



MONITORING YEAR 3 ANNUAL REPORT FINAL

January 2024

LYON HILLS MITIGATION SITE

Wilkes County, NC
Yadkin River Basin
HUC 03040101

DMS Project No. 100085
NCDEQ Contract No. 7620
USACE Action ID No. SAW-2018-01784
DWR Project No. 2018-1274 v1
Data Collection Dates: January-November 2023

DMS RFP No. 16-007406
June 19, 2018

PREPARED FOR:



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

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Governor

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Secretary

MARC RECKTENWALD
Director



Mr. Jeff Keaton, PE
Wildlands Engineering, Inc.
312 West Millbrook Road, Suite 225
Raleigh, NC 27609

January 2, 2024

Subject: Lyon Hills Mitigation Site – Monitoring Year 3 Draft Report
Yadkin River Basin – CU# 03040101
Wilkes County
DMS Project ID No. 100085
Contract # 7620

Dear Mr. Keaton:

On November 22, 2023, the Division of Mitigation Services (DMS) received the Draft Monitoring Year 3 Report for the Lyon Hills Mitigation Site from Wildlands Engineering, Inc. (WEI).

The report establishes the year 3 monitoring conditions on the project site. Anticipated mitigation on the site includes recordation of a 20.72-acre conservation easement and restoration, enhancement I, and enhancement II of 9,363 linear feet of perennial and intermittent stream channels. The project is expected to provide 5,304.783 stream credits at closeout. The following are our comments on the draft report:

Section 2.2 - Vegetation Areas of Concern and Management Activity: DMS is encouraged by the successful reduction in the invasive plant community. Thank you for closely monitoring the *Murdannia* in UT4 and UT5 and providing an interpretation of how the invasives should respond over time.

Section 2.4 - Stream Areas of Concern and Management Activity, Stream Repair: Please indicate why the rip-rap reinforcement was scoured on the downstream side of the crossing. Did the culvert become blocked increasing the stage upstream of the culvert or did another mechanism contribute to the erosion? Please indicate any measures taken to reduce the chance for a recurrence; was the rip-rap size increased or the grading geometry altered?

Section 2.5 Hydrology Assessment: Thank you for extending the data collection period through October.

Appendix F. Additional Documentation: Thank you for including comparison photographs showing the culvert before and after the repair.



North Carolina Department of Environmental Quality | Division of Mitigation Services
217 West Jones Street | 1652 Mail Service Center | Raleigh, North Carolina 27699-1652
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Digital Deliverable:

- Please review and revise the stream areas of concern and structure repairs as submitted to reflect the CCPV in the report. The report and stream visual assessment table indicates 1 structure on R 4 as problematic and no other areas of stream concern; the data submitted indicates two structures repaired, one in the same location as the problem area identified, and six areas of stream erosion/instability..

At your earliest convenience, please provide an electronic response letter addressing the DMS comments. The comment response letter should be included in the Final MY3 revised report and included after the report cover page.

Please submit two (2) final hard copies and an electronic copy on USB drive to my attention at the address below (Mooresville Regional office). Please also include all final MY3 project support files on the USB drive. The final electronic monitoring report with all attachments should be named: *LyonHills_100085_MY3_2023.pdf*

If you have any questions, please contact me at any time at (919) 723-7565 or email me at kelly.phillips@ncdenr.gov.

Sincerely,

Kelly Phillips

Kelly Phillips
Project Manager
NCDEQ – Division of Mitigation Services
610 East Center Avenue
Suite 301
Mooresville, NC 28115
919-723-7565

cc: file





January 15, 2024

Mr. Kelly Phillips
Project Manager
NCDEQ – Division of Mitigation Services
610 East Center Avenue
Mooresville, NC 28115

RE: Lyon Hills Mitigation Site – Monitoring Year 3 Draft Report
Yadkin River Basin – CU# 03040101
Wilkes County, NC
DMS Project ID No. 100085
Contract # 7620

Dear Mr. Phillips:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services' (DMS) comments from the Lyon Hills Mitigation Site Monitoring Year 3 Annual Report, received on January 2, 2024. The draft report has been revised for the final submittal to reflect those comments. DMS' comments are noted below in **Bold**. Wildlands' responses to those comments are noted in *Italics*.

DMS' Comment: DMS is encouraged by the successful reduction in the invasive plant community. Thank you for closely monitoring the Murdannia in UT4 and UT5 and providing an interpretation of how the invasives should respond over time.

Wildlands' Response: Thank you for the comment.

DMS' Comment: Please indicate why the rip-rap reinforcement was scoured on the downstream side of the crossing. Did the culvert become blocked increasing the stage upstream of the culvert or did another mechanism contribute to the erosion? Please indicate any measures taken to reduce the chance for a recurrence; was the rip-rap size increased or the grading geometry altered?

Wildlands' Response: In the summer of 2023, debris from several large storm events blocked the culvert inlet. The blocked inlet caused water to flow over the crossing during a large storm event and erode the rip-rap reinforcement on the downstream side of the culvert. To repair the culvert revetment, Wildlands conducted some light grading and redressed the headwall with Class-1 and Class-2 stone size rip-rap. The report text has been modified to include the additional repair and material details. Wildlands will continue to monitor all internal crossings for signs of blockage and instability.

DMS' Comment: Thank you for extending the data collection period through October.

Wildlands' Response: Thank you for the comment.

DMS' Comment: Thank you for including comparison photographs showing the culvert before and after the repair.

Wildlands' Response: Thank you for the comment.



Digital Support File Comments:

DMS' Comment: Please review and revise the stream areas of concern and structure repairs as submitted to reflect the CCPV in the report. The report and stream visual assessment table indicates 1 structure on R 4 as problematic and no other areas of stream concern; the data submitted indicates two structures repaired, one in the same location as the problem area identified, and six areas of stream erosion/instability.

Wildlands' Response: The report and CCPV Figures accurately reflect that there is only one stream area of concern, and it is located on UT4 Reach 2. The geodatabase has been updated to correctly reflect a single area of concern. However, the structure issue was inadvertently included on the Visual Assessment Table (Table 4) for UT4 Reach 3. This is incorrect. There are no issues on UT4 Reach 3, so the table has been updated to correctly reflect this. Since UT4 Reach 2 is an EII reach and EII reaches are not reported in the Visual Assessment Tables, no other Table 4 updates are needed.

As requested, Wildlands has included two (2) hard copies of the final report, a full final .pdf copy of the report, and a full final electronic submittal of the support files. A copy of the DMS comment letter and our response letter have been included inside the front cover of each report's hard copy, as well as the .pdf version of the report. Please let me know if you have any questions.

Sincerely,

A handwritten signature in blue ink that reads "Kristi Suggs".

Kristi Suggs
Senior Environmental Scientist

PREPARED BY:



Wildlands Engineering, Inc.
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Charlotte, NC 28203

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LYON HILLS MITIGATION SITE
Monitoring Year 3 Annual Report

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Section 1: PROJECT OVERVIEW

The Lyon Hills Mitigation Site (Site) is located in Wilkes County, approximately eleven miles northwest of the Town of Elkin. The Site contains a network of streams that range in drainage area from five acres to 9.58 square miles. These include a portion of Sparks Creek, Hanks Branch (tributary to Sparks Creek), five unnamed tributaries to Hanks Branch; four of which originate within the project limits, and two unnamed tributaries to Sparks Creek. Sparks Creek and its tributaries are located within the East Prong Roaring River 12-digit HUC (030401010600). The Site is within a targeted local watershed (TLW) but is not in a local watershed planning (LWP) area. The HUC is described in the 2009 Upper Yadkin Pee-Dee River Basin Restoration Priorities (RBRP) document (NC DMS, 2009).

1.1 Project Quantities and Credits

A conservation easement was recorded on 20.72 acres. Mitigation work within the Site included restoration, enhancement I, and enhancement II of 9,363 linear feet of perennial and intermittent stream channels. The project is expected to provide 5,304.783 stream credits at closeout.

Table 1: Project Quantities and Credits

PROJECT MITIGATION QUANTITIES							
Project Segment	Mitigation Plan Footage	As-Built Footage	Mitigation Category	Restoration Level	Mitigation Ratio (X:1)	Credits	Comments
STREAMS							
Spark Creek – Not for Credit	215	215	Cool	EII	2.5	0	No buffer on right side
Sparks Creek	405	405	Cool	EII	2.5	162.000	Fenced Out Cattle, Planted Buffer
Sparks Creek - Not for Credit	42	42	Cool	EII	2.5	0	Ford Crossing
Sparks Creek	332	332	Cool	EII	2.5	132.800	Fenced Out Cattle, Planted Buffer
Hanks Branch Reach 1	1,678	1,659	Cool	EII	2.5	671.200	Localized Bank Repairs, Floodplain Bench at Upstream End, Fenced Out Cattle
Hanks Branch Reach 2	1,065	1,012	Cool	EII	2.5	426.000	Fenced Out Cattle, Localized Bank Repairs, Planted Buffer, Add Wood to Channel
Hanks Branch Reach 2 - Not for Credit	42	42	Cool	EII	2.5	0	Culvert Crossing
Hanks Branch Reach 3	581	585	Cool	EI	1.5	387.333	Fenced Out Cattle, Floodplain Bench, Planted Buffer
UT1 - Not for Credit	60	57	Cool	R	1	0	TCE to work above property line
UT1	659	657	Cool	R	1	659.000	Restored Dimension, Pattern, and Profile, Planted Buffer
UT1 - Not for Credit	40	40	Cool	R	1	0	Culvert Crossing
UT1	106	105	Cool	R	1	106.000	Restored Dimension, Pattern, and Profile, Planted Buffer
UT2	78	78	Cool	EII	3	26.000	Fenced Out Cattle

PROJECT MITIGATION QUANTITIES							
Project Segment	Mitigation Plan Footage	As-Built Footage	Mitigation Category	Restoration Level	Mitigation Ratio (X:1)	Credits	Comments
STREAMS							
UT3 Reach 1	655	652	Cool	R	1	655.000	Restored Dimension, Pattern, and Profile, Planted Buffer
UT3 Reach 2	447	436	Cool	EII	2.5	178.800	Fenced Out Cattle, Localized Bank Repairs, Planted Buffer
UT3 Reach 3	513	512	Cool	R	1	513.000	Restored Dimension, Pattern, and Profile, Planted Buffer
UT3 Reach 3 - Not for Credit	45	45	Cool	R	1	0	Culvert Crossing
UT3 Reach 3	74	74	Cool	R	1	74.000	Restored Dimension, Pattern, and Profile, Planted Buffer
UT3 Reach 4	272	271	Cool	EII	4	68.000	Fenced Out Cattle, Planted Buffer
UT3A	253	252	Cool	EII	2.5	101.200	Fenced Out Cattle, Planted Buffer
UT4 Reach 1	233	233	Cool	R	1	233.000	Restored Dimension, Pattern, and Profile, Planted Buffer
UT4 Reach 2	323	319	Cool	EII	2.5	129.200	Fenced Out Cattle, Stabilize Headcuts, Planted Buffer
UT4 Reach 3	140	139	Cool	R	1	140.000	Restored Dimension, Pattern, and Profile, Planted Buffer
UT4 Reach 3 - Not for Credit	40	40	Cool	R	1	0	Culvert Crossing
UT4 Reach 3	100	100	Cool	R	1	100.000	Restored Dimension, Pattern, and Profile, Planted Buffer
UT5 Reach 1	437	437	Cool	EII	4	109.250	Fenced Out Cattle
UT5 Reach 2	220	221	Cool	R	1	220.000	Restored Dimension, Pattern, and Profile, Planted Buffer, Removed Impoundment
UT5 Reach 2 - Not for Credit	35	35	Cool	R	1	0	Culvert Crossing
UT5 Reach 2	107	107	Cool	R	1	107.000	Restored Dimension, Pattern, and Profile, Planted Buffer
UT5A	318	318	Cool	EII	3	106.000	Fenced Out Cattle
Total						5,304.783	

Restoration Level	Stream		
	Warm	Cool	Cold
Restoration		2,807.000	
Enhancement I		387.333	
Enhancement II		2,110.450	
Preservation		---	
Totals		5,304.783	
Total Stream Credit	5,304.783		

1.2 Project Goals and Objectives

The project is intended to provide numerous ecological benefits within the Yadkin River Basin. While benefits such as habitat improvement and geomorphic stability are limited to the Site, reduced nutrient and sediment loading have farther reaching effects. Table 2 below describes expected outcomes to water quality and ecological processes associated with the project goals and objectives. These goals were established and completed with careful consideration of goals and objectives described in the RBRP and to meet the DMS mitigation needs while maximizing the ecological and water quality uplift within the watershed.

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Improve the stability of stream channels	Construct stream channels that will maintain a stable pattern and profile considering hydrologic and sediment inputs to the system; install bank revetments and grade control; install bank vegetation.	Reduce erosion and sediment inputs; maintain appropriate bed forms and sediment size distribution.	ER over 1.4 for B-type and 2.2 for C-type channels and BHR below 1.2 with visual assessments showing progression towards stability.	Cross-sections will be assessed during MY1, 2, 3, 5, and 7 and visual inspections will be assessed annually.	Minor deviations from design; however, streams are stable and functioning as designed. All riffle XS BHRs are below 1.2 and ER are at least 1.4 for B-type channels and 2.2 for C-type channels.
Reconnect channels with floodplains and riparian wetlands	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to the existing floodplain.	Reduce shear stress on channel; hydrate adjacent wetland areas; filter pollutants out of overbank flows; provide surface storage of water on floodplain; increase groundwater recharge while reducing outflow of stormwater; support water quality and habitat goals.	Four bankfull events in separate years within monitoring period. 30 consecutive days of flow for intermittent channel.	Crest gages and/or stream gages recording flow elevations.	Hanks Branch Reach 3, UT1, UT3 Reach 3, UT4 Reach 3 and UT5 Reach 2 all obtained one or more bankfull events in MY3. UT4 Reach 1 obtained 129 days of consecutive flow during MY3.
Improve instream habitat	Install habitat features such as cover logs, log sills, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct a variety of riffle features and pools of varying depth. Fence out livestock.	Support biological communities and processes. Provide aquatic habitats for diverse populations of aquatic organisms.	There is no required performance standard for this metric.	N/A	N/A



Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Improve water quality	Stabilize stream banks. Plant riparian buffers with native trees. Construct BMPs to treat pasture runoff. Fence out livestock.	Reduce sediment and nutrient inputs from stream banks; reduce sediment, nutrient, and bacteria inputs from pasture runoff; keep livestock out of streams, further reducing pollutants in project streams.	There is no required performance standard for this metric.	N/A	N/A
Restore/improve riparian buffers	Plant native tree species in riparian zone where currently insufficient.	Provide a canopy to shade streams and reduce thermal loadings; stabilize stream banks and floodplain; support water quality and habitat goals.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7. Height requirement is 7 feet at MY5 and 10 feet at MY7.	One hundred square meter vegetation plots are placed on 2% of the planted area of the Site and monitored in MY1, 2, 3, 5 and 7.	All 9 vegetation plots have a planted stem density greater than 320 stems per acre; therefore, the Site has met the MY3 performance criteria.
Permanently protect the project Site from harmful uses	Establish conservation easements on the Site.	Ensure that development and agricultural uses that would damage the Site or reduce the benefits of the project are prevented.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	No easement encroachments.

1.3 Project Attributes

According to the RBRP, agricultural land use, including 30 animal operations, is a major stressor to aquatic resources in the lower portion of the HUC. Degraded riparian buffers are also noted as a significant stressor. Stressors described for the 8-digit HUC include erosion and sedimentation, including erosion from pasture lands, which had led to aquatic habitat degradation. Turbidity and fecal coliform bacteria violations have also been documented across the HUC. In addition, data from the 2008 Yadkin Pee-Dee River Basinwide Water Quality Plan (NC DWR, 2008) indicates that fecal coliform concentrations often exceeded the maximum regulatory limits in the HUC creating a potential health risk. The plan also notes that major stressors in the Yadkin River Basin include excessive sedimentation and changes in hydrology and geomorphology due to urban development and agriculture. Agriculture was identified in the plan as the most significant stressor leading to water quality degradation in the Yadkin River basin.

Table 3: Project Attributes

PROJECT INFORMATION					
Project Name	Lyon Hills Mitigation Site	County	Wilkes County		
Project Area (acres)	20.72	Project Coordinates	36.32924° N, 81.01018° W		
PROJECT WATERSHED SUMMARY INFORMATION					
Physiographic Province	Piedmont	River Basin	Yadkin		
USGS HUC 8-digit	03040101	USGS HUC 14-digit	03040101060030		
DWR Sub-basin	03-07-01	Land Use Classification	66% forested, 28% agriculture, 6% developed,		
Project Drainage Area (acres)	6,131	Percentage of Impervious Area	<1%		
RESTORATION TRIBUTARY SUMMARY INFORMATION					
Parameters	Hanks Branch	UT1	UT3	UT4	UT5
Pre-project length (feet)	3,384	930	2,112	836	793
Post-project (feet)	3,298	802	1,990	831	800
Valley confinement (Confined, moderately confined, unconfined)	Unconfined		Confined		Unconfined
Drainage area (acres)	669	37	46	12	13
Perennial, Intermittent, Ephemeral	Perennial				
DWR Water Quality Classification	C				
Dominant Stream Classification (existing)	C4	B4	B4	B4	B4
Dominant Stream Classification (proposed)	C4	B4	B4	B4	C4b
Dominant Evolutionary class (Simon) if applicable	Stage I		Stage IV		
REGULATORY CONSIDERATIONS					
Parameters	Applicable?	Resolved?	Supporting Documentation		
Water of the United States - Section 404	Yes	Yes	USACE Nationwide Permit No. 27 and DWQ 401 Water Quality Certification No. 4134.		
Water of the United States - Section 401	Yes	Yes			
Endangered Species Act	Yes	Yes	Categorical Exclusion in Mitigation Plan (Wildlands, 2019)		
Historic Preservation Act	Yes	Yes			
Coastal Zone Management Act (CZMA or CAMA)	N/A	N/A	N/A		
Essential Fisheries Habitat	N/A	N/A	N/A		



Section 2: MONITORING YEAR 3 DATA ASSESSMENT

Annual monitoring and site visits were conducted during MY3 to assess the condition of the project. The vegetation and stream success criteria for the Site follow the approved success criteria presented in the Mitigation Plan (Wildlands, 2020). Performance criteria for vegetation, stream, and hydrologic assessments are located in Section 1.2 Table 2: Goals, Performance Criteria, and Functional Improvements. Methodology for annual monitoring is presented in the MY0 Annual Report (Wildlands, 2021).

2.1 Vegetative Assessment

Vegetation plot monitoring is being conducted in post-construction monitoring years 1, 2, 3, 5, and 7. Permanent plots are monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008) and the 2016 USACE Stream and Wetland Mitigation Guidance to assess the vegetation success. A total of 7 permanent vegetation plots were established within the project easement area. All permanent plots were established as either a 10-meter by 10-meter square plot or 5-meter by 20-meter rectangular plot. In addition, 2 mobile vegetation plots were arbitrarily established in MY1 throughout the planted conservation easement to evaluate the random vegetation performance for the Site. Mobile plots have been or will be reestablished in differing and random locations in monitoring years 2, 3, 5, and 7. Mobile vegetation monitoring plot assessments will document stems, species, and height using a circular or 100-meter square/rectangular plot.

The MY3 vegetative survey was completed in July 2023. Vegetation monitoring resulted in a 100% of both permanent and mobile plots individually meeting the interim requirement of 320 stems per acre at MY3. Planted stem densities ranged from 324 to 607 stems per acre with an average planted stem density of 445 stems per acre. The average stem height is 4 feet, and the average species diversity is six species per plot. The survival rate among the planted stems in the permanent vegetation plots since as-built (MY0) is 80%, and the tree/shrub species with the lowest survival rates include black gum (*Nyssa sylvatica*), willow oak (*Quercus phellos*) and American sycamore (*Platanus occidentalis*). Along with successful tree growth, the herbaceous vegetation is dense and includes native pollinator species indicating a healthy riparian habitat. Please refer to Appendix 2 for vegetation plot photographs, Current Condition Plan View (CCPV) Figures 1a-c for vegetation plot locations, and Appendix B for vegetation data tables.

2.2 Vegetation Areas of Concern and Management Activity

MY3 visual assessments reveal that over 99% of the conservation easement is unaffected by invasive species populations. However, when found, they consisted of scattered patches along the existing woody buffers of Sparks Creek, UT4, UT3, and UT3A. Targeted invasive species treatments that were conducted in these areas consisted of mechanical invasive removal and herbicide applications in May and July 2023, effectively treating the following species: tree of heaven (*Ailanthus altissima*), Chinese privet (*Ligustrum sinense*), oriental bittersweet (*Celastrus orbiculatus*), honeysuckle (*Lonicera caprifolium*), and multiflora rose (*Rosa multiflora*). Contractors are scheduled to further treat these invasive species populations in late 2023, working alongside Wildlands.

After the removal and chemical treatment of in-stream vegetation in MY2, the establishment of marsh dewflower (*Murdannia keisak*) in riffles along UT4 Reach 1 and Reach 3 and UT5 Reach 2 diminished in MY3 and is no longer causing sedimentation in riffle beds or culverts. Wildlands anticipates that as riparian woody vegetation becomes established along streambanks, the establishment of in-stream vegetation will continue to diminish and no longer be an issue. Vegetation areas of concern will continue



to be monitored in MY4, and additional areas of invasive species will be treated throughout the post-construction monitoring period, as needed.

MY1 Visual assessments reveal that there were no easement boundary areas of concern. Wildlands staff walked the easement boundary and determined that signage and easement markers are sufficient and visible, the fencing is intact, and no encroachments have been identified. Wildlands will continue to monitor the easement boundary throughout the monitoring period.

2.3 Stream Assessment

Riffle cross-sections on the restoration reaches should be stable and should show little change in bankfull area and width-to-depth ratio. Per NC IRT 2016 guidance for compensatory mitigation, bank height ratios shall not exceed 1.2 and entrenchment ratios shall be at least 1.4 for restored B-type channels and 2.2 for restored C-type channels to be considered stable. All riffle cross-sections should fall within the parameters defined for channels of the appropriate stream type. If any changes do occur, these changes will be evaluated to assess whether the stream channel is showing signs of instability. Indicators of instability include a vertically incising thalweg, eroding channel banks and/or significant deposition within the streambed. Changes in the channel that indicate a movement toward stability, or an enhancement of aquatic habitat include a decrease in the width-to-depth ratio in meandering channels or an increase in pool depth. Remedial action would not be taken if channel changes indicate a movement toward stability.

Morphological surveys for MY3 were conducted in July 2023. Cross-section survey results indicate that channel dimensions are stable and functioning as designed on all restoration and enhancement I reaches with minimal adjustments. Changes occurring within some cross-sections include slight variations in cross-sectional areas and bankfull widths due to natural channel processes, such as vegetation growth along the top of bank and deposition in the floodplain. These adjustments have helped keep the channels stable, bank height ratios no greater than 1.1, and entrenchment ratios of at least 1.4 on B-type channels and 2.2 on C-type channels. Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table, and stream photographs. Refer to Appendix C for Stream Geomorphology Data.

2.4 Stream Areas of Concern and Management Activity

The MY3 visual assessment revealed that more than 99% of the project reaches' bed and banks are stable and performing as intended with only minor instances of scour and/or localized structure issues. On UT4 Reach 2, a log sill at station 604+40 is piping and exhibiting minimal scour on the right bank. Although not performing as intended, this structure issue currently has no negative impact on overall stream function. To address this issue, Wildlands will add herbaceous plugs along the bank to increase structure stability. Wildlands will continue to monitor the structure's stability, as well as the remainder of the project reaches and make additional repairs as needed. Refer to Appendix A for stream stability tables, Stream Areas of Concern Photographs, and CCPV Figures 1a-c.

Stream Repairs

Continuous storm events, occurring between June and July 2023 and resulting in a culmination of 12.54 inches of precipitation, resulted in the loss of most of the rip-rap protection on the downstream side of the culvert crossing on Hanks Branch Reach 3. To keep the crossing stable and minimize any additional erosion around the culvert, Wildlands conducted some light grading and redressed the headwall with Class-1 and Class-2 stone size rip-rap in August 2023. Wildlands will continue to monitor all the culverts within the project area, for continued stability. Refer to Appendix F for Repair Photos, and CCPV Figures b and 1c for the location of the repair.



2.5 Hydrology Assessment

Six automated pressure transducers were installed on restoration and enhancement reaches across the Site and are used to document stream hydrology throughout the seven-year monitoring period. Automated transducers are programmed to record every 2 hours. Five gages document bankfull events and are referred to as “crest gages” (CG). The remaining gage documents both baseflow and bankfull events and is referred to as “stream gage” (SG).

Re-Installations

Due to a barotroll logger malfunction in MY2, Wildlands installed a new barotroll in February of MY3 located on UT4 Reach 3. As previously discussed in Section 2.4, multiple large storm events caused crest gage 1 (CG1) on Hanks Branch Reach 3 to be washed away; therefore, no data was recorded from April 21st to July 20th. A replacement gage was installed on July 20th; however, no data was recorded from July 20th to October 10th due to a gage malfunction. CG1 was replaced on October 10th and is functioning as intended. Refer to CCPV Figure 1c, Appendix F for Bankfull Photographs and Appendix D for hydrological data.

Bankfull Events and Baseflow Monitoring

At the end of the seven-year monitoring period, four or more bankfull flow events must have occurred in separate years within the restoration and enhancement level I reaches. In MY3, at least 1 bankfull event was recorded on all the monitored project reaches (Hanks Branch Reach 3, UT1, UT3 Reach 3, UT4 Reach 3, UT5 Reach 2). Therefore, the performance standard for bankfull events has been partially met for the Site. Though the crest gage on Hanks Branch Reach 3 was washed away and a bankfull event was not recorded by an automated pressure transducer in MY3, bankfull indicators, such as wrack lines were observed and documented in June and October 2023 (Appendix F). In addition to receiving at least one bankfull event in MY3, the stream gage on UT4 Reach 1 documented 129 days of consecutive stream flow thereby exceeding the consecutive 30-day requirement. Refer to Appendix D for hydrologic data and Appendix F for Bankfull Photographs.

2.6 Monitoring Year 3 Summary

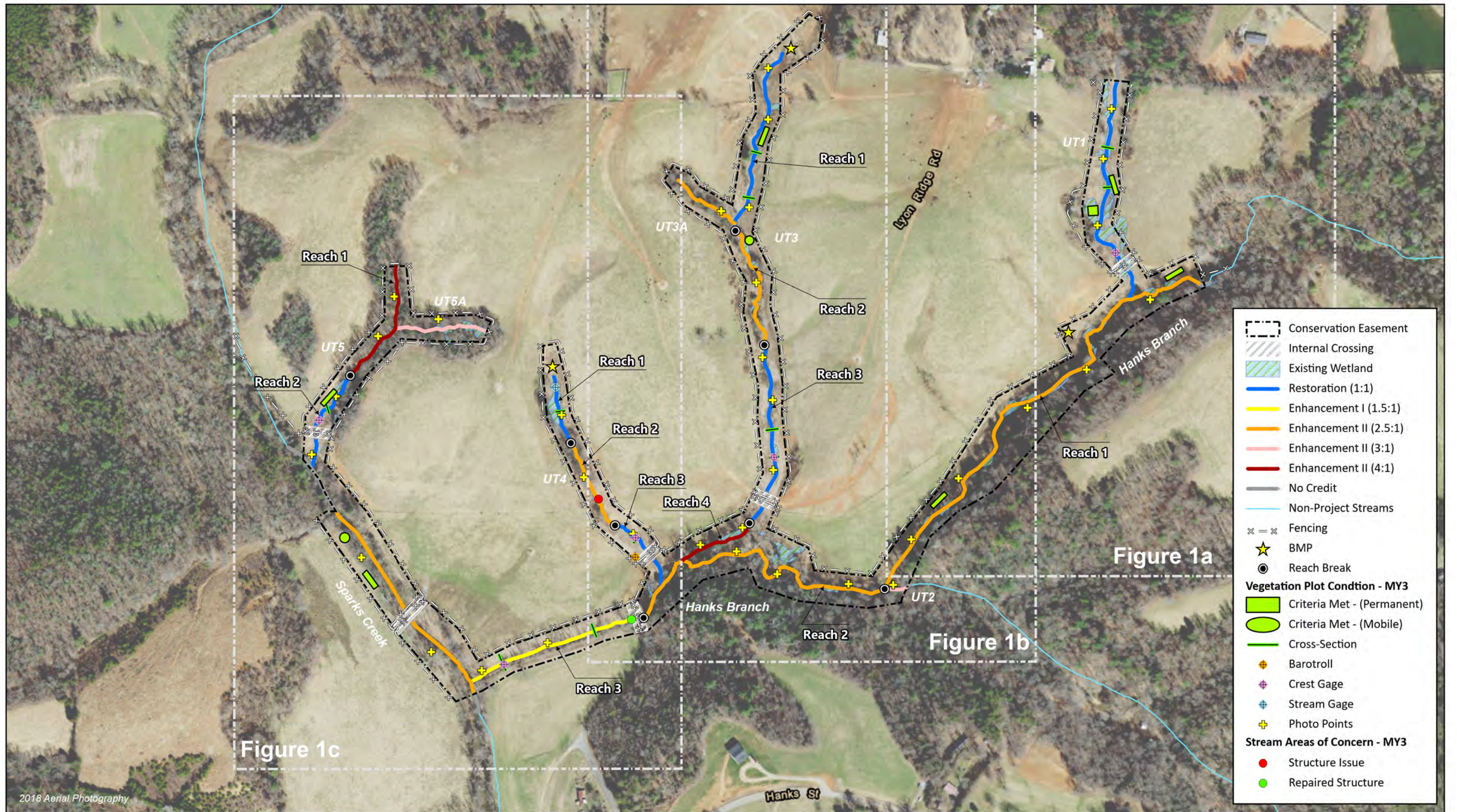
Overall, the Site has met the required stream, vegetation, and hydrology success criteria for MY3 and is on track to meet the final success criteria. With an overall average planted stem density of 445 stems per acre the Site has met and exceeded the MY3 requirement of 320 stems per acre. Geomorphic surveys indicate that cross-section bankfull dimensions closely match the baseline monitoring with some minor adjustments, and streams are functioning as intended. At least one bankfull event was documented on 100% of project reaches since the completion of construction. Greater than 30 days of consecutive flow was recorded on the intermittent section of UT4 Reach 1 fulfilling MY3 success criteria. The MY3 visual assessment documented a few small patches of invasive plant species and minor instances of in-stream vegetation, neither of which are negatively impacting the Site; however, they will continue to be treated as necessary in MY4 to maintain the condition of the project. Adaptive management activities will continue to be implemented as necessary throughout the seven-year monitoring period to benefit the ecological health of the Site. Summary information and data related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices.

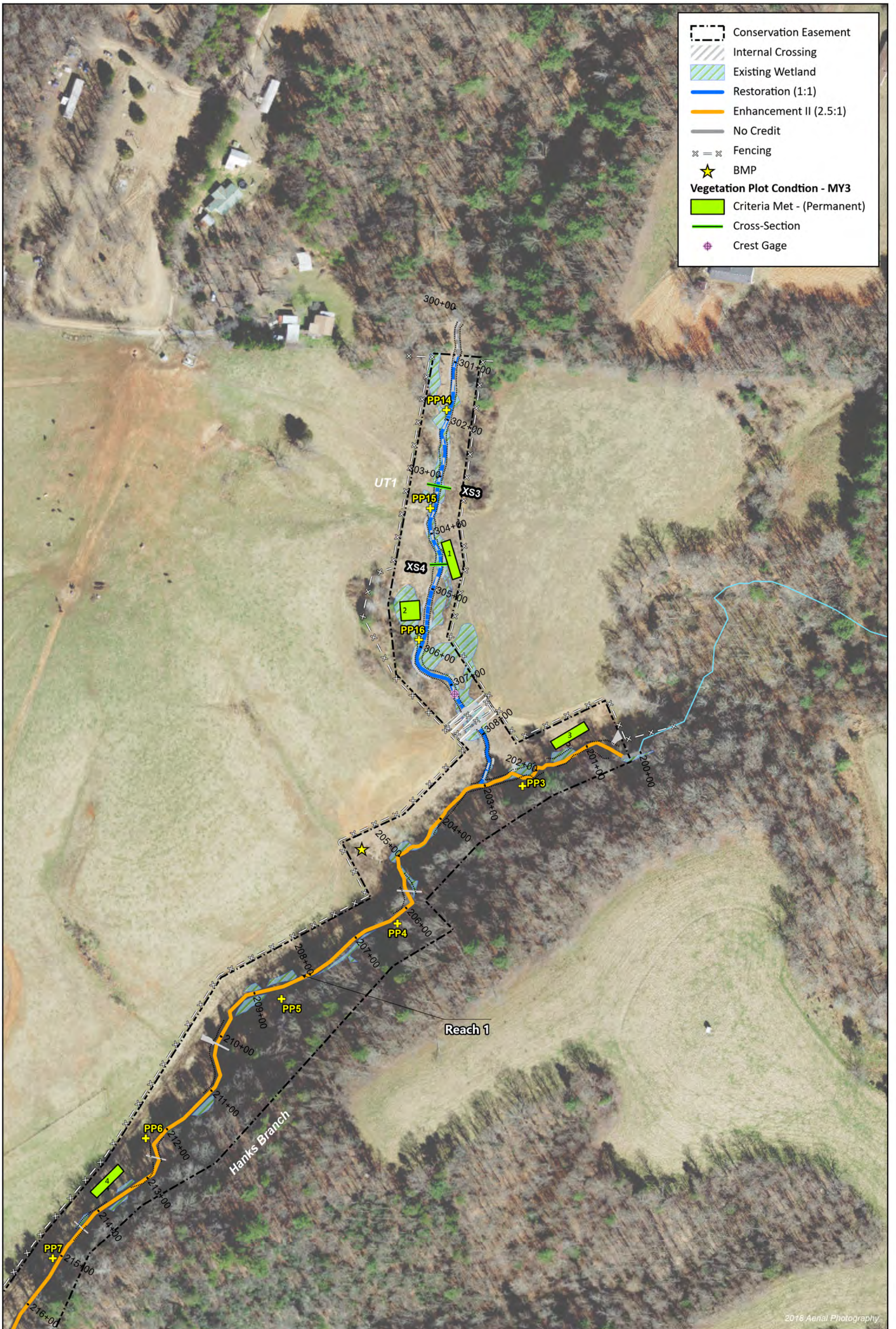


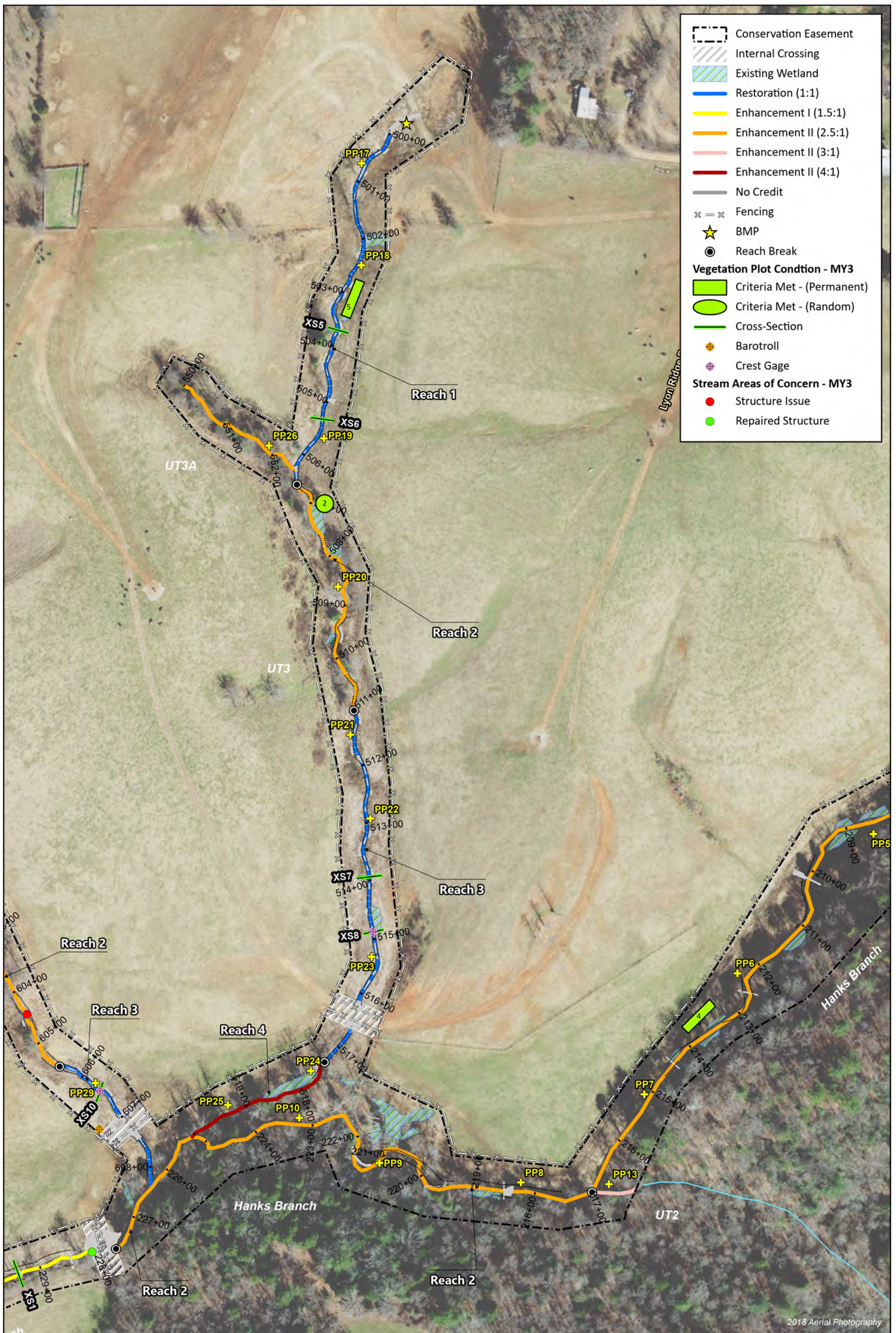
Section 3: REFERENCES

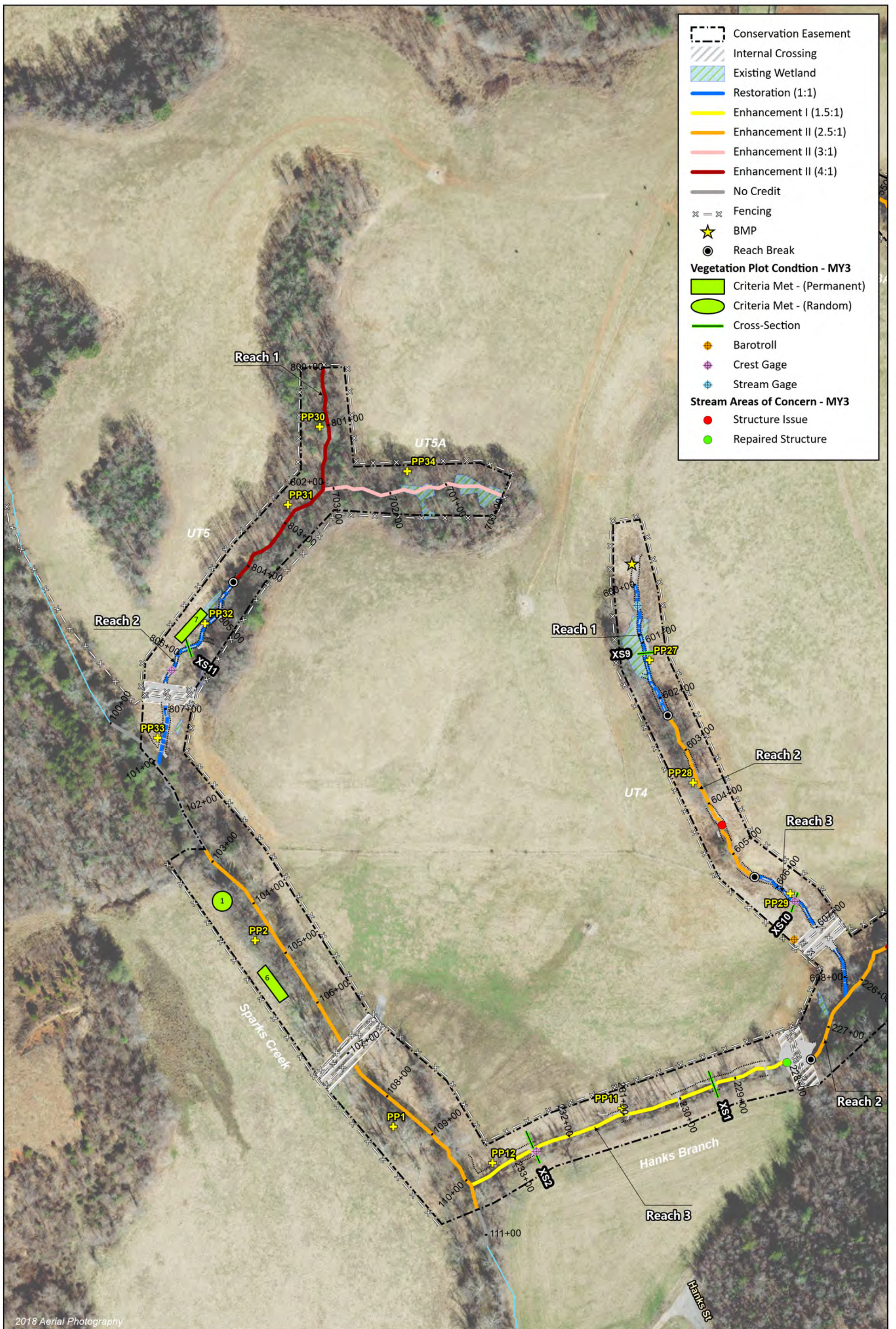
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FIGURES









APPENDIX A. Visual Assessment Data

Table 4. Visual Stream Morphology Stability Assessment Table

Lyon Hills Mitigation Site
 DMS Project No. 100085
 Monitoring Year 3 - 2023

Hanks Branch Reach 3

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	585
					Assessed Bank Length	1,170
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
					Totals:	0
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	5	5		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	0	0		N/A

Visual assessment was completed October 1, 2023.

UT1

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	802
					Assessed Bank Length	1,604
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
					Totals:	0
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	25	25		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	15	15		100%

Visual assessment was completed October 1, 2023.

Table 4. Visual Stream Morphology Stability Assessment Table

Lyon Hills Mitigation Site
 DMS Project No. 100085
 Monitoring Year 3 - 2023

UT3 Reach 1

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	652
					Assessed Bank Length	1,304
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
					Totals:	0
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	36	36		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	11	11		100%

Visual assessment was completed October 1, 2023.

UT3 Reach 3

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	631
					Assessed Bank Length	1,262
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
					Totals:	0
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	31	31		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	10	10		100%

Visual assessment was completed October 1, 2023.

Table 4. Visual Stream Morphology Stability Assessment Table

Lyon Hills Mitigation Site
 DMS Project No. 100085
 Monitoring Year 3 - 2023

UT4 Reach 1

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	233
					Assessed Bank Length	466
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
					Totals:	0
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	14	14		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	2	2		100%

Visual assessment was completed October 1, 2023.

UT4 Reach 3

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	279
					Assessed Bank Length	558
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
					Totals:	0
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	11	11		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	4	4		100%

Visual assessment was completed October 1, 2023.

Table 4. Visual Stream Morphology Stability Assessment Table

Lyon Hills Mitigation Site
 DMS Project No. 100085
 Monitoring Year 3 - 2023

UT5 Reach 2

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	363
					Assessed Bank Length	726
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
					Totals:	0
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	15	15		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	6	6		100%

Visual assessment was completed October 1, 2023.

Table 5. Vegetation Condition Assessment Table

Lyon Hills Mitigation Site
 DMS Project No. 100085
 Monitoring Year 3 - 2023

Planted Acreage 10.80

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10	0	0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10	0	0%
Total			0	0%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10	0	0%
Cumulative Total			0.0	0%

Visual assessment was completed October 1, 2023.

Easement Acreage 20.72

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Invasive species included in summation above should be identified in report summary.	0.10	0	0%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists	none	0 Encroachments Noted / 0 ac	

STREAM PHOTOGRAPHS



PHOTO POINT 1 Spark's Creek – upstream (4/21/2023)



PHOTO POINT 1 Spark's Creek – downstream (4/21/2023)



PHOTO POINT 2 Spark's Creek – upstream (4/21/2023)



PHOTO POINT 2 Spark's Creek – downstream (4/21/2023)



PHOTO POINT 3 Hank's Branch R1 – upstream (4/21/2023)



PHOTO POINT 3 Hank's Branch R1 – downstream (4/21/2023)





PHOTO POINT 4 Hank's Branch R1 – upstream (4/21/2023)



PHOTO POINT 4 Hank's Branch R1 – downstream (4/21/2023)



PHOTO POINT 5 Hank's Branch R1 – upstream (4/21/2023)



PHOTO POINT 5 Hank's Branch R1 – downstream (4/21/2023)



PHOTO POINT 6 Hank's Branch R1 – upstream (4/21/2023)



PHOTO POINT 6 Hank's Branch R1 – downstream (4/21/2023)





PHOTO POINT 7 Hank's Branch R1 – upstream (4/21/2023)



PHOTO POINT 7 Hank's Branch R1 – downstream (4/21/2023)



PHOTO POINT 8 Hank's Branch R2 – upstream (4/21/2023)



PHOTO POINT 8 Hank's Branch R2 – downstream (4/21/2023)



PHOTO POINT 9 Hank's Branch R2 – upstream (4/21/2023)



PHOTO POINT 9 Hank's Branch R2 – downstream (4/21/2023)





PHOTO POINT 10 Hank's Branch R2 – upstream (4/21/2023)



PHOTO POINT 10 Hank's Branch R2 – downstream (4/21/2023)



PHOTO POINT 11 Hank's Branch R3 – upstream (4/21/2023)



PHOTO POINT 11 Hank's Branch R3 – downstream (4/21/2023)



PHOTO POINT 12 Hank's Branch R3 – upstream (4/21/2023)



PHOTO POINT 12 Hank's Branch R3 – downstream (4/21/2023)





PHOTO POINT 13 UT2 – upstream (4/21/2023)



PHOTO POINT 13 UT2 – downstream (4/21/2023)



PHOTO POINT 14 UT1 – upstream (4/21/2023)



PHOTO POINT 14 UT1 – downstream (4/21/2023)



PHOTO POINT 15 UT1 – upstream (4/21/2023)



PHOTO POINT 15 UT1 – downstream (4/21/2023)





PHOTO POINT 16 UT1 – upstream (4/21/2023)



PHOTO POINT 16 UT1 – downstream (4/21/2023)



PHOTO POINT 17 UT3 R1 – upstream (4/21/2023)



PHOTO POINT 17 UT3 R1 – downstream (4/21/2023)



PHOTO POINT 18 UT3 R1 – upstream (4/21/2023)



PHOTO POINT 18 UT3 R1 – downstream (4/21/2023)





PHOTO POINT 19 UT3 R1 – upstream (4/21/2023)



PHOTO POINT 19 UT3 R1 – downstream (4/21/2023)



PHOTO POINT 20 UT3 R2 – upstream (4/21/2023)



PHOTO POINT 20 UT3 R2 – downstream (4/21/2023)



PHOTO POINT 21 UT3 R3 – upstream (4/21/2023)



PHOTO POINT 21 UT3 R3 – downstream (4/21/2023)





PHOTO POINT 22 UT3 R3 – upstream (4/21/2023)



PHOTO POINT 22 UT3 R3 – downstream (4/21/2023)

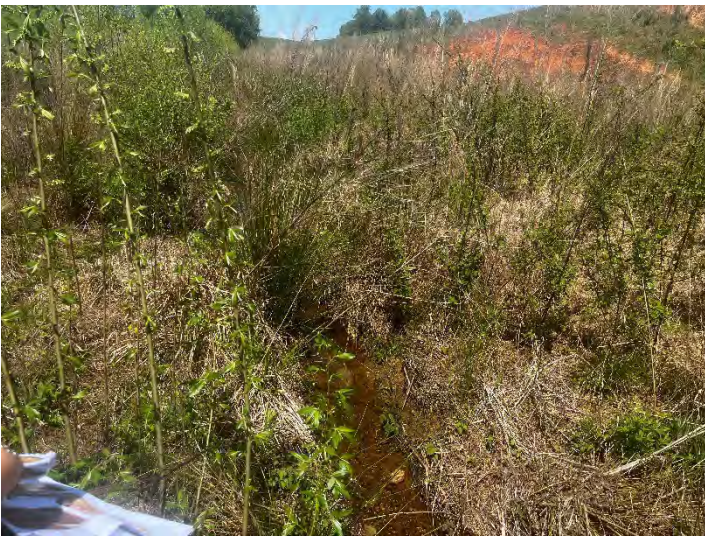


PHOTO POINT 23 UT3 R3 – upstream (4/21/2023)



PHOTO POINT 23 UT3 R3 – downstream (4/21/2023)



PHOTO POINT 24 UT3 R4 – upstream (4/21/2023)



PHOTO POINT 24 UT3 R4 – downstream (4/21/2023)





PHOTO POINT 25 UT3 R4 – upstream (4/21/2023)



PHOTO POINT 25 UT3 R4 – downstream (4/21/2023)



PHOTO POINT 26 UT3A – upstream (4/21/2023)



PHOTO POINT 26 UT3A – downstream (4/21/2023)



PHOTO POINT 27 UT4 R1 – upstream (4/21/2023)



PHOTO POINT 27 UT4 R1 – downstream (4/21/2023)





PHOTO POINT 28 UT4 R2 – upstream (4/21/2023)



PHOTO POINT 28 UT4 R2 – downstream (4/21/2023)



PHOTO POINT 29 UT4 R3 – upstream (4/21/2023)



PHOTO POINT 29 UT4 R3 – downstream (4/21/2023)



PHOTO POINT 30 UT5 R1 – upstream (4/21/2023)



PHOTO POINT 30 UT5 R1 – downstream (4/21/2023)





PHOTO POINT 31 UT5 R1 – upstream (4/21/2023)



PHOTO POINT 31 UT5 R1 – downstream (4/21/2023)



PHOTO POINT 32 UT5 R2 – upstream (4/21/2023)



PHOTO POINT 32 UT5 R2 – downstream (4/21/2023)



PHOTO POINT 33 UT5 R2 – upstream (4/21/2023)



PHOTO POINT 33 UT5 R2 – downstream (4/21/2023)





PHOTO POINT 34 UT5A – upstream (4/21/2023)



PHOTO POINT 34 UT5A – downstream (4/21/2023)



CULVERT CROSSING PHOTOGRAPHS



Hanks Branch R3 - Looking Upstream (4/20/2023)



Hanks Branch R3 - Looking Downstream (4/20/2023)



UT1 - Looking Upstream (4/20/2023)



UT1 - Looking Downstream (4/20/2023)



UT3 R3 - Looking Upstream (4/20/2023)



UT3 R3 - Looking Downstream (4/20/2023)





UT4 R3 - Looking Upstream (4/20/2023)



UT4 R3 - Looking Downstream (4/20/2023)



UT5 R2 - Looking Upstream (4/20/2023)



UT5 R2 - Looking Downstream (4/20/2023)



VEGETATION PLOT PHOTOGRAPHS



FIXED VEG PLOT 1 (07/12/2023)



FIXED VEG PLOT 2 (07/12/2023)



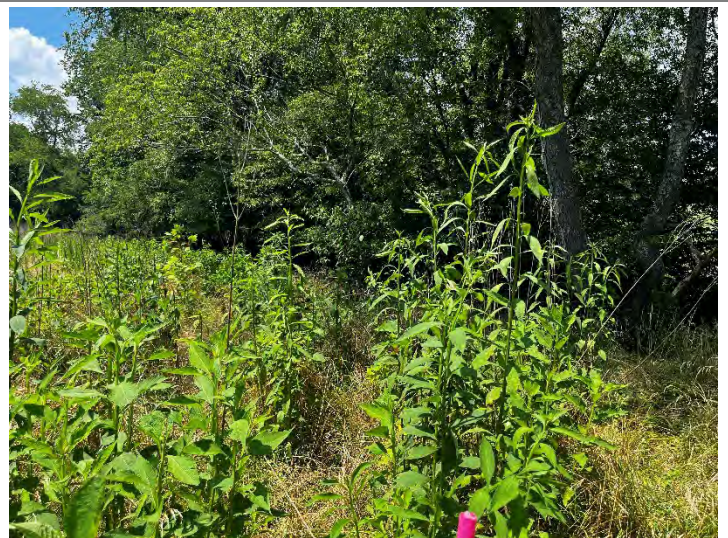
FIXED VEG PLOT 3 (07/12/2023)



FIXED VEG PLOT 4 (07/12/2023)



FIXED VEG PLOT 5 (07/12/2023)



FIXED VEG PLOT 6 (07/12/2023)





FIXED VEG PLOT 7 (07/12/2023)



RANDOM VEG PLOT 1 (07/12/2023)



RANDOM VEG PLOT 2 (07/12/2023)



AREA OF CONCERN PHOTOGRAPHS



UT4 Reach 2, station 604+40 – Log sill piping (10/1/2023)



APPENDIX B. Vegetation Plot Data

Table 6. Vegetation Plot Data

Lyon Hills Mitigation Site
 DMS Project No. 100085
 Monitoring Year 3 - 2023

Planted Acreage	10.8
Date of Initial Plant	2021-03-22
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2023-07-17
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/S hrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F		Veg Plot 5 F		Veg Plot 6 F		Veg Plot 7 F		Veg Plot 1 R	Veg Plot 2 R	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total
Species Included in Approved Mitigation Plan	<i>Acer negundo</i>	boxelder	Tree	FAC			1	2												1	
	<i>Betula nigra</i>	river birch	Tree	FACW	3	3	2	2	3	3			1	1	1	1	3	3	3	2	
	<i>Diospyros virginiana</i>	common persimmon	Tree	FAC	1	1			1	1			1	1			1	1	2		
	<i>Liriodendron tulipifera</i>	tuliptree	Tree	FACU							1	1	1	1					1	3	
	<i>Morus rubra</i>	red mulberry	Tree	FACU	1	1															
	<i>Nyssa sylvatica</i>	blackgum	Tree	FAC	2	2	2	2	1	1	2	2	1	1	1	1	1	1	1		
	<i>Platanus occidentalis</i>	American sycamore	Tree	FACW	1	1	2	2	5	5	3	3	3	3	2	2	2	2	1	1	
	<i>Prunus serotina</i>	black cherry	Tree	FACU					1	1											
	<i>Quercus phellos</i>	willow oak	Tree	FACW	3	3	1	2	1	1	2	2	2	2	1	1	2	2	2	1	
	<i>Quercus rubra</i>	northern red oak	Tree	FACU	1	1			2	2	2	2	1	1	2	2	3	3	1		
<i>Ulmus americana</i>	American elm	Tree	FAC	1	1	1	1	1	1	2	2	1	1	2	2						
Sum	Performance Standard				13	13	9	11	15	15	12	12	11	11	9	9	12	12	8	8	
Post Mitigation Plan Species	<i>Acer rubrum</i>	red maple	Tree	FAC					1				3					1			
	<i>Juglans nigra</i>	black walnut	Tree	UPL										2			1				
Sum	Proposed Standard				13	13	9	11	15	15	12	12	11	11	9	9	12	12	8	8	
Mitigation Plan Performance Standard	Current Year Stem Count					13		11		15		12		11		9		12	8	8	
	Stems/Acre					526		445		607		486		445		364		486	324	324	
	Species Count					8		6		8		6		8		6		6	5	5	
	Dominant Species Composition (%)					23		18		31		25		21		18		21	38	38	
	Average Plot Height (ft.)					4		6		2		5		4		3		4	3	6	
	% Invasives					0		0		0		0		0		0		0	0	0	
Post Mitigation Plan Performance Standard	Current Year Stem Count					13		11		15		12		11		9		12	8	8	
	Stems/Acre					526		445		607		486		445		364		486	324	324	
	Species Count					8		6		8		6		8		6		6	5	5	
	Dominant Species Composition (%)					23		18		31		25		21		18		21	38	38	
	Average Plot Height (ft.)					1		1		1		1		1		1		1	3	6	
	% Invasives					0		0		0		0		0		0		0	0	0	

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

Table 7. Vegetation Plot Summary Data

Lyon Hills Mitigation Site
DMS Project No. 100085
Monitoring Year 3 - 2023

Vegetation Performance Standards Summary Table												
	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	526	4	8	0	445	6	6	0	607	2	8	0
Monitoring Year 2	526	3	8	0	364	5	6	0	607	2	8	0
Monitoring Year 1	567	2	8	0	486	3	6	0	607	2	8	0
Monitoring Year 0	607	2	8	0	607	3	6	0	607	2	8	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	486	5	6	0	445	4	8	0	364	3	6	0
Monitoring Year 2	567	4	7	0	364	3	7	0	405	3	6	0
Monitoring Year 1	607	3	8	0	486	3	8	0	567	3	7	0
Monitoring Year 0	607	2	8	0	526	2	8	0	607	2	7	0
	Veg Plot 7 F				Veg Plot Group 1 R				Veg Plot Group 2 R			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	486	4	6	0	324	3	5	0	324	6	5	0
Monitoring Year 2	486	4	6	0	445	2	5	0	405	3	6	0
Monitoring Year 1	486	3	6	0	324	2	5	0	324	2	5	0
Monitoring Year 0	526	2	6	0	445	2	9	0	607	3	9	0

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

APPENDIX C. Stream Geomorphology Data

CROSS-SECTION PLOTS

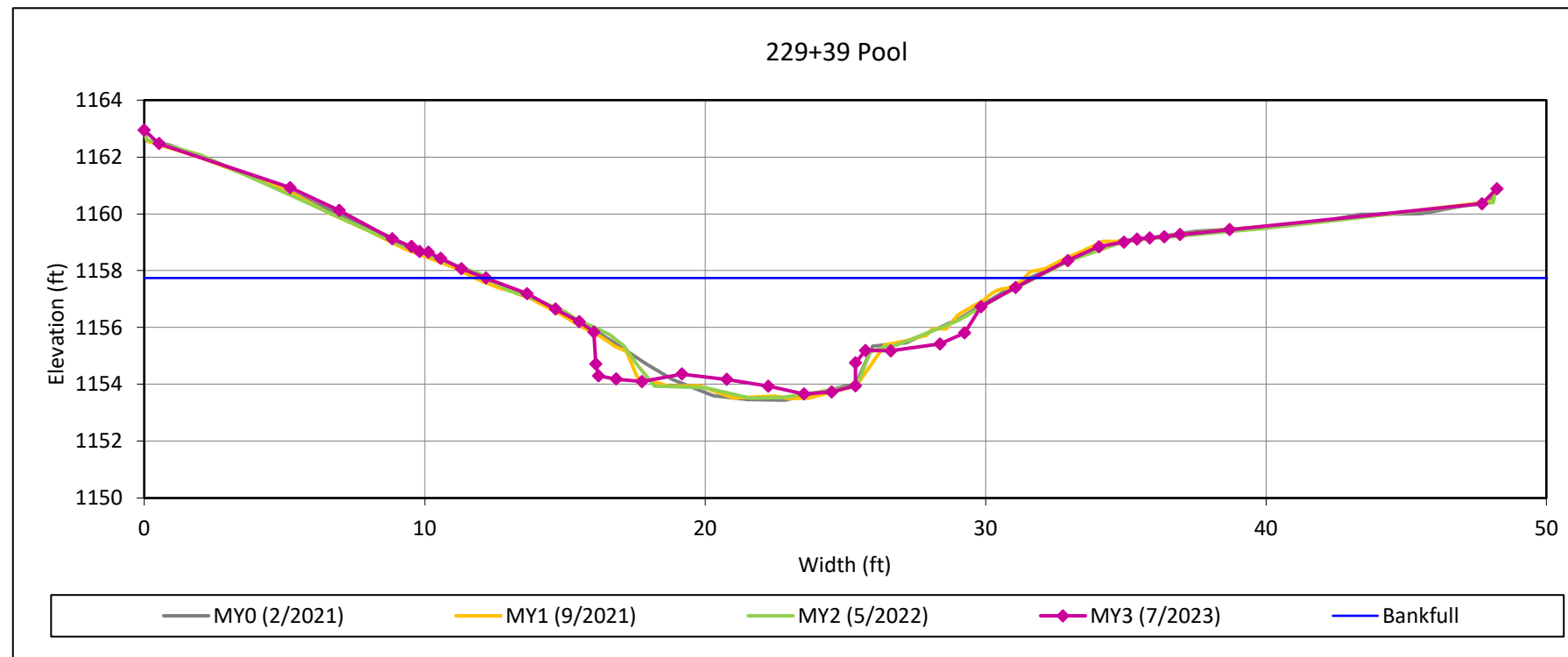
Cross-Section Plots

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

Cross-Section 1-Hanks Branch Reach 3

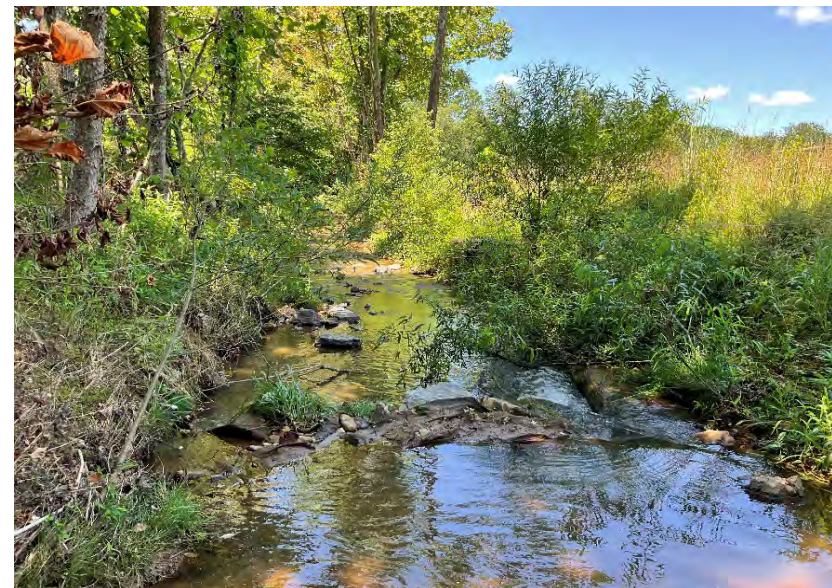


Bankfull Dimensions

48.8	x-section area (ft.sq.)
19.5	width (ft)
2.5	mean depth (ft)
4.1	max depth (ft)
23.4	wetted perimeter (ft)
2.1	hydraulic radius (ft)
7.8	width-depth ratio

Survey Date: 7/2023

Field Crew: Wildlands Engineering



View Downstream

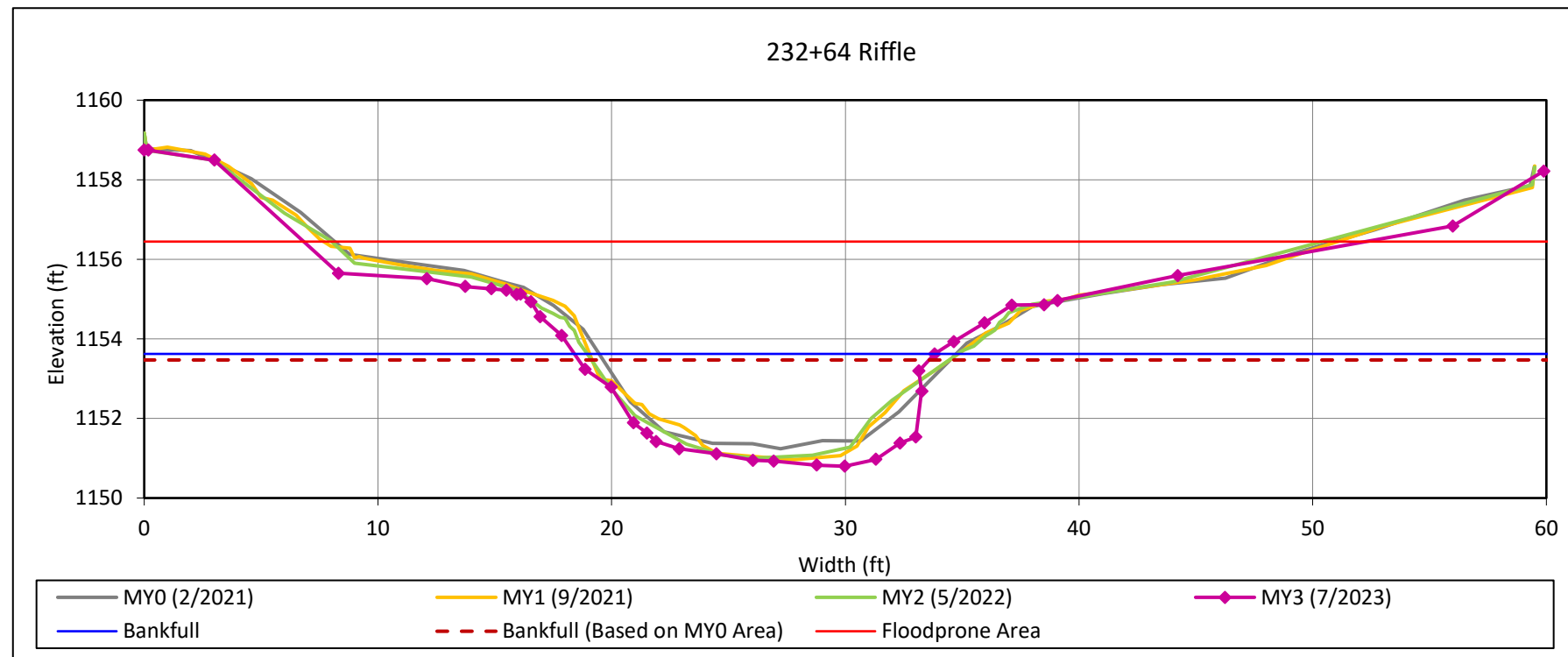
Cross-Section Plots

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

Cross-Section 2-Hanks Branch Reach 3



Bankfull Dimensions

33.0	x-section area (ft.sq.)
15.4	width (ft)
2.1	mean depth (ft)
2.8	max depth (ft)
17.9	wetted perimeter (ft)
1.8	hydraulic radius (ft)
7.2	width-depth ratio
45.5	W flood prone area (ft)
3.0	entrenchment ratio
1.1	low bank height ratio

Survey Date: 7/2023

Field Crew: Wildlands Engineering



View Downstream

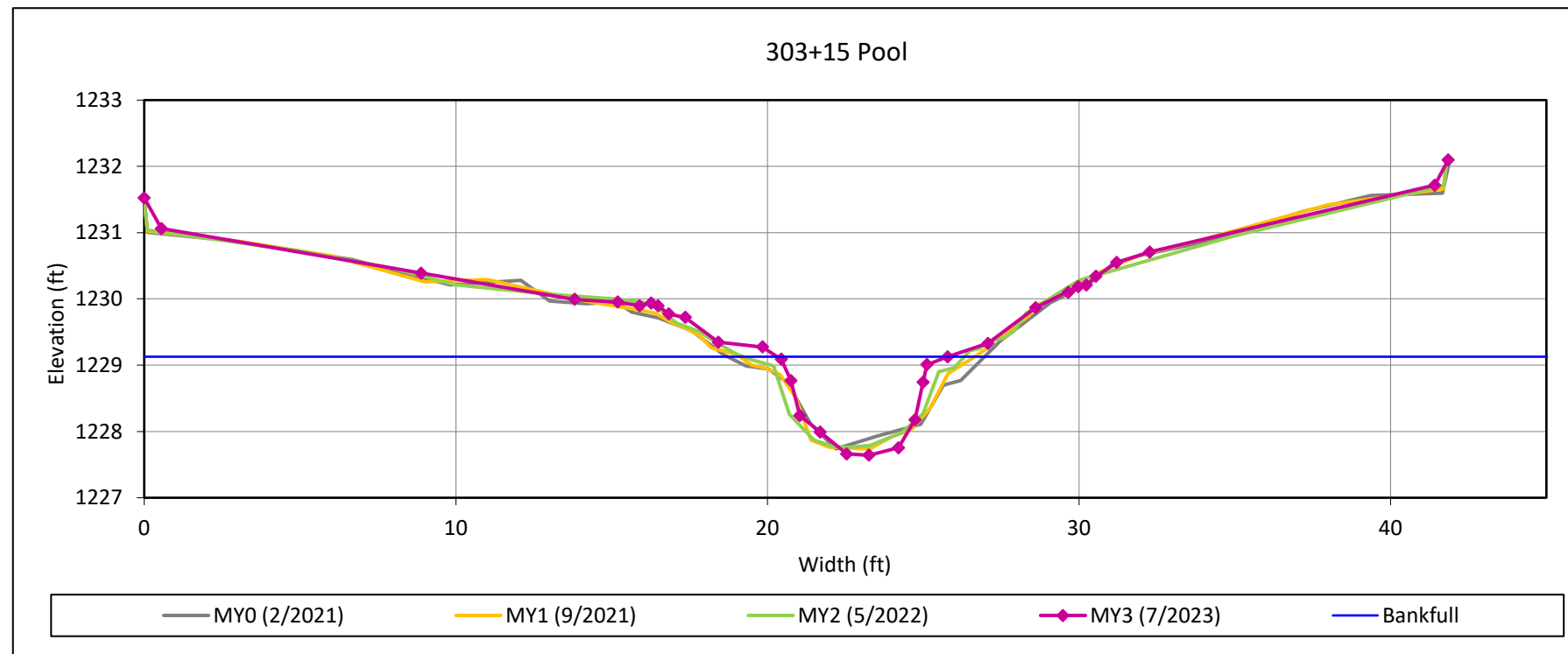
Cross-Section Plots

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

Cross-Section 3-UT1



Bankfull Dimensions

5.3	x-section area (ft.sq.)
5.5	width (ft)
1.0	mean depth (ft)
1.5	max depth (ft)
6.7	wetted perimeter (ft)
0.8	hydraulic radius (ft)
5.7	width-depth ratio

Survey Date: 7/2023

Field Crew: Wildlands Engineering



View Downstream

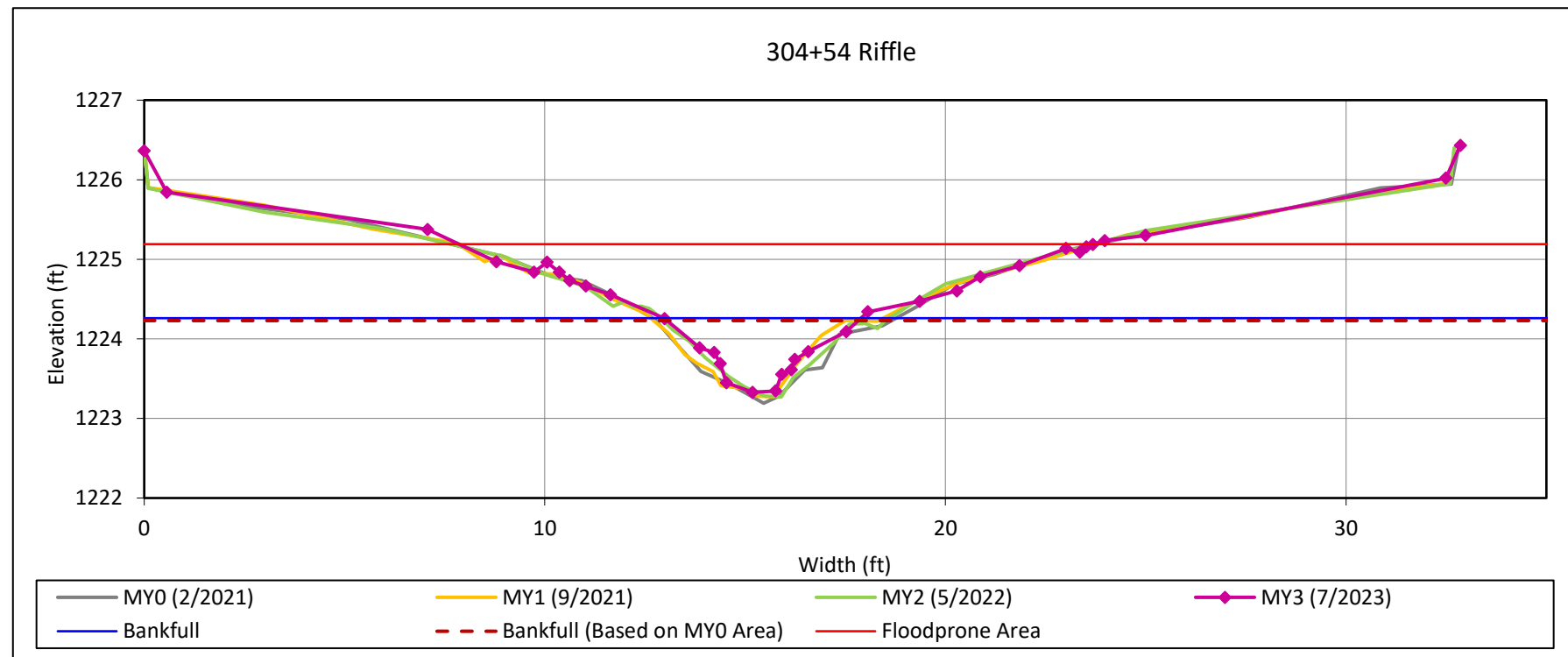
Cross-Section Plots

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

Cross-Section 4-UT1



Bankfull Dimensions

2.4	x-section area (ft.sq.)
4.9	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
5.4	wetted perimeter (ft)
0.4	hydraulic radius (ft)
10.0	width-depth ratio
15.8	W flood prone area (ft)
3.2	entrenchment ratio
1.0	low bank height ratio

Survey Date: 7/2023

Field Crew: Wildlands Engineering



View Downstream

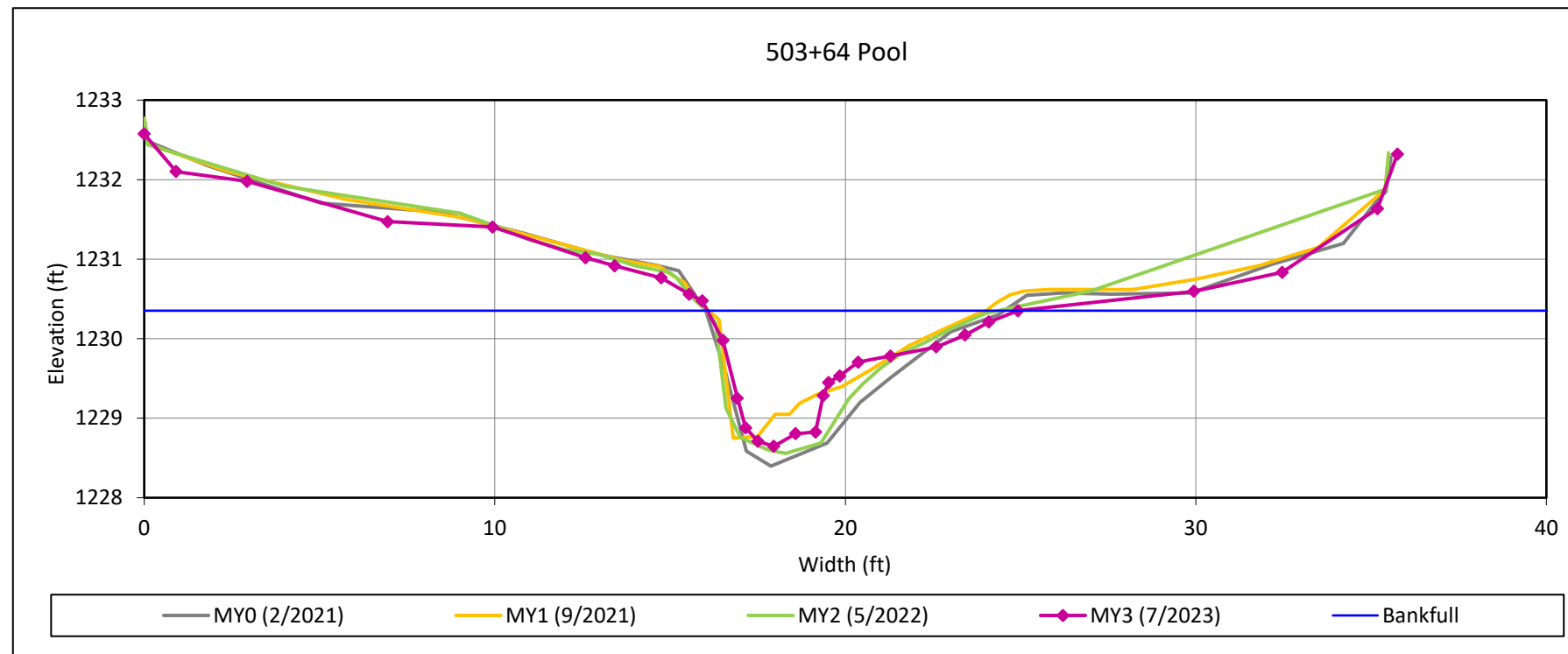
Cross-Section Plots

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

Cross-Section 5-UT3 Reach 1



Bankfull Dimensions

6.7	x-section area (ft.sq.)
8.9	width (ft)
0.8	mean depth (ft)
1.7	max depth (ft)
10.1	wetted perimeter (ft)
0.7	hydraulic radius (ft)
11.7	width-depth ratio

Survey Date: 7/2023

Field Crew: Wildlands Engineering



View Downstream

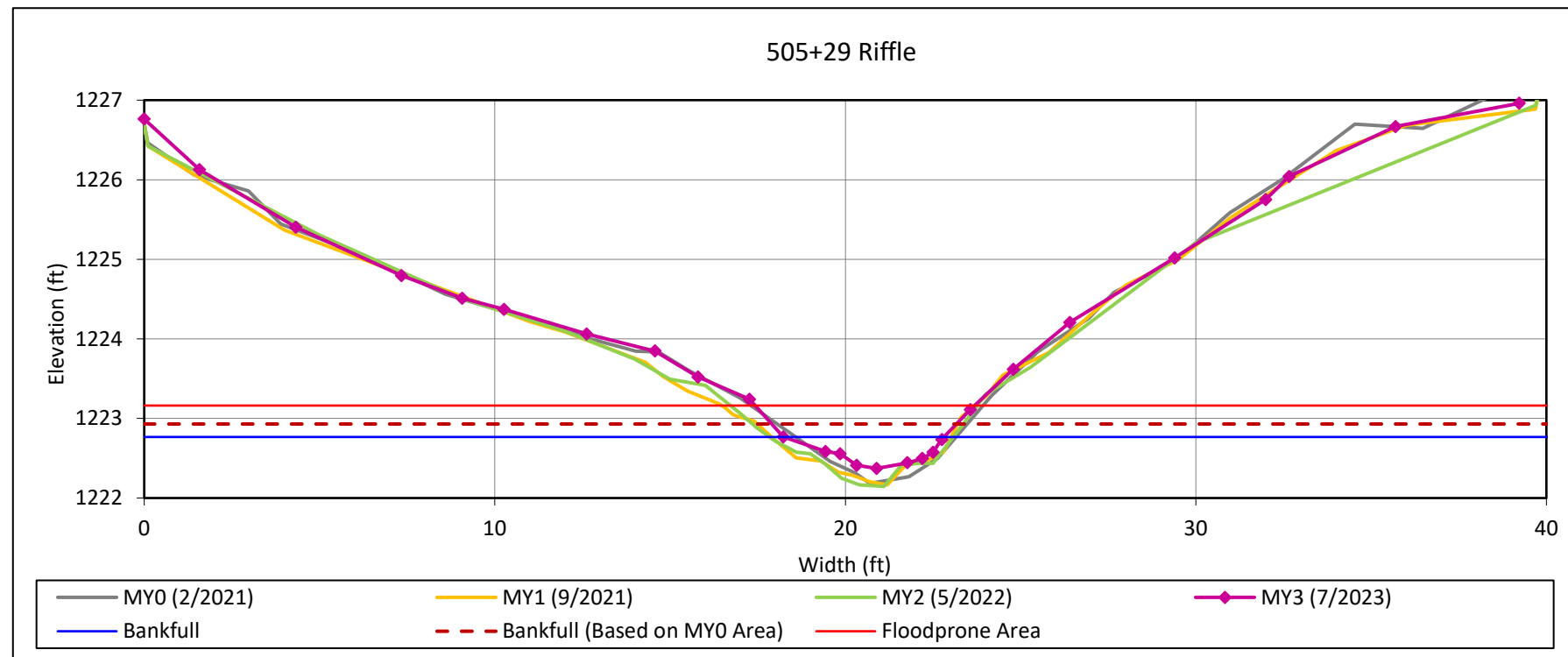
Cross-Section Plots

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

Cross-Section 6-UT3 Reach 1



Bankfull Dimensions

- 1.1 x-section area (ft.sq.)
- 4.6 width (ft)
- 0.2 mean depth (ft)
- 0.4 max depth (ft)
- 4.7 wetted perimeter (ft)
- 0.2 hydraulic radius (ft)
- 19.5 width-depth ratio
- 6.3 W flood prone area (ft)
- 1.4 entrenchment ratio
- < 1.0 low bank height ratio

Survey Date: 7/2023

Field Crew: Wildlands Engineering



View Downstream

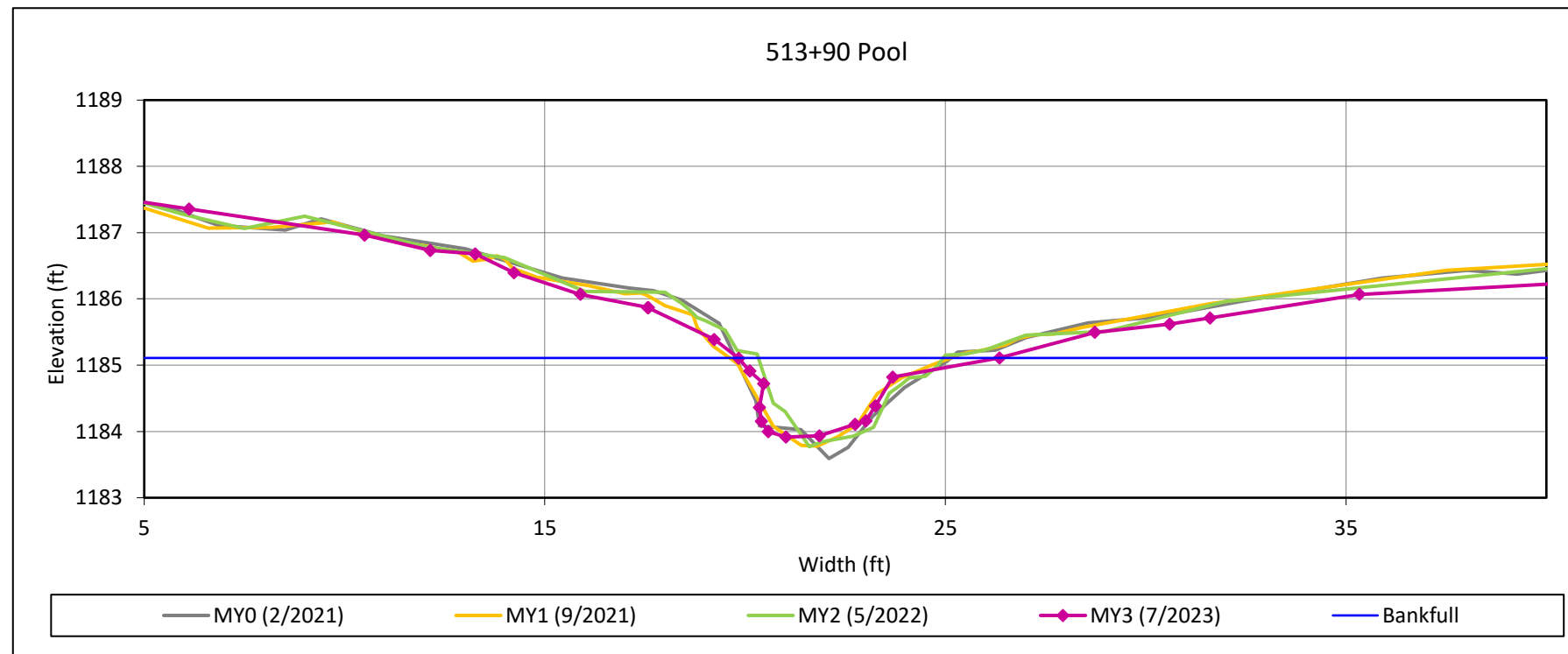
Cross-Section Plots

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

Cross-Section 7-UT3 Reach 3



Bankfull Dimensions

3.8	x-section area (ft.sq.)
6.5	width (ft)
0.6	mean depth (ft)
1.2	max depth (ft)
7.6	wetted perimeter (ft)
0.5	hydraulic radius (ft)
11.1	width-depth ratio

Survey Date: 7/2023

Field Crew: Wildlands Engineering



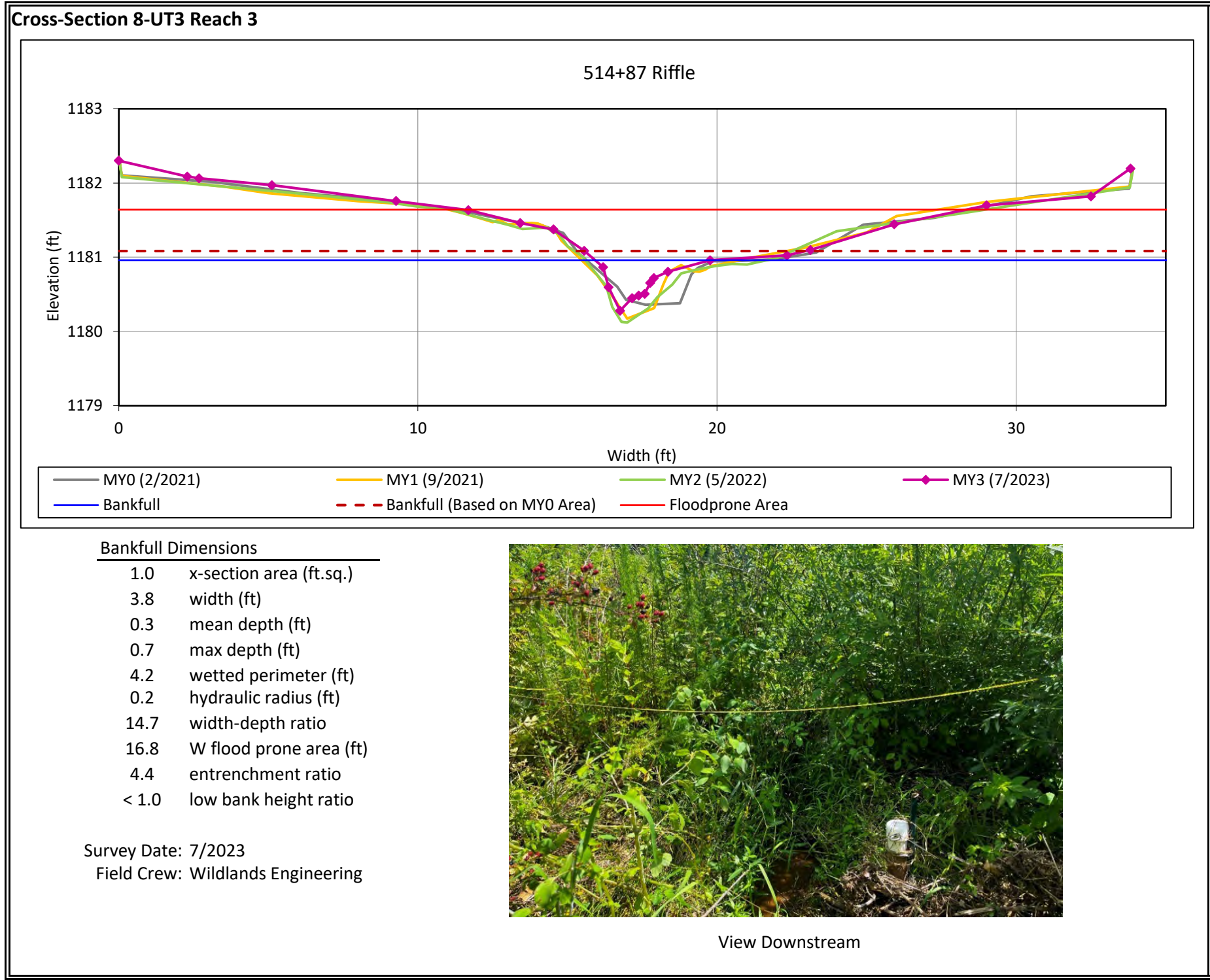
View Downstream

Cross-Section Plots

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023



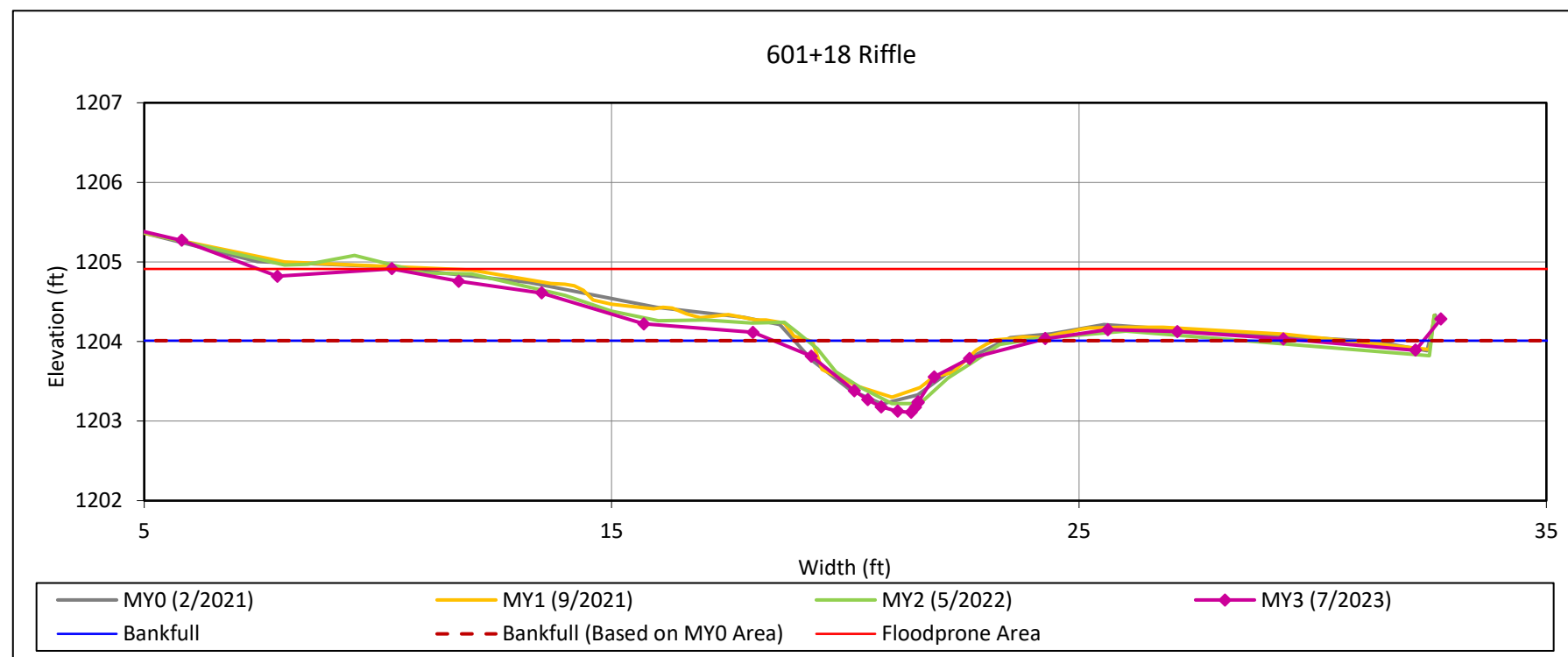
Cross-Section Plots

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

Cross-Section 9-UT4 Reach 1



Bankfull Dimensions

2.2	x-section area (ft.sq.)
5.7	width (ft)
0.4	mean depth (ft)
0.9	max depth (ft)
6.0	wetted perimeter (ft)
0.4	hydraulic radius (ft)
14.6	width-depth ratio
25.5	W flood prone area (ft)
4.5	entrenchment ratio
1.0	low bank height ratio

Survey Date: 7/2023

Field Crew: Wildlands Engineering



View Downstream

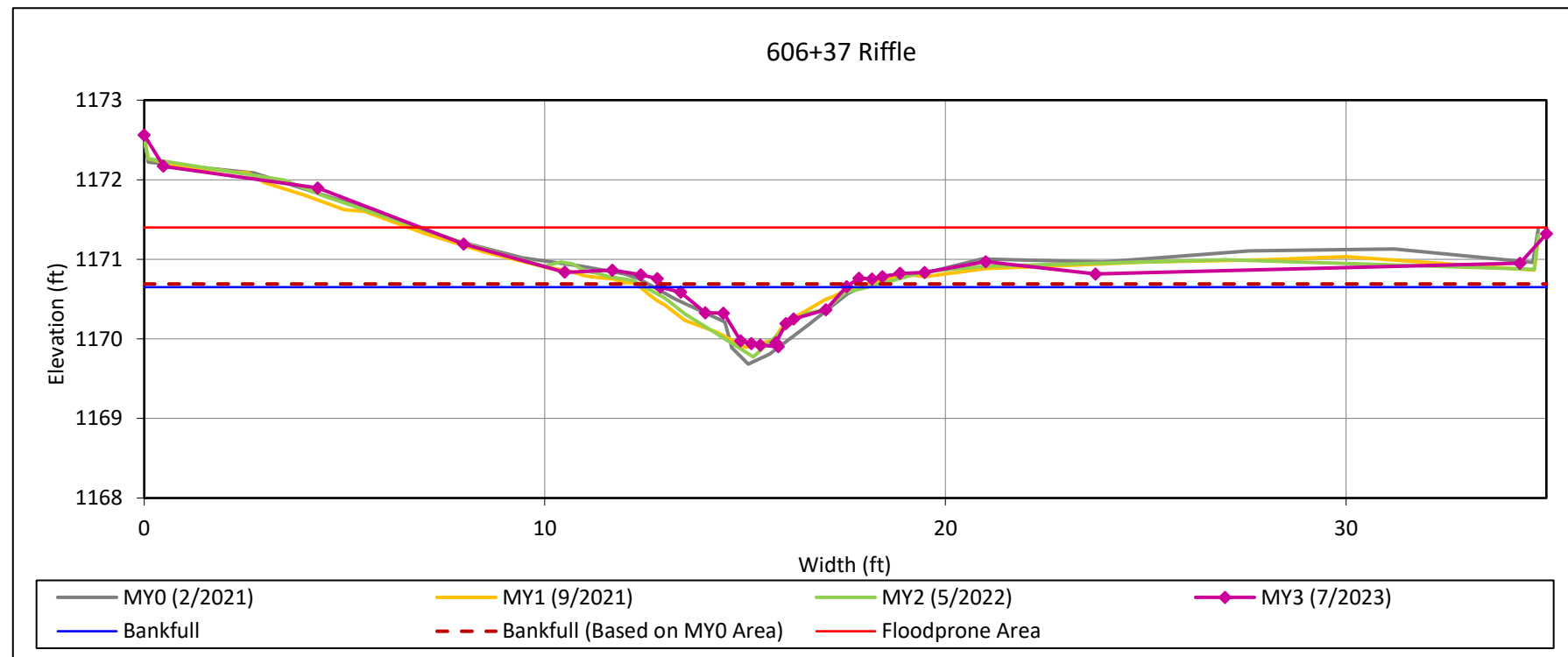
Cross-Section Plots

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

Cross-Section 10-UT4 Reach 3



Bankfull Dimensions

1.7	x-section area (ft.sq.)
4.6	width (ft)
0.4	mean depth (ft)
0.8	max depth (ft)
5.2	wetted perimeter (ft)
0.3	hydraulic radius (ft)
12.6	width-depth ratio
28.1	W flood prone area (ft)
6.1	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 7/2023

Field Crew: Wildlands Engineering



View Downstream

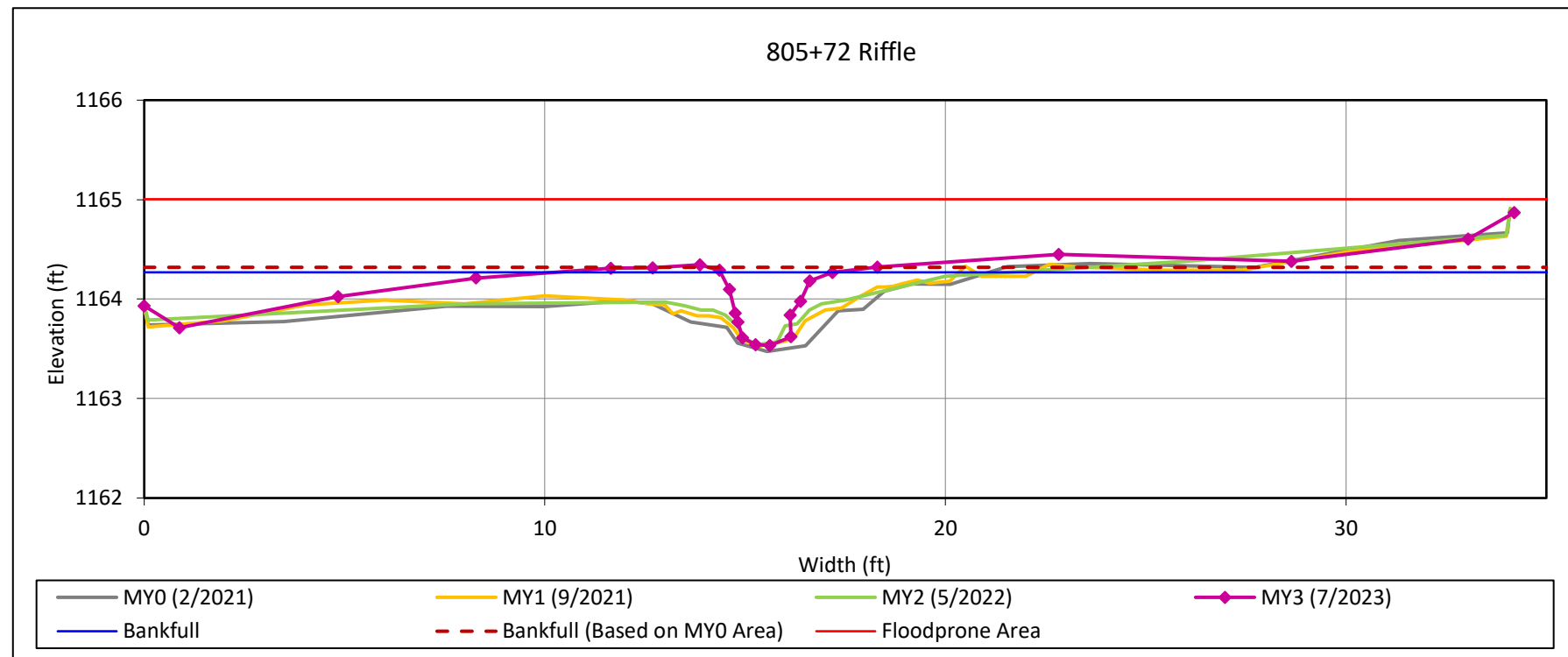
Cross-Section Plots

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

Cross-Section 11-UT5 Reach 2



Bankfull Dimensions

- 1.2 x-section area (ft.sq.)
- 2.8 width (ft)
- 0.4 mean depth (ft)
- 0.7 max depth (ft)
- 3.5 wetted perimeter (ft)
- 0.3 hydraulic radius (ft)
- 6.7 width-depth ratio
- 34.2 W flood prone area (ft)
- 12.2 entrenchment ratio
- < 1.0 low bank height ratio

Survey Date: 7/2023

Field Crew: Wildlands Engineering



View Downstream

Table 8. Baseline Stream Data Summary

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

Parameter	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
	Min	Max	n	Min	Max	Min	Max	n
Hanks Branch Reach 3								
Riffle Only	Min	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	13		1	15.5		16		1
Floodprone Width (ft)	---		1	34	78	38		1
Bankfull Mean Depth	1		1	1.1		1.9		1
Bankfull Max Depth	1.2		1	1.7		2.7		1
Bankfull Cross Sectional Area (ft ²)	13.4		1	17.7		30.7		1
Width/Depth Ratio	12.6		1	14.0		8.4		1
Entrenchment Ratio	1.2		1	2.2	5.0	2.3		1
Bank Height Ratio	4.8		1	14.0		1.0		1
Max part size (mm) mobilized at bankfull	95			79		93		
Rosgen Classification	C4			C4		C4		
Bankfull Discharge (cfs)	68.8			85.0		145.0		1
Sinuosity	1.06			---		---		
Water Surface Slope (ft/ft) ²	0.0210		1	0.017	0.020	0.012		1
Other	---			---		---		
UT1								
Riffle Only	Min	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	7		1	6.6		4.3		1
Floodprone Width (ft)	---		1	9	15	12		1
Bankfull Mean Depth	0.5		1	0.5		0.5		1
Bankfull Max Depth	1.2		1	0.6	0.7	0.9		1
Bankfull Cross Sectional Area (ft ²)	3.3		1	3.2		2.2		1
Width/Depth Ratio	13.5		1	14.0		8.4		1
Entrenchment Ratio	6.7		1	>1.4		2.9		1
Bank Height Ratio	1.7		1	1.0		1.0		1
Max part size (mm) mobilized at bankfull	54			99		117		
Rosgen Classification	B4			B4		B4		
Bankfull Discharge (cfs)	13.2			13.0		10.0		1
Sinuosity	1.10			1.05		1.05		
Water Surface Slope (ft/ft) ²	0.051		1	0.051	0.056	0.052		1
Other	---			---		---		

Table 8. Baseline Stream Data Summary

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

Parameter	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
	Min	Max	n	Min	Max	Min	Max	n
UT3 Reach 1								
Riffle Only	Min	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	7.3		1	5.9		4.9		1
Floodprone Width (ft)	10.4		1	8	13	8		1
Bankfull Mean Depth	0.4		1	0.5		0.4		1
Bankfull Max Depth	0.6		1	0.7		0.6		1
Bankfull Cross Sectional Area (ft ²)	3.1		1	2.7		1.9		1
Width/Depth Ratio	17.5		1	13.0		12.5		1
Entrenchment Ratio	1.4		1	>1.4		1.7		1
Bank Height Ratio	2.7		1	1.0		1.0		1
Max part size (mm) mobilized at bankfull	114			87		75		
Rosgen Classification	B4			B4		B4		
Bankfull Discharge (cfs)	15.0			10.0		6.6		1
Sinuosity	1.02			1.10		1.10		
Water Surface Slope (ft/ft) ²	0.056		1	0.036	0.040	0.042		1
Other	---			---		---		
UT3 Reach 3								
Riffle Only	Min	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	6.0		1	6.8		4.7		1
Floodprone Width (ft)	8.7		1	10	15	15		1
Bankfull Mean Depth	0.8		1	0.5		0.3		1
Bankfull Max Depth	1.0		1	0.8		0.6		1
Bankfull Cross Sectional Area (ft ²)	4.8		1	3.5		1.5		1
Width/Depth Ratio	7.5		1	13.0		14.4		1
Entrenchment Ratio	1.4		1	>1.4		3.2		1
Bank Height Ratio	2.6		1	1.0		1.0		1
Max part size (mm) mobilized at bankfull	128			102		64		
Rosgen Classification	B4			B4		B4		
Bankfull Discharge (cfs)	27.5			15.0		4.8		1
Sinuosity	1.03			1.05		1.05		
Water Surface Slope (ft/ft) ²	0.039		1	0.042	0.053	0.044		1
Other	---			---		---		

Table 8. Baseline Stream Data Summary

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

Parameter	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
	Min	Max	n	Min	Max	Min	Max	n
UT4 Reach 1								
Riffle Only	Min	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	6.2		1	4.0		4.7		1
Floodprone Width (ft)	7.4		1	6	9	35		1
Bankfull Mean Depth	0.5		1	0.3		0.5		1
Bankfull Max Depth	0.7		1	0.5		0.8		1
Bankfull Cross Sectional Area (ft ²)	3.1		1	1.3		2.2		1
Width/Depth Ratio	12.5		1	13.0		10.2		1
Entrenchment Ratio	1.2		1	>1.4		7.4		1
Bank Height Ratio	1.7		1	1.0		1.0		1
Max part size (mm) mobilized at bankfull	122			74		159		
Rosgen Classification	B4			B4		B4		
Bankfull Discharge (cfs)	15.5			4.0		11.3		1
Sinuosity	1.10			1.05		1.05		
Water Surface Slope (ft/ft) ²	0.053		1	0.054	0.059	0.073		1
Other	---			---		---		
UT4 Reach 3								
Riffle Only	Min	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	7.3		1	4.9		4.5		1
Floodprone Width (ft)	9.0		1	7	11	35		1
Bankfull Mean Depth	0.3		1	0.4		0.4		1
Bankfull Max Depth	0.4		1	0.6		0.9		1
Bankfull Cross Sectional Area (ft ²)	1.8		1	1.9		1.9		1
Width/Depth Ratio	29.1		1	13.0		11.0		1
Entrenchment Ratio	1.2		1	>1.4		7.7		1
Bank Height Ratio	2.3		1	1.0		1.0		1
Max part size (mm) mobilized at bankfull	140			67		86		
Rosgen Classification	B4			B4		B4		
Bankfull Discharge (cfs)	5.6			6.0		7.0		1
Sinuosity	1.00			1.05		1.05		
Water Surface Slope (ft/ft) ²	0.044		1	0.045	0.049	0.046		1
Other	---			---		---		

Table 8. Baseline Stream Data Summary

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

Parameter	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
	UT5 Reach 2							
Riffle Only	Min	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	5.4		1	5.0		5.4		1
Floodprone Width (ft)	11.0		1	11	25	35		1
Bankfull Mean Depth	0.4		1	0.4		0.2		1
Bankfull Max Depth	0.6		1	0.6		0.5		1
Bankfull Cross Sectional Area (ft ²)	2.2		1	1.9		1.3		1
Width/Depth Ratio	13.0		1	13.0		21.6		1
Entrenchment Ratio	2.1		1	2.2	5.0	6.5		1
Bank Height Ratio	1.7		1	1.0		1.0		1
Max part size (mm) mobilized at bankfull	79			49		39		
Rosgen Classification	C4b			C4b		C4b		
Bankfull Discharge (cfs)	9.0			6.0		4.9		1
Sinuosity	1.10			1.20		1.20		
Water Surface Slope (ft/ft) ²	0.051		1	0.028	0.033	0.035		1
Other	---							

Table 9. Cross-Section Morphology Monitoring Summary

Lyon Hills Mitigation Site
 DMS Project No. 100085
 Monitoring Year 3 - 2023

Dimension	Hanks Branch Reach 3												UT1					
	Cross-Section 1 (Pool)						Cross-Section 2 (Riffle)						Cross-Section 3 (Pool)					
	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	N/A	N/A	N/A	N/A			1,153.89	1,153.82	1,153.78	1,153.47			N/A	N/A	N/A	N/A		
Bank Height Ratio - Based on AB Bankfull ¹ Area	N/A	N/A	N/A	N/A			1.00	1.00	1.01	1.10			N/A	N/A	N/A	N/A		
Thalweg Elevation	1,153.44	1,153.50	1,153.52	1,153.66			1,151.24	1,150.96	1,151.00	1,150.80			1,227.74	1,227.74	1,227.76	1,227.64		
LTOB ² Elevation	1,157.57	1,157.39	1,157.29	1,157.74			1,153.89	1,153.82	1,153.81	1,153.62			1,228.70	1,228.86	1,228.90	1,229.13		
LTOB ² Max Depth (ft)	4.13	3.89	3.77	4.08			2.65	2.86	2.81	2.82			1.00	1.12	1.14	1.49		
LTOB ² Cross Sectional Area (ft ²)	44.10	41.91	39.27	48.80			30.70	30.69	31.26	33.00			3.20	4.30	4.53	5.28		
Dimension	UT1						UT3 Reach 1						UT3 Reach 3					
	Cross-Section 4 (Riffle)						Cross-Section 5 (Pool)						Cross-Section 6 (Riffle)					
	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	1,224.06	1,224.15	1,224.15	1,224.23			N/A	N/A	N/A	N/A			1,222.82	1,222.79	1,222.78	1,222.94		
Bank Height Ratio - Based on AB Bankfull ¹ Area	1.00	1.10	1.03	1.00			N/A	N/A	N/A	N/A			1.00	0.90	0.90	0.70		
Thalweg Elevation	1,223.19	1,223.27	1,223.27	1,223.33			1,228.40	1,228.75	1,228.56	1,228.65			1,222.18	1,222.17	1,222.15	1,222.37		
LTOB ² Elevation	1,224.06	1,224.23	1,224.18	1,224.26			1,230.54	1,230.60	1,230.60	1,230.35			1,222.82	1,222.73	1,222.72	1,222.77		
LTOB ² Max Depth (ft)	0.90	0.96	0.91	0.93			2.10	1.85	2.04	1.71			0.60	0.56	0.57	0.39		
LTOB ² Cross Sectional Area (ft ²)	2.20	2.48	2.32	2.39			10.20	8.30	10.18	6.73			1.90	1.61	1.57	1.08		
Dimension	UT3 Reach 3						UT4 Reach 1						UT4 Reach 3					
	Cross-Section 7 (Pool)						Cross-Section 8 (Riffle)						Cross-Section 9 (Riffle)					
	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	N/A	N/A	N/A	N/A			1,180.95	1,180.94	1,180.91	1,181.08			1,204.05	1,204.11	1,204.05	1,204.01		
Bank Height Ratio - Based on AB Bankfull ¹ Area	N/A	N/A	N/A	N/A			1.00	0.94	0.96	0.97			1.00	0.94	0.97	1.00		
Thalweg Elevation	1,183.59	1,183.79	1,183.77	1,183.92			1,180.36	1,180.17	1,180.12	1,180.28			1,203.22	1,203.30	1,203.22	1,203.11		
LTOB ² Elevation	1,185.20	1,185.21	1,185.15	1,185.11			1,180.95	1,180.98	1,180.88	1,180.96			1,204.05	1,204.06	1,204.03	1,204.04		
LTOB ² Max Depth (ft)	1.60	1.43	1.38	1.19			0.60	0.72	0.76	0.68			0.80	0.76	0.81	0.90		
LTOB ² Cross Sectional Area (ft ²)	4.90	4.45	3.82	3.82			1.50	1.20	1.39	1.01			2.20	1.95	2.08	2.20		
Dimension	UT5 Reach 2						UT5 Reach 3						UT5 Reach 2					
	Cross-Section 10 (Riffle)						Cross-Section 11 (Riffle)						Cross-Section 12 (Riffle)					
	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	1,170.57	1,170.61	1,170.59	1,170.69			1,163.95	1,164.03	1,164.12	1,164.32			1,163.95	1,163.95	1,163.97	1,164.27		
Bank Height Ratio - Based on AB Bankfull ¹ Area	1.00	1.01	1.00	1.00			1.00	0.84	0.74	0.90			1.00	0.84	0.74	0.90		
Thalweg Elevation	1,169.68	1,169.89	1,169.77	1,169.90			1,163.47	1,163.52	1,163.54	1,163.52			1,163.47	1,163.52	1,163.54	1,163.52		
LTOB ² Elevation	1,170.57	1,170.62	1,170.58	1,170.65			1,163.95	1,163.95	1,163.97	1,164.27			1,163.95	1,163.95	1,163.97	1,164.27		
LTOB ² Max Depth (ft)	0.90	0.73	0.81	0.75			0.50	0.43	0.43	0.73			0.50	0.43	0.43	0.73		
LTOB ² Cross Sectional Area (ft ²)	1.90	1.96	1.87	1.71			1.30	0.92	0.73	1.16			1.30	0.92	0.73	1.16		

¹Bank Height Ratio (BHR) takes the As-built bankfull area as the basis for adjusting each subsequent years bankfull elevation.

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

APPENDIX D. Hydrology Data

Table 10. Bankfull Events

Lyon Hills Mitigation Site
DMS Project No. 100085
Monitoring Year 3 - 2023

Reach	MY1 (2021)	MY2 (2022)	MY3 (2023)	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
Hanks Branch Reach 3	2/17/2021 2/20/2021 8/18/2021	---	6/18/2023** 10/5/2023**				
UT1	*	8/6/2022	6/20/2023 8/7/2023				
UT3 Reach 3	1/26/2021 8/15/2021 8/18/2021	1/3/2022 2/28/2022 8/6/2022 8/15/2022 8/25/2022 8/28/2022	3/4/2023 6/20/2023 8/6/2023				
UT4 Reach 3	8/15/2021	---	6/18/2023				
UT5 Reach 2	2/16/2021 2/21/2021 3/3/2021 3/20/2021 6/12/2021 7/26/2021 8/15/2021 8/17/2021 8/25/2021 9/1/2021 10/6/2021	1/3/2022 2/4/2022 2/18/2022 5/26/2022 7/5/2022 7/8/2022 7/13/2022 7/18/2022 8/6/2022 8/15/2022	3/4/2023 4/28/2023 5/17/2023 6/22/2023 7/5/2023 7/9/2023 7/16/2023 7/23/2023 8/4/2023 8/6/2023 8/28/2023 9/17/2023				

*Gage malfunction

**Crest gage 1 (CG1) on Hanks Branch Reach 3 was washed away after multiple large storm events. Though a bankfull event was not recorded by an automated pressure transducer in MY3, bankfull indicators, such as wrack lines were observed and documented in June and October 2023.

--- - No Bankfull events

Table 11. Rainfall Summary

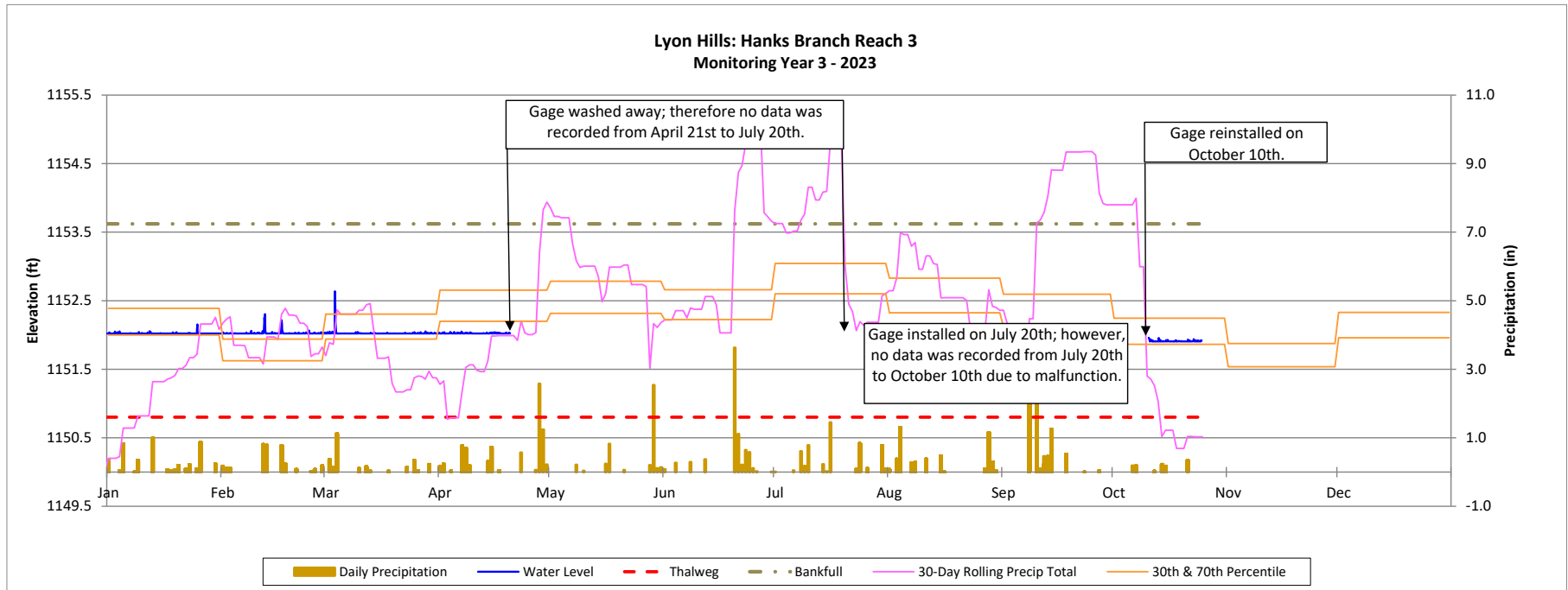
Lyon Hills Mitigation Site
DMS Project No. 100085
Monitoring Year 3 - 2023

	MY1 (2021)	MY2 (2022)	MY3 (2023)	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
Annual Precip Total	41.71	48.23	48.04*				
WETS 30th Percentile	43.05	42.70	43.17				
WETS 70th Percentile	53.13	52.76	53.13				
Normal	Low	Yes	Yes*				

*Annual precipitation data was collected from 1-1-23 to 11-1-23. Based on current data, precipitation is deemed 'Normal' as the sum of the annual precipitation falls with the Wets 30th and 70th percentile totals.

Recorded Bankfull Events Plot

Lyon Hills Mitigation Site
DMS Project No. 100085
Monitoring Year 3 - 2023



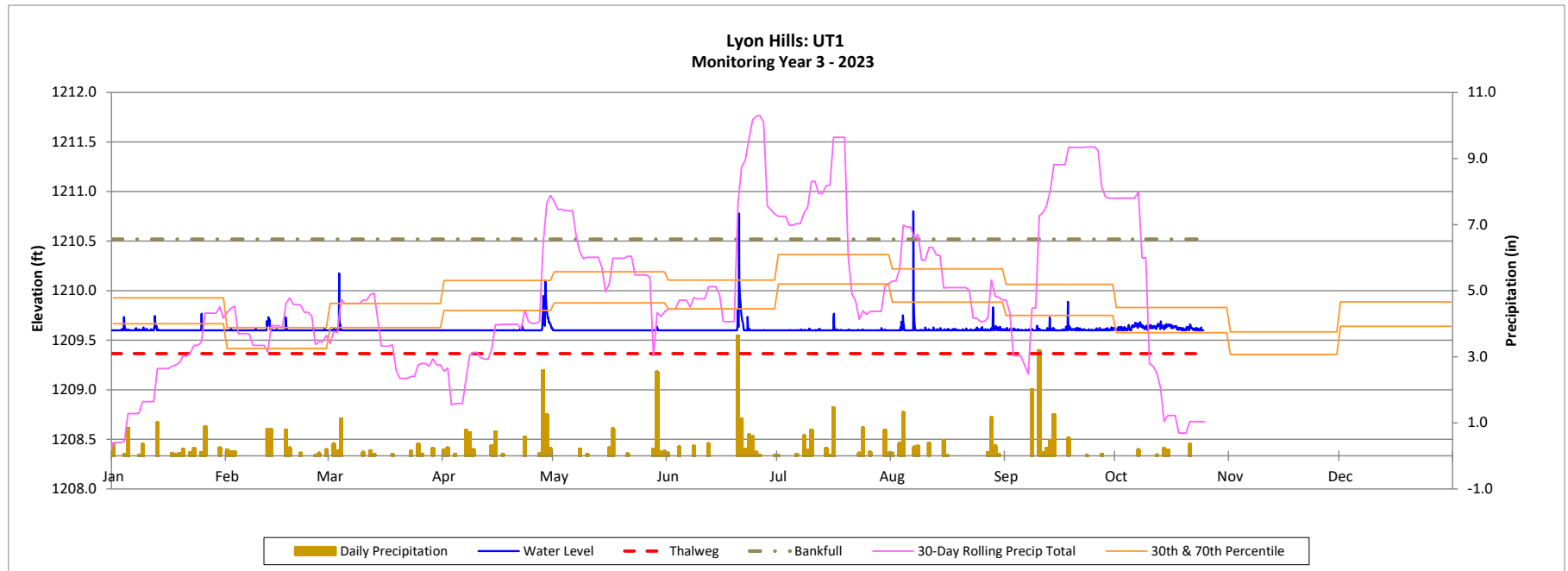
Multiple large storm events caused crest gage 1 (CG1) to be washed away. The replacement crest gage was installed on July 20th; however, no data was recorded from July 20th through October 10th due to malfunction. CG1 was reinstalled on October 10th and is functioning as intended.

Recorded Bankfull Events Plot

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

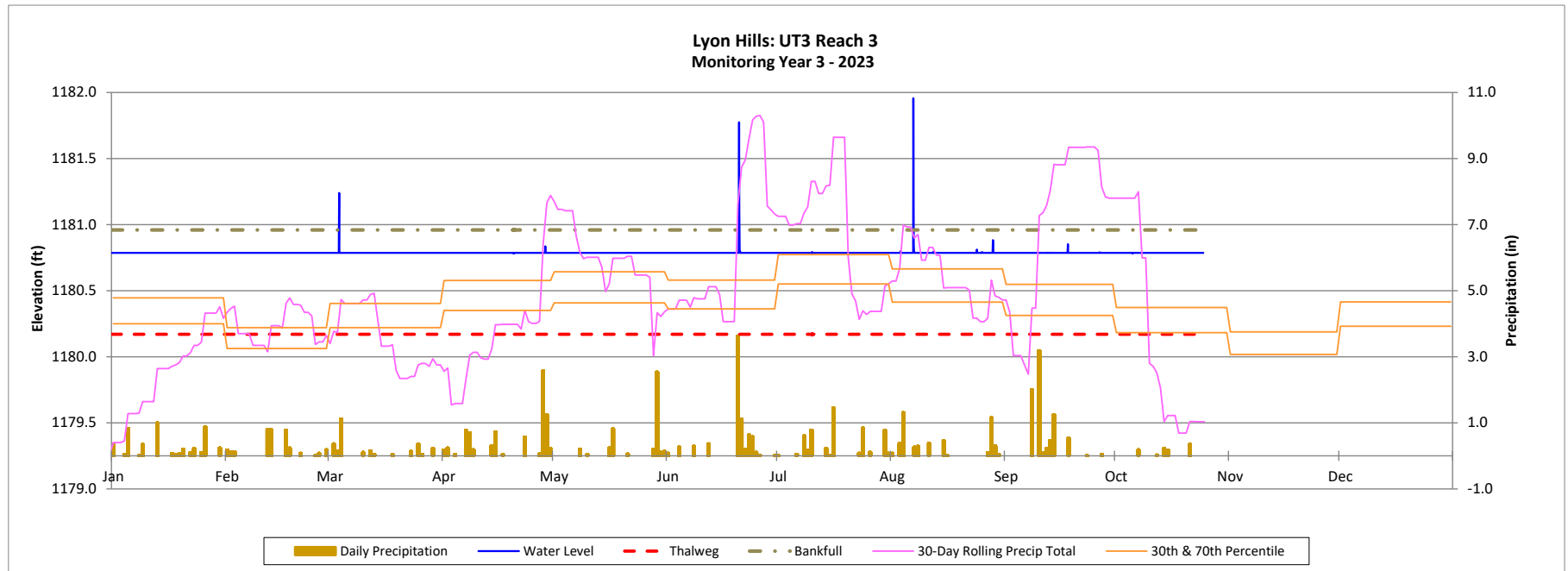


Recorded Bankfull Events Plot

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

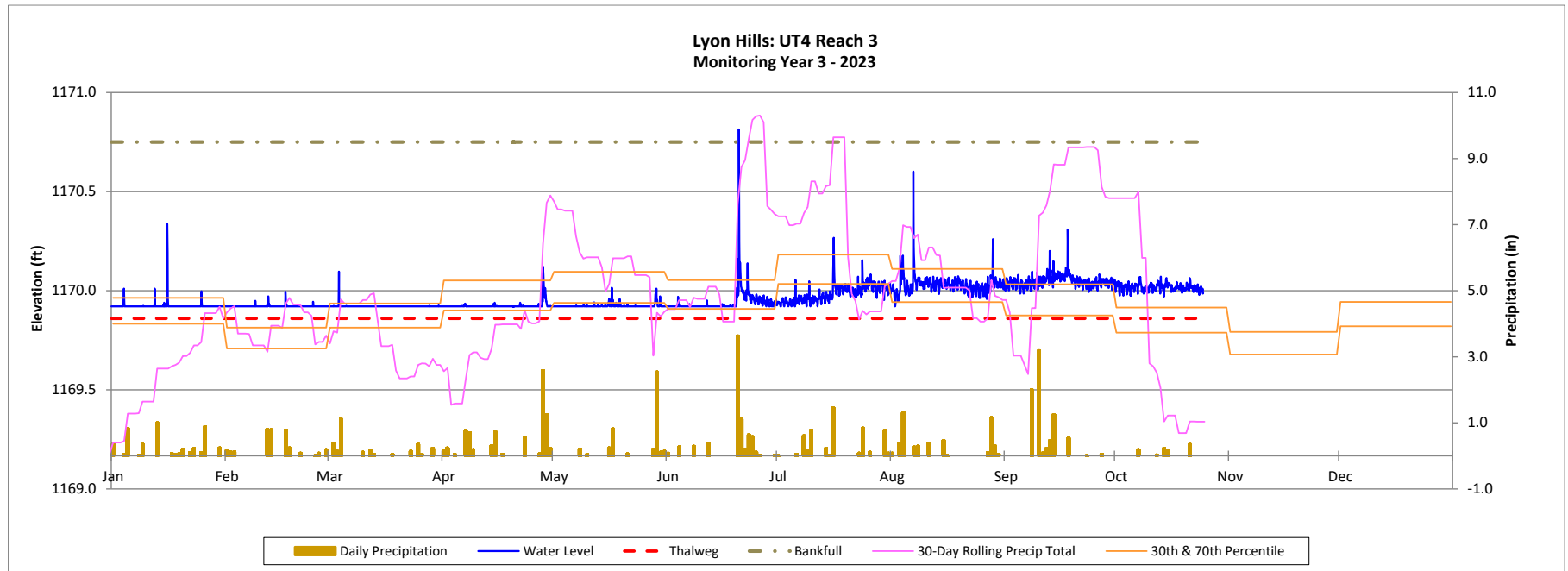


Recorded Bankfull Events Plot

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023



Recorded Bankfull Events Plot

Lyon Hills Mitigation Site

DMS Project No. 100085

Monitoring Year 3 - 2023

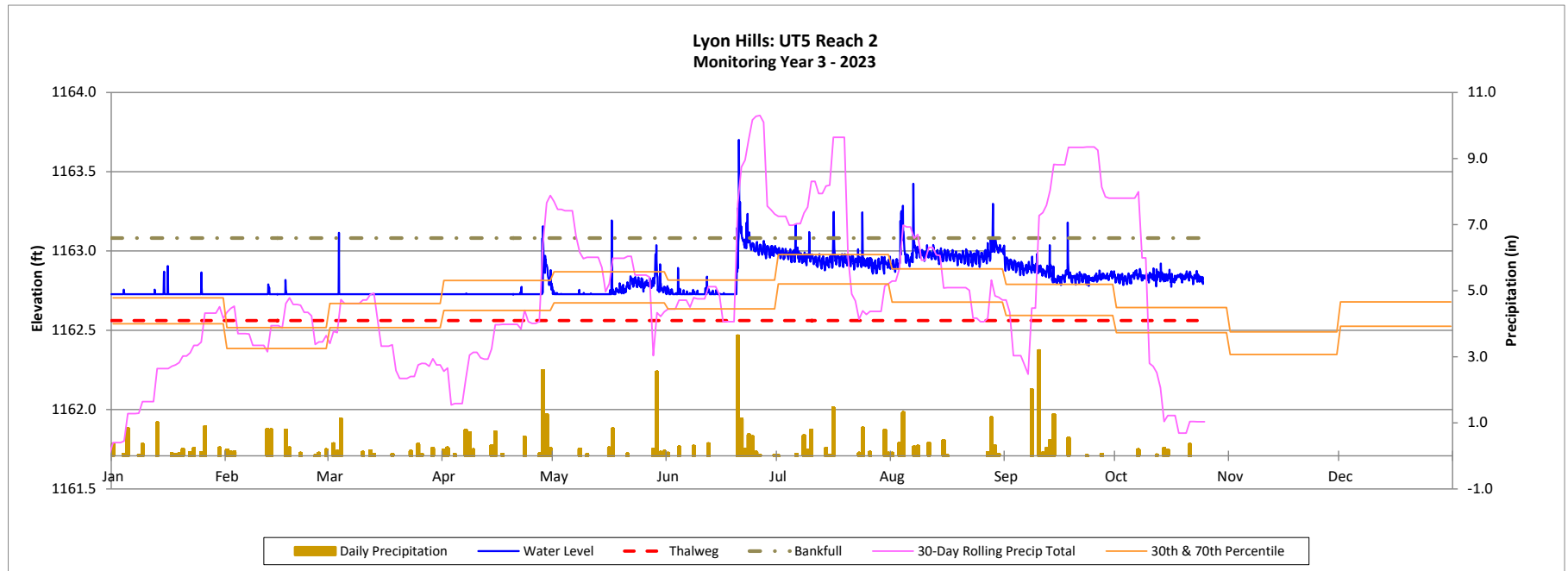


Table 12. Recorded In-Stream Flow Events Summary

Lyon Hills Mitigation Site
 DMS Project No. 100085
Monitoring Year 3 - 2023

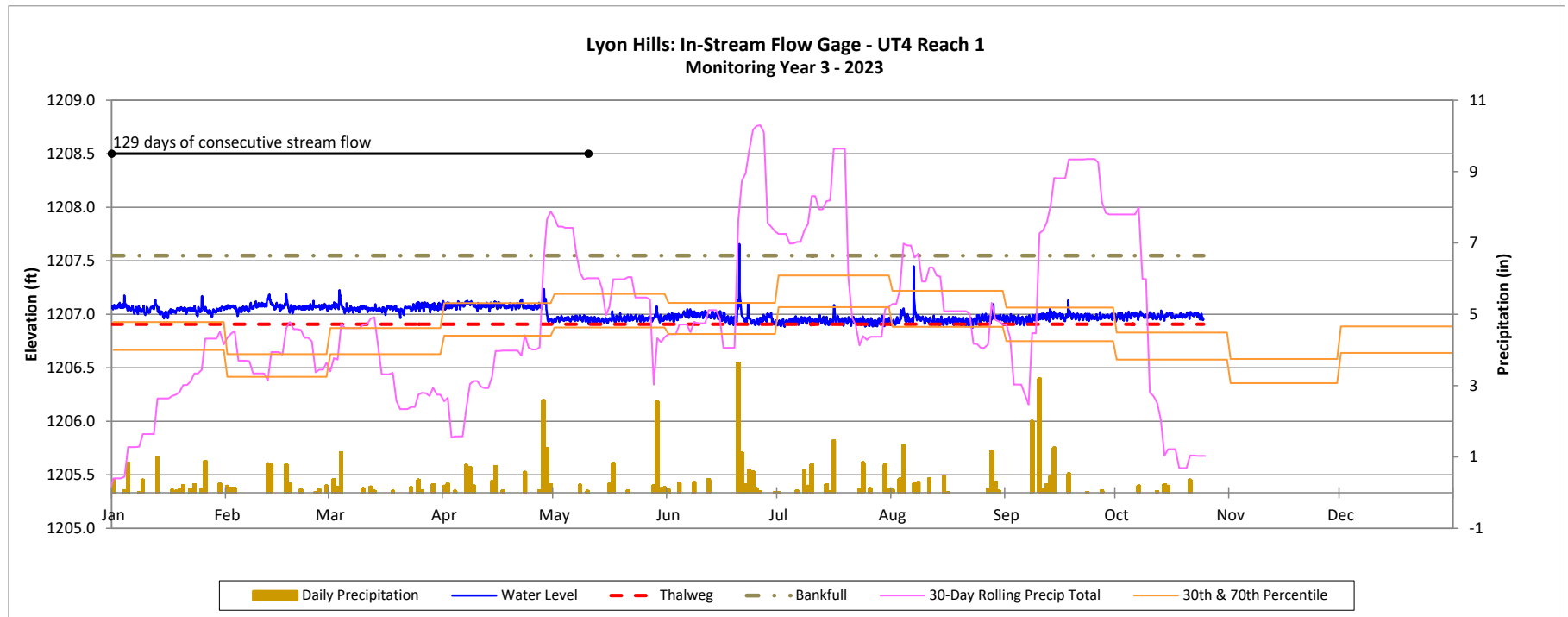
Reach	Max Consecutive Days/Total Days Meeting Success Criteria*						
	MY1 (2021)	MY2 (2022)	MY3 (2023)**	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
UT4	365 Days/	130 Days/	129 Days/				
Reach 1	365 Days	365 Days	297 Days				

*Success criteria is 30 consecutive days of flow.

**Data collected through October 24, 2023.

Recorded In-Stream Flow Events Plot

Lyon Hills Mitigation Site
DMS Project No. 100085
Monitoring Year 3 - 2023



APPENDIX E. Project Timeline and Contact Info

Table 13. Project Activity and Reporting History

Lyon Hills Mitigation Site
 DMS Project No. 100085
Monitoring Year 3 - 2023

Activity or Deliverable		Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted		NA	June 2018
Mitigation Plan Approved		July 2020	July 2020
Construction (Grading) Completed		NA	January 2021
Planting Completed		NA	March 2021
As-Built Survey Completed		February 2021	February 2021
Baseline Monitoring Document (Year 0)	Stream Survey	February 2021	June 2021
	Vegetation Survey	March 2021	
Year 1 Monitoring	Stream Survey	September 2021	December 2021
	Vegetation Survey		
Year 2 Monitoring	Stream Survey	May 2022	November 2022
	J-Hook and Perched Culvert Repair	August 2022	
	In-stream Vegetation Treatment		
	Vegetation Survey		
Year 3 Monitoring	Invasive Treatment	May, July, and November 2023	November 2023
	Stream Survey	July 2023	
	Vegetation Survey	August 2023	
	Culvert Repair		
Year 4 Monitoring			December 2024
Year 5 Monitoring	Stream Survey	2025	December 2025
	Vegetation Survey	2025	
Year 6 Monitoring			December 2026
Year 7 Monitoring	Stream Survey	2027	December 2027
	Vegetation Survey	2027	

Table 14. Project Contact Table

Lyon Hills Mitigation Site
 DMS Project No. 100085
Monitoring Year 3 - 2023

Designer Nicole Macaluso Millns, PE	Wildlands Engineering, Inc. 312 West Millbrook Road, Suite 225 Raleigh, NC 27609 704.819.0848
Construction Contractor	Wildlands Construction, Inc. 312 West Millbrook Road, Suite 225 Raleigh, NC 27609
Monitoring Performers Monitoring, POC	Wildlands Engineering, Inc. Kristi Suggs 704.332.7754

APPENDIX F. Additional Documentation

BANKFULL PHOTOGRAPHS



Hanks Branch R3, station 232+61 – Right Bank Wrack Line
(6/18/2023)



Hanks Branch R3, station 232+61 – Left Bank Wrack Line
(10/5/2023)



REPAIR PHOTOGRAPHS



Hanks Branch R3 – Culvert Outlet (6/21/2023)



Hanks Branch R3 – Repaired Culvert Outlet (10/17/2023)

