemeral/Intermittent >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>					
Station ID/ Stream Name	Reach2 Church Creek			**LAT (DD)**	39.473968
Reach Length (m)	2	Date	2022/11/03	**LONG (DD)**	-76.247431

HABITAT PARAMETER	CATEGORY: Optimal	Sub-optimal	Marginal	Poor
1. SUBSTRATE/ DIVERSITY **AVAILBLE COVER FOR AMPHIBIANS CRAYFISH** **SCORE:** 4	*Greater than 50% of substrate consisting of mix of snags, tree roots or other stable habitat providing cover for amphibians and aquatic or terrestrial invertebrates. LWD in moderate to advanced stage of decay and within- active channel; Substrate roughness capable of trapping lots of organic matter. If moss covered, rate high.*	*30 to 50% cover and mix of diverse stable habitat; well suited for full cover potential; adequate habitat for maintenance of populations; presence of additional LWD in the form of new fall. Substrate roughness still capable of trapping organic matter.*	*10 to 30% mix of stable cover; habitat availability less than desirable; substrate frequently disturbed or removed. LWD low in density and/or may be new fall or in early decay stage. Some areas suitable for trapping organic matter. If lg. wood is absent, score low.*	*Less than 10% stable cover; lack of habitat is obvious; substrate unstable or lacking. Few areas suitable for trapping organic matter.*
	Rate in Channel and Toe of Banks			
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. POOL SUBSTRATE CHARACTER-IZATION **In dry channels, pool areas should still be observable** **SCORE:** 10	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged (or remnant) aquatic vegetation are common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged (or remnant) vegetation are present.	All mud or clay or sand bottom; little or no root mat; no submerged (or remnant) vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. CHANNEL ALTERATION **SCORE:** 20	Channelization or dredging absent of minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging (>than past 20 years) may be present, but no evidence of recent channelization.	Channelization may be extensive; embankments or shoring structures present on both banks; 40 to 80% of the stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. SEDIMENT DEPOSITION **SCORE:** 11	Little or no enlargement of "islands" or point bars and less than 20% of the bottom affected by fine sediment deposition. Leaf packs and woody debris with minimal silt covering.	Some new increase in bar formation mostly from sand, or fine sediment; 20 to 50% of the bottom is affected; slight deposition in pools. Leaf packs with moderate silt covering.	Moderate deposition of new sand, or fine sediment on old and new bars; 50 to 80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent. Leaf packs with heavier silt covering.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. CHANNEL SINUOSITY **SCORE:** 7	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	the bends in the stream increase the stream length up to 2 times longer than if it was in a straight line.	Channel is straight; waterway has been channelized for a long distance.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Appendix 1: Modified Environmental Protection Agency Rapid Bioassessment Protocol (EPA RBP)
Habitat Assessment Field Data Sheet (Low Gradient Ephemeral/Intermittent Streams)

RAPID HABITAT ASSESSMENT: LOW GRADIENT >>>>>>>>>>>>>>>>>>>>>>>>>>			Reviewers Initials	TC/AV
	Optimal	**Sub-optimal**	**Marginal**	**Poor**
6. BANK STABILITY (score each bank) *determine left/ right by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems (<5% of bank affected).	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LEFT: 2	10 9	8 7 6	5 4 3	2 1 0
RIGHT: 2	10 9	8 7 6	5 4 3	2 1 0
7. BANK VEGETATIVE PROTECTION SCORE:	More than 90% of the streambank surfaces and immediate riparian zones covered by vegetation including trees, understory shrubs, and non-woody plants (herbs, grasses, ferns, mosses); vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces are covered by vegetation, but one class of plants is not well represented; disruption evident, but not affecting plant growth potential to extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces are covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less that one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces are covered by vegetation; disruption of streambank vegetation very high; vegetation has been removed to 2 inches or less in average stubble height.
		If assessed in winter or early spring look for remnants of herbs, and saplings.		
LEFT: 5	10 9	8 7 6	5 4 3	2 1 0
RIGHT: 4	10 9	8 7 6	5 4 3	2 1 0
8. WIDTH OF UNDISTURBED VEG. ZONE (undisturbed veg. Is trees, shrubs, and non-woody macro-phytes)	Width of undisturbed vegetative zone is >18 meters; human activities (parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted this zone.	Zone width is between 12 and 18 meters; human activities have only minimally impacted this zone.	Zone width is between 6 and 12 meters; human activities have impacted the zone a great deal.	Width of zone is less than 6 meters; little or no undisturbed vegetation due to man-induced activities.
LEFT: 10	10 9	8 7 6	5 4 3	2 1 0
RIGHT: 10	10 9	8 7 6	5 4 3	2 1 0

TOTAL: (max=160)	**Max Pool Depth (if water is present; otherwise "NA")** 61 **cm** **Average Channel Width (Toe of Banks)** 2.74 **m**	**Total from front** 52 **+ Total from back** 33 **=** 85 **Score Percentage= Total Score /160 X 100** 53 **%**

Average Width Intact Rip Vegetative Zone (m)	**Left** 33.53 **m**	**Right** 39.62 **m**

→ What is the dominant vegetation type in the reach? ☑ **Deciduous** ☐ **Coniferous (pine/cypress)** ☐ **Mixed (>10%)**	**Estimated age of forest:** ✓ ***>50 yrs*** ___ ***25-50 yrs*** ___ ***5-25 yrs*** ___ ***<5 yrs*** **Number of strata** ***(e.g, canopy, subcanopy, shrub, herb (4 max))*** 4

Stream Surface Shading (%) (average of lower, middle, upper reach)	**Indicate % based on cloudless day in <u>summer</u> at noon. Fill in square that applies.**		
☐ **Fully exposed (0-25%)**	☑ **Partly shaded (25-50%)**	☐ **Partly exposed (50-75%)**	☐ **Fully shaded (75-100%)**
-or- % Canopy (Densiometer)		**Compass Bearing (facing downstream) (0-360°)**	

Appendix 1: Modified Environmental Protection Agency Rapid Bioassessment Protocol (EPA RBP)
Habitat Assessment Field Data Sheet (Low Gradient Ephemeral/Intermittent Streams)

RAPID HABITAT ASSESSMENT: LOW GRADIENT Ephemeral/Intermittent >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

Station ID/ Stream Name	Reach 3 Church Creek			**LAT (DD)**	39.473697
Reach Length (m)		Date	2022/11/03	**LONG (DD)**	-76.247259

HABITAT PARAMETER	**CATEGORY** Optimal	Sub-optimal	Marginal	Poor
1. SUBSTRATE/ DIVERSITY **AVAILBLE COVER FOR AMPHIBIANS CRAYFISH** **SCORE:** 7	*Greater than 50% of substrate consisting of mix of snags, tree roots or other stable habitat providing cover for amphibians and aquatic or terrestrial invertebrates. LWD in moderate to advanced stage of decay and within- active channel; Substrate roughness capable of trapping lots of organic matter. If moss covered, rate high.*	*30 to 50% cover and mix of diverse stable habitat; well suited for full cover potential; adequate habitat for maintenance of populations; presence of additional LWD in the form of new fall. Substrate roughness still capable of trapping organic matter.*	*10 to 30% mix of stable cover; habitat availability less than desirable; substrate frequently disturbed or removed. LWD low in density and/or may be new fall or in early decay stage. Some areas suitable for trapping organic matter. If lg. wood is absent, score low.*	*Less than 10% stable cover; lack of habitat is obvious; substrate unstable or lacking. Few areas suitable for trapping organic matter.*
	Rate in Channel and Toe of Banks			
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. POOL SUBSTRATE CHARACTER-IZATION **In dry channels, pool areas should still be observable** **SCORE:** 10	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged (or remnant) aquatic vegetation are common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged (or remnant) vegetation are present.	All mud or clay or sand bottom; little or no root mat; no submerged (or remnant) vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. CHANNEL ALTERATION **SCORE:** 20	Channelization or dredging absent of minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging (>than past 20 years) may be present, but no evidence of recent channelization.	Channelization may be extensive; embankments or shoring structures present on both banks; 40 to 80% of the stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. SEDIMENT DEPOSITION **SCORE:** 11	Little or no enlargement of "islands" or point bars and less than 20% of the bottom affected by fine sediment deposition. Leaf packs and woody debris with minimal silt covering.	Some new increase in bar formation mostly from sand, or fine sediment; 20 to 50% of the bottom is affected; slight deposition in pools. Leaf packs with moderate silt covering.	Moderate deposition of new sand, or fine sediment on old and new bars; 50 to 80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent. Leaf packs with heavier silt covering.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. CHANNEL SINUOSITY **SCORE:** 6	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	the bends in the stream increase the stream length up to 2 times longer than if it was in a straight line.	Channel is straight; waterway has been channelized for a long distance.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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Habitat Assessment Field Data Sheet (Low Gradient Ephemeral/Intermittent Streams)

RAPID HABITAT ASSESSMENT: LOW GRADIENT >>>>>>>>>>>>>>>>>>>>>>>>>>>			Reviewers Initials	TC/AV
	Optimal	**Sub-optimal**	**Marginal**	**Poor**
6. BANK STABILITY (score each bank) *determine left/ right by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems (<5% of bank affected).	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LEFT: 3	10 9	8 7 6	5 4 3	2 1 0
RIGHT: 3	10 9	8 7 6	5 4 3	2 1 0
7. BANK VEGETATIVE PROTECTION SCORE:	More than 90% of the stream-bank surfaces and immediate riparian zones covered by vegetation including trees, understory shrubs, and non-woody plants (herbs, grasses, ferns, mosses); vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces are covered by vegetation, but one class of plants is not well represented; disruption evident, but not affecting plant growth potential to extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces are covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less that one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces are covered by vegetation; disruption of streambank vegetation very high; vegetation has been removed to 2 inches or less in average stubble height.
		If assessed in winter or early spring look for remnants of herbs, and saplings.		
LEFT: 6	10 9	8 7 6	5 4 3	2 1 0
RIGHT: 6	10 9	8 7 6	5 4 3	2 1 0
8. WIDTH OF UNDISTURBED VEG. ZONE (undisturbed veg. Is trees, shrubs, and non-woody macro-phytes)	Width of undisturbed vege-tative zone is >18 meters; human activities (parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted this zone.	Zone width is between 12 and 18 meters; human activities have only minimally impacted this zone.	Zone width is between 6 and 12 meters; human activities have impacted the zone a great deal.	Width of zone is less than 6 meters; little or no un-disturbed vegetation due to man-induced activities.
LEFT: 10	10 9	8 7 6	5 4 3	2 1 0
RIGHT: 10	10 9	8 7 6	5 4 3	2 1 0

TOTAL: (max=160)	Max Pool Depth (if water is present; otherwise "NA") 20.3 cm Average Channel Width (Toe of Banks) 3 m	Total from front 54 + Total from back 38 = 92 Score Percentage= Total Score /160 X 100 57.5 %

Average Width Intact Rip Vegetative Zone (m)	Left 36.58 m	Right 70 m

→ What is the dominant vegetation type in the reach? ☑ Deciduous ☐ Coniferous (pine/cypress) ☐ Mixed (>10%)	Estimated age of forest: ✓ >50 yrs ____ 25-50 yrs ____ 5-25 yrs ____ <5 yrs Number of strata *(e.g, canopy, subcanopy, shrub, herb (4 max))* 4

Stream Surface Shading (%) (average of lower, middle, upper reach)	Indicate % based on cloudless day in summer at noon. Fill in square that applies.		
☐ Fully exposed (0-25%)	☐ Partly shaded (25-50%)	☑ Partly exposed (50-75%)	☐ Fully shaded (75-100%)
-or- % Canopy (Densiometer)		Compass Bearing (facing downstream) (0-360°)	

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Habitat Assessment Field Data Sheet (Low Gradient Ephemeral/Intermittent Streams)

RAPID HABITAT ASSESSMENT: LOW GRADIENT Ephemeral/Intermittent >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

Station ID/ Stream Name	Reach 4 Church Creek	**LAT (DD)**	39.472648
Reach Length (m)		Date 2022/11/03	**LONG (DD)** -76.247687

HABITAT PARAMETER	CATEGORY			
	Optimal	**Sub-optimal**	**Marginal**	**Poor**
1. SUBSTRATE/ DIVERSITY **AVAILBLE COVER FOR AMPHIBIANS CRAYFISH** **SCORE:** 5	*Greater than 50% of substrate consisting of mix of snags, tree roots or other stable habitat providing cover for amphibians and aquatic or terrestrial invertebrates. LWD in moderate to advanced stage of decay and within- active channel; Substrate roughness capable of trapping lots of organic matter. If moss covered, rate high.*	*30 to 50% cover and mix of diverse stable habitat; well suited for full cover potential; adequate habitat for maintenance of populations; presence of additional LWD in the form of new fall. Substrate roughness still capable of trapping organic matter.*	*10 to 30% mix of stable cover; habitat availability less than desirable; substrate frequently disturbed or removed. LWD low in density and/or may be new fall or in early decay stage. Some areas suitable for trapping organic matter. If lg. wood is absent, score low.*	*Less than 10% stable cover; lack of habitat is obvious; substrate unstable or lacking. Few areas suitable for trapping organic matter.*
	Rate in Channel and Toe of Banks			
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. POOL SUBSTRATE CHARACTER-IZATION **In dry channels, pool areas should still be observable** **SCORE:** 10	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged (or remnant) aquatic vegetation are common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged (or remnant) vegetation are present.	All mud or clay or sand bottom; little or no root mat; no submerged (or remnant) vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. CHANNEL ALTERATION **SCORE:** 20	Channelization or dredging absent of minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging (>than past 20 years) may be present, but no evidence of recent channelization.	Channelization may be extensive; embankments or shoring structures present on both banks; 40 to 80% of the stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. SEDIMENT DEPOSITION **SCORE:** 13	Little or no enlargement of "islands" or point bars and less than 20% of the bottom affected by fine sediment deposition. Leaf packs and woody debris with minimal silt covering.	Some new increase in bar formation mostly from sand, or fine sediment; 20 to 50% of the bottom is affected; slight deposition in pools. Leaf packs with moderate silt covering.	Moderate deposition of new sand, or fine sediment on old and new bars; 50 to 80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent. Leaf packs with heavier silt covering.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. CHANNEL SINUOSITY **SCORE:** 8	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	the bends in the stream increase the stream length up to 2 times longer than if it was in a straight line.	Channel is straight; waterway has been channelized for a long distance.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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RAPID HABITAT ASSESSMENT: LOW GRADIENT >>>>>>>>>>>>>>>>>>>>>>>>>>>			Reviewers Initials	TC/AV
	Optimal	**Sub-optimal**	**Marginal**	**Poor**
6. BANK STABILITY (score each bank) *determine left/ right by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems (<5% of bank affected).	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LEFT: 1	10 9	8 7 6	5 4 3	2 1 0
RIGHT: 2	10 9	8 7 6	5 4 3	2 1 0
7. BANK VEGETATIVE PROTECTION **SCORE:**	More than 90% of the streambank surfaces and immediate riparian zones covered by vegetation including trees, understory shrubs, and non-woody plants (herbs, grasses, ferns, mosses); vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces are covered by vegetation, but one class of plants is not well represented; disruption evident, but not affecting plant growth potential to extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces are covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less that one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces are covered by vegetation; disruption of streambank vegetation very high; vegetation has been removed to 2 inches or less in average stubble height.
		If assessed in winter or early spring look for remnants of herbs, and saplings.		
LEFT: 0	10 9	8 7 6	5 4 3	2 1 0
RIGHT: 2	10 9	8 7 6	5 4 3	2 1 0
8. WIDTH OF UNDISTURBED VEG. ZONE (undisturbed veg. Is trees, shrubs, and non-woody macro-phytes)	Width of undisturbed vegetative zone is >18 meters; human activities (parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted this zone.	Zone width is between 12 and 18 meters; human activities have only minimally impacted this zone.	Zone width is between 6 and 12 meters; human activities have impacted the zone a great deal.	Width of zone is less than 6 meters; little or no undisturbed vegetation due to man-induced activities.
LEFT: 10	10 9	8 7 6	5 4 3	2 1 0
RIGHT: 10	10 9	8 7 6	5 4 3	2 1 0

TOTAL: (max=160)	**Max Pool Depth (if water is present; otherwise "NA")** 35.6 **cm** **Average Channel Width (Toe of Banks)** 3.7 **m**	**Total from front** 56 **+ Total from back** 25 **=** 81 **Score Percentage= Total Score /160 X 100** 51 **%**

Average Width Intact Rip Vegetative Zone (m)	**Left** 51.82 **m**	**Right** 67 **m**

→ **What is the dominant vegetation type in the reach?** ☑ **Deciduous** ☐ **Coniferous (pine/cypress)** ☐ **Mixed (>10%)**	**Estimated age of forest:** ✓ *>50 yrs* ___ *25-50 yrs* ___ *5-25 yrs* ___ *<5 yrs* **Number of strata** *(e.g, canopy, subcanopy, shrub, herb (4 max))* 4

Stream Surface Shading (%) (average of lower, middle, upper reach)	**Indicate % based on cloudless day in summer at noon. Fill in square that applies.**		
☐ **Fully exposed (0-25%)**	☐ **Partly shaded (25-50%)**	☑ **Partly exposed (50-75%)**	☐ **Fully shaded (75-100%)**
-or- % Canopy (Densiometer)	**Compass Bearing (facing downstream) (0-360°)**		