



MONITORING YEAR 2 ANNUAL REPORT FINAL

December 2023

DOUBLE H FARMS MITIGATION SITE

Alleghany County, NC
DEQ Contract No. 7608
DMS Project No. 100082

New River Basin HUC 05050001
USACE Action ID No. SAW-2018-01771
NCDEQ DWR#: 18-1270
RFP #: 16-007403
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PREPARED FOR:



NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
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December 15, 2023

Mr. Harry Tsomides
Western Project Manager
NCDEQ – Division of Mitigation Services
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211

RE: Draft Year 2 Monitoring Report
Double H Farms Mitigation Site, Alleghany County
New River Basin – HUC 05050001
DMS Project ID No. 100082 / DEQ Contract #7608

Dear Mr. Tsomides:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments from the Draft Year 2 Monitoring Report for the Double H Farms Mitigation Site. The report and associated digital files have been updated to reflect those comments. The Final MY2 Report is included. DMS' comments are noted below in **bold** text. Wildlands' responses to DMS' report comments are noted below in *italics*.

DMS' comment: Thank you for noting the action items from the 2023 Credit Release meeting and addressing them (steep slope random plot, gwg reporting format, etc.)

Wildlands' Response: Thank you.

DMS' comment: Please fix minor typo error in Table of Contents

Wildlands' Response: Error in the Table of Contents has been corrected.

DMS' comment: DMS appreciates the good culvert inlet / outlet paired photos. Conditions in these do not appear to have changed much since MY1 (2022).

Wildlands' Response: The culverts are performing well on site and WEI will continue to take culvert photos in early Spring to ensure visibility.

DMS' comment: Table 2 (Goals, Performance Criteria, and functional Improvements) – Wildlands might want to update the stream stability cumulative monitoring results to reflect the structural failures/ stream instabilities along reaches UT1/UT4 and part of UTCC, and indicate or footnote that an adaptive management plan to address these (and the vegetation) issues is in progress.

Wildlands' Response: A footnote detailing the underperforming areas that will be addressed in the Adaptive Management Plan has been added to Table 2.

DMS' comment: Digitals – No edits needed.

Wildlands' Response: Digital files will be submitted via USB for the final submittal. Thank you.



As requested, Wildlands has included two hard copies of the Final Double H Farms Mitigation Year 2 Monitoring Report with a copy of our comment response letter inserted after the report's cover page. In addition, a USB drive with the full final electronic copy of the report, our response letter, and all the electronic support files has been included. 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
ksuggs@wildlandseng.com

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DOUBLE H FARMS MITIGATION SITE
Monitoring Year 2 Annual Report

TABLE OF CONTENTS

Section 1: PROJECT OVERVIEW 1-1

 1.1 Project Quantities and Credits 1-1

 1.2 Project Goals and Objectives 1-2

 1.3 Project Attributes..... 1-4

Section 2: MONITORING YEAR 2 DATA ASSESSMENT..... 2-7

 2.1 Vegetative Assessment 2-7

 2.2 Stream Assessment..... 2-2

 2.3 Stream Hydrology Assessment 2-2

 2.4 Wetland Hydrology Assessment 2-3

 2.5 Areas of Concern and Management Activity 2-3

 2.6 Monitoring Year 2 Summary 2-5

Section 3: REFERENCES 3-1

TABLES

Table 1: Project Quantities and Credits 1-1

Table 1.2: Credit Summary Table..... 1-2

Table 2: Goals, Performance Criteria, and Functional Improvements 1-3

Table 3: Project Attributes..... 1-5

FIGURES

Figure 1 Current Condition Plan View (Key)

Figures 1a-1d Current Condition Plan View

Figure 2a Project Component Map and Wetland Asset Map

Figure 2b Wetland Planting Map

APPENDICES

Appendix A Visual Assessment Data

Tables 4a- 4c Visual Stream Morphology Stability Assessment Table

Table 5 Vegetation Condition Assessment Table

Stream Photographs

Internal Crossing Photographs

MY2 Stream Area of Concern Photographs

Supplemental Photographs

Permanent Vegetation Plot Photographs

Mobile Vegetation Plot Photographs

Bog Vegetation Plot Photographs

Vegetation Transect Photographs

Appendix B Vegetation Plot Data

Table 6a Vegetation Plot Data

Table 6b Vegetation Plot Data Continued

Table 7a Vegetation Performance Standards Summary Table

Table 7b	Bog Herbaceous Wetland Vegetation Plot Data
Table 7c	Vegetation Transect Table

Appendix C

Stream Geomorphology Data

	Cross-Section Plots
Table 8	Baseline Stream Data Summary
Table 9	Cross-Section Morphology Monitoring Summary

Appendix D

Hydrology Data

Table 10	Bankfull Event Summary
Table 11	Rainfall Summary
Table 12	Recorded In-Stream Flow Events Summary
Table 13	Recorded Groundwater Gage Summary
	Recorded Bankfull Event Plots
	Recorded In-Stream Flow Events Plots
	Groundwater Gage Plots

Appendix E

Project Timeline and Contact Info

Table 14	Project Activity and Reporting History
Table 15	Project Contact Table

Section 1: PROJECT OVERVIEW

The Double H Farms Mitigation Site (Site) is situated in the Blue Ridge Physiographic Province of North Carolina, in the rural countryside in Alleghany County near Ennice, NC, and approximately eleven miles northwest of the Town of Sparta. The Site is loosely bound by Little Pine Road to the southwest, Crab Creek Road to the west, and Wilson Road to the north (Figure 1). Ten unnamed tributaries (UTs) to Crab Creek (UT to Crab Creek, UT1, UT1A, UT3, UT3A, UT4, UT5, UT6, UT7, and Hillside Tributary) are protected as part of the project’s conservation easement. Table 3 presents information related to the project attributes.

1.1 Project Quantities and Credits

The project restored, enhanced, and preserved 8,650 linear feet (LF) of streams and preserved and enhanced 4.872 acres (AC) of wetlands. Additionally, pastureland was converted into riparian buffer, and cattle were excluded from Site’s streams and wetlands. The work proposed on the Site will provide 6,560.410 stream mitigation units (SMUs) and 2.151 wetland mitigation units (WMUs). The Site is located within the Little River targeted local watershed Hydrologic Unit Code (HUC) 05050001030020 in the northeastern portion of the New River basin 05050001 (New 01). This Site was included in the 2004-2007 Little River and Brush Creek Local Watershed Plan (LWP).

Please refer to Table 1 and Table 1.2 for project quantities and credits by stream and the credit summary table, respectively. Annual monitoring will be conducted for seven years with close-out anticipated to commence in 2028 given the success criteria are met.

Table 1.1: Project Quantities and Credits

Project Components						
Project Stream	Mitigation Plan Footage ^{1,3}	As-Built Footage ^{1,3}	Mitigation Category	Restoration Level	Mitigation Ratio (X:1)	Credits
UT to Crab Creek Reach 1 and Reach 2	2,817.7	2,817.000	Cold	R	1.000	2,817.700
UT1 Reach 1	619.1	606.000	Cold	P	10.000	61.910
UT1 Reach 2	91.8	84.000	Cold	EII	5.000	18.360
UT1A Reach 1	1,112.9	1,114.000	Cold	R	1.000	1,112.900
UT1A Reach 2	110.0	110.000	Cold	P	10.000	11.000
UT3	365.5	365.000	Cold	EII	3.000	121.833
UT3A	145.7	146.000	Cold	EII	3.000	48.567
UT4 Reach 1	849.8	847.000	Cold	R	1.000	849.800
UT4 Reach 2	588.6	602.000	Cold	EI	1.500	392.400
UT5 Reach 1 ²	252.1	252.000	Cold	EII	2.500	100.840
UT5 Reach 2	305.0	305.000	Cold	R	1.000	305.000

Table 1.1: Project Quantities and Credits

Project Components						
Project Stream	Mitigation Plan Footage ^{1,3}	As-Built Footage ^{1,3}	Mitigation Category	Restoration Level	Mitigation Ratio (X:1)	Credits
Hillside Tributary	248.1	248.000	Cold	EII	2.500	99.240
UT6	283.0	283.000	Cold	P	N/A	0.000
	422.4	419.000	Cold	EII	2.500	168.960
UT7 ²	451.9	452.000	Cold	R	1.000	451.900
Total:						6,560.410
Project Wetlands						
Wetlands C and F	0.308	0.303	RR	P	10.000	0.031
Wetland N	0.932	0.932	RR	E	3.000	0.311
All other Site Wetlands	3.618	3.637	RR	E	2.000	1.809
Total:						2.151

Notes:

1. Internal culvert crossings are excluded from the credited stream footage.
2. No direct credit for BMP's.
3. UT1A contains an overhead powerline easement that was excluded from the stream lengths.
4. The length of the riprap easement encroachment at the UT4 Reach 1 and UT6 crossings have been removed from the credited stream length.

Table 1.2: Credit Summary Table

Project Credits							
Restoration Level	Stream			Riparian Wetland		Non-Riparian Wetland	Coastal Marsh
	Warm	Cool	Cold	Riverine	Non-Riverine		
Restoration	N/A	N/A	5,537.300	N/A	N/A	N/A	N/A
Re-establishment				N/A	N/A	N/A	N/A
Rehabilitation				N/A	N/A	N/A	N/A
Enhancement				2.120	N/A	N/A	N/A
Enhancement I	N/A	N/A	392.400				
Enhancement II	N/A	N/A	557.800				
Creation				N/A	N/A	N/A	N/A
Preservation	N/A	N/A	72.910	0.031	N/A	N/A	
Totals	N/A	N/A	6,560.410	2.151	N/A	N/A	N/A

1.2 Project Goals and Objectives

The Site is providing numerous ecological benefits within the New River Basin. The project goals were established with careful consideration to address stressors that were identified in the 2004-2007 Little River and Brush Creek Local Watershed Plan, the 2009 New River Basin Restoration Priorities (RBRP) report, and the 2015 North Carolina Wildlife Resource Commission's (NCWRC) Wildlife Action Plan

(WAP). The project has improved stream functions through the implementation of stream restoration and enhancement, the conversion of maintained pastureland into riparian buffer, and the exclusion of cattle from the Site’s streams and wetlands. Improvements are outlined below as project goals and objectives.

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Reconnect channels with floodplains and riparian wetlands to allow a natural flooding regime.	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to the existing floodplain. Remove overburden to reconnect with adjacent wetlands.	Dispersion of high flows on the floodplain and recharging of riparian wetlands.	Four bankfull events in separate years within monitoring period.	UT to Crab Creek R2 Crest Gage (CG); UT1A R1 Stream Gage (SG).	Channel has met bankfull in two separate years and is on track to meet performance criteria. The SG on UT1A R1 met the minimum criteria (30 days).
Exclude livestock from stream channels and wetlands.	Install livestock fencing as needed to exclude livestock from stream channels, wetlands, and riparian areas.	Reduction in sediment inputs from bank erosion, reduction of shear stress, and improved overall hydraulic function. Eliminate cattle trampling wetlands.	There is no required performance standard for this metric.	Visual annual assessments.	No cattle within the easement.
Restore and enhance native floodplain vegetation.	Plant native tree and understory species in riparian zones and plant appropriate species on streambanks. Protect and enhance existing forested riparian buffers. Allow wetlands determined to have good bog turtle potential to be open herbaceous areas that naturally succeed.	Reduction in floodplain sediment inputs from runoff, increased bank stability, increased LWD and organic material in streams. Support all stream functions.	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 6 feet at MY5 and 8 feet at MY7. Bog plots with >80% vegetated cover with >50% of species with an indicator status of FAC or wetter.	9 permanent, 5 mobile vegetation plots. 2 bog herbaceous assess areas of suitable bog turtle habitat. Plots will be assessed in MY1, MY2, MY3, MY5 and MY7.	6/14 (43%) veg plots have a stem density greater than 320 stems per acre. ¹ Both bog plots have a vegetative cover of 80% and greater than 50% of the species have an indicator status of FAC - OBL.

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 slated for restoration with stable dimensions and appropriate depth relative to the existing floodplain. Add bank revetments and instream structures to protect restored/ enhanced streams.	Reduction of sediment inputs from bank erosion, shear stress and increase floodplain engagement.	ER remains greater than 2.2 for C channels and 1.4 for B channels, and a BHR of less than 1.2. Visual assessments showing progression towards stability.	14 cross-sections surveyed in MY1, MY2, MY3, MY5, & MY7.	Most streams and structures are stable. ¹ BHR is <1.2, and entrenchment ratios are >1.4 for B channels and >2.2 for C channels.
Improve instream habitat.	Install habitat features such as constructed steps, cover logs, and brush toes on restored reaches. Add woody materials to channel beds. Construct pools of varying depth. Remove man-made impoundment.	Increase and diversify available habitats for macroinvertebrates, fish, and amphibians. Promote aquatic species migration and recolonization and increase biodiversity over time.	There is no required performance standard for this metric.	N/A.	N/A
Treat concentrated agricultural runoff.	Install agricultural BMPs in areas of concentrated agricultural runoff to treat runoff before it enters the stream channel.	Reduce nutrient input from surrounding agricultural fields.	There is no required performance standard for this metric.	Annual visual assessments.	N/A
Permanently protect the project Site from harmful uses.	Establish a conservation easement on the Site.	Protect Site from encroachment on the riparian corridor and direct impact to stream and wetlands.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure that no easement encroachment is occurring.	No easement encroachments.

1. Supplemental planting will be proposed in an Adaptive Management Plan (AMP) to address the failing vegetation plots and surrounding areas of low stem density. The AMP will also propose a repair plan to address structural failures along UT1, UT4 and UT to CC identified during the visual stream assessment.

1.3 Project Attributes

The Site’s immediate drainage area, as well as the surrounding watershed, has a long history of agricultural activity. Stream and wetland functional stressors for the Site were related to both historic and current land use practices. Major stream stressors for the Site pre-restoration included

livestock trampling and fecal coliform inputs, lack of stabilizing stream bank and riparian vegetation, active erosion, and incision. The effects of these stressors resulted in channel instability, degraded water quality, and the loss of both aquatic and riparian habitat throughout the Site's immediate watershed when compared to reference conditions.

The overall Site topography consists of steep and confined valleys along the tributaries that flow into a more open and gradually sloped valley along the mainstem of UT to Crab Creek. All tributaries, except UT4 and UT to Crab Creek, originate as headwater seeps on the project parcels. Upstream UT4 begins below the roadway culvert of Crab Creek Road. UT to Crab Creek begins offsite and flows northeast to the project's outlet. All Site drainage areas are encompassed by the UT to Crab Creek watershed, which extends northwest past Crab Creek Road and is typically defined by forested and agricultural land use with sporadic rural residential developments. Pre-construction and post-construction conditions are outlined in Table 3 below and Table 8 in Appendix C.

Table 3: Project Attributes

Project Watershed Summary Information								
Physiographic Province	Blue Ridge		River Basin			New River		
USGS Hydrologic Unit 8-digit	05050001		USGS Hydrologic Unit 14-digit			05050001030020		
Project Watershed Summary Information								
DWR Sub-basin	05-07-03		2011 NLCD Land Use Classification			Forest (35%), Agriculture (57%), Developed (8%)		
Project Drainage Area (acres)	274		Project Drainage Area Percentage of Impervious Area			0.5%		
Reach Summary Information								
Parameters	UT to Crab Creek R1	UT to Crab Creek R2	UT1A R1	UT1A R2	UT1 R1	UT1 R2	UT3	UT3A
Post-project length (feet)	2,817		1,114	110	606	84	365	146
Valley confinement (Confined, moderately confined, unconfined)	Moderately Confined	Unconfined	Confined	Moderately Confined	Unconfined	Moderately confined	Unconfined	
Drainage area (acres)	127	274	14		47		49	1
Perennial (P), Intermittent (I), Ephemeral (E)	P	P	I/P	P	P	P	P	P
NCDWR Water Quality Classification	Class C; Tr; HQW							
Dominant Stream Classification (existing)	C4b	C4b	A4	N/A	N/A	N/A	N/A	N/A
Dominant Stream Classification (proposed)	B4	C4	A4a+/B4a	N/A	N/A	N/A	N/A	N/A

Table 3: Project Attributes

Dominant Evolutionary Classification (Simon) if applicable	III	IV	III	VI	VI	IV->V	VI	VI
Parameters	UT4 R1	UT4 R2	UT5 R1	UT5 R2	UT6	UT7	Hillside Tributary	
Post-project length (feet)	847	602	252	305	749	452	248	
Valley confinement (Confined, moderately confined, unconfined)	Confined	Moderately Confined	Confined	Moderately Confined	Confined	Confined	Unconfined	
Drainage area (acres)	27	35	10		12	23	4	
Perennial (P), Intermittent (I), Ephemeral (E)	P	P	P	P	I/P	P	P	
NCDWR Water Quality Classification	Class C; Tr; HQW							
Dominant Stream Classification (existing)	B4a	B4a	N/A	B4a	N/A	B4a	N/A	
Dominant Stream Classification (proposed)	B4a	B4a	N/A	B4a	N/A	B4a	N/A	
Dominant Evolutionary Classification (Simon) if applicable	III	IV	V	V	VI	III	V	
Regulatory Considerations								
Regulation	Applicable?		Resolved?	Supporting Docs?				
Waters of the United States - Section 404	Yes		Yes	USACE Action ID #SAW-2018-01771				
Waters of the United States - Section 401	Yes		Yes	DWR# 20181270				
Division of Land Quality (Erosion and Sediment Control)	Yes		Yes	NPDES Construction Stormwater General Permit NCG010000				
Endangered Species Act	Yes		Yes	Categorical Exclusion Document in Mitigation Plan				
Historic Preservation Act	Yes		Yes	Categorical Exclusion Document in Mitigation Plan				
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No		N/A	N/A				
FEMA Floodplain Compliance	No		N/A	N/A				
Essential Fisheries Habitat	No		N/A	N/A				
Wetland Summary Information								
Parameters	Wetlands C and F			Wetland N		All other Site Wetlands		
Pre-project area (acres)	0.303			0.932		3.637		
Post-project area (acres)	N/A			N/A		N/A		
Wetland Type (non-riparian, riparian)	Riparian Riverine							

Table 3: Project Attributes

Mapped Soil Series	Chester Loam, 10-25% slopes (CeE)	Alluvial Land, wet (AD)	Chester Loam, 10-25% slopes (CeE), Alluvial Land, wet (AD), Tate Loam, 6-10% slopes (TaC)
Soil Hydric Status	Hydric		

Section 2: MONITORING YEAR 2 DATA ASSESSMENT

Annual monitoring and Site visits were conducted during MY2 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 assessment are located in section 1.2 Table 2: Goals, Performance Criteria, and Functional Improvements. Methodology for annual monitoring is presented in the Monitoring Year (MY) 0 Annual Report (Wildlands, 2022).

2.1 Vegetative Assessment

Please see the Current Condition Plan View (CCPV) maps for permanent vegetation plot (VP) locations, MY2 mobile plot locations, bog turtle herbaceous plot locations, and vegetation transect locations. Vegetation plot and vegetation transect photographs are located in Appendix A. All vegetation summary data for plots and transects are in Appendix B. Please note Table 7 summarizes only the Mitigation Plan species stem densities. Two additional riparian species were approved by the IRT as documented in the MY0 Annual Monitoring Report (Wildlands, 2022). To account for the inclusion of the approved “Post Mitigation Plan” species, please refer to the “Post Mitigation Plan” planted densities in Tables 6a and 6b. These densities are used in the results discussion below.

Vegetation Monitoring Plot Results

The MY2 permanent plot stem densities using the “Post Mitigation Plan” performance standard ranged from 202 to 405 stems per acre. In MY2, 5 out of 9 plots are on track to meet the MY3 criteria. The MY2 mobile plot stem “Post Mitigation Plan” planted densities ranged from 121 to 364 stems per acre with 1 out of 5 on track to meet MY3 criteria. The average stem height was 2 feet. The average species diversity was 4 species per plot.

Overall, there was a 28% decrease in plots on track to meet criteria from 71% (10/14) of plots meeting in MY1 to 43% (6/14) in MY2. In MY1 the average planted density was 364 stems per acre for the Site as a whole, exceeding the MY3 criteria of 320 stems per acre. However, the MY2 Site average stem density dropped to 278 stems per acre. The Site is no longer on track to meet the MY3 criteria of 320 stems per acre. Please refer to the vegetation areas of concern in section 2.5 for more detail and planned adaptive management activities.

Vegetation Transect Results

As documented in the MY1 report (Wildlands, 2022), two additional vegetation transects are used to monitor the development of woody stems in wetland areas. To maintain herbaceous cover as the dominant vegetation for the bog turtle habitat, woody riparian species were limited to 15 feet from the top of bank on tributaries UT3, UT3A, UT5, UT6, and Hillside Tributary. In areas where the bog turtle wetlands intersected the main channel corridor of UT to Crab Creek, riparian species were planted 30 feet from the top of bank. These transects rotate throughout the 15 and 30 foot planted wooded buffers

along UT to Crab Creek, UT5, and UT6 adjacent to wetland N, P, W and AA each monitoring year and are not held to the density or height requirements.

In MY2, vegetation transect 1 was located within wetland P along UT5 and had a total stem count of 7 woody stems. Transect 2 was located within wetland N near the UT3/ UT to Crab Creek confluence and had a total woody stem count of 3 stems. A third vegetation transect was requested by the IRT along steep slopes during the MY2 vegetation assessment. Transect 3 was collected along UT1A Reach 1 where a mobile vegetation plot failed to meet density requirements in MY1. Throughout all transects, sycamore (*Platanus occidentalis*) was the dominant species and there was a reduction in species count from MY1 to MY2. The vegetation transect data supports the need for woody supplemental planting to increase species diversity and density which is detailed in section 2.5.

Bog Turtle Herbaceous Wetland Vegetation Plot Results

In MY2, bog areas have maintained diverse native herbaceous species with FACW-OBL wetland indicator status. Overall, bogs are maintaining herbaceous wetland cover to support bog turtle habitat without interference from woody stems. No supplemental planting is proposed in bog areas outside of what was proposed in the Mitigation Plan (Wildlands, 2020). Summary data and photographs of each plot can be found in Appendix B and Appendix A, respectively.

2.2 Stream Assessment

Riffle cross-sections (XS) on the restoration reaches should be stable and show minor change in bankfull area, maximum depth ratio, and width-to-depth ratio. All riffle cross-sections should fall within the parameters defined for the designated 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 and/or eroding channel banks.

Morphological surveys for MY2 were conducted in June 2023. Riffle cross-section survey results indicate that channel dimensions are stable and functioning as designed on all restoration reaches with minimal adjustments from MY0 to MY2. Pool cross-sections along UT to Crab Creek show both slight aggradation and scour at various cross-sections along the restored channel from MY0 to MY2 but is not considered an area of concern. Cross-section plots and dimensional results are located in Appendix C.

While all cross-sections have maintained a bank height ration of less than 1.2 and appropriate Rosgen parameters, there are areas of stream instability throughout two steeply sloped tributaries on the Site (UT1A and UT4) and the main channel along UT to Crab Creek (XS5 on UT to Crab Creek has incised slightly compared to MY1). These instances of structure piping and incision likely occurred early in the late winter months of 2022 during large rainfall events. Please refer to section 2.5 for more detail about the stream areas of concern.

2.3 Stream Hydrology Assessment

An automated pressure transducer was installed on UT to Crab Creek to document bankfull events throughout the seven-year monitoring period. Henceforth, this device is referred to as a “crest gage (CG).” Automated pressure transducers were also installed in the channel to capture stream flow on UT1A and UT4 and are henceforth referred to as “stream gage (SG).”

Bankfull events have occurred in both MY1 and MY2 and the Site is halfway to meeting the success criteria requirements of four or more bankfull flow events occurring in separate years. One bankfull event was recorded by the CG on 6/22/23 in MY2 in addition to wracklines documented on 4/5/23. In MY2, all three SGs on Site recorded 284 days of continuous flow as of 10/12/23 encompassing the entire

period monitored. UT1A's baseflow exceeded the minimum criteria of 30 consecutive days during a normal precipitation year. Refer to Appendix D for hydrologic data.

Based on collected rainfall obtained from the nearest rain gage station 318158- Sparta 2 Se (located approximately 7 miles from the Site), the Site has received a total of 41.4 inches of precipitation as of October 2023. The 30th and 70th percentile data collected from the SPARTA 3.5 SSW, NC WETS Station (1971 – 2000) indicate that the recorded rainfall for 2023 will likely fall within the average amount of annual precipitation. Please refer to Appendix D for hydrology summary data and gage plots.

2.4 Wetland Hydrology Assessment

As part of the IRT's approval for the Site's Mitigation Plan, the NC DWR requested groundwater gages in existing wetlands in order to monitor the effect of stream restoration on existing wetland hydrology. Representative gages GWG1 and GWG2 were installed in Wetland S and Wetland M to record groundwater levels twice each day. The established growing season for Alleghany County, NC is from April 26 through October 11 under typical precipitation conditions compiled from the SPARTA 3.5 SSW, NC WETS Station (1971 – 2000). The groundwater gages are not held to success criteria and were installed solely to verify the continuation of hydrology. The groundwater gage plots are available in Appendix D. Supplemental photographs of the GWGs, and surrounding wetland areas, are provided in Appendix A.

MY1 and MY2 groundwater summary data is available in Table 13 per IRT request during the 2023 Credit Release meeting. Although not held to criteria, GWG2 only rose within 12 inches of the ground surface for 5 consecutive days in MY2 and appears to have rainfall driven hydrology. Based on field observations, GWG2 is on the fringe of Wetland M and there is much stronger evidence of hydrology and wetland vegetation immediately adjacent to the gage in the southern portion of the wetland closer to the hillside seep hydrology source. Wetland vegetation is still found in the wetland area represented by GWG2, as documented in supplemental photographs in Appendix A. GWG1 in Wetland S has recorded groundwater just below the ground surface for 169 consecutive days and is more representative of the wetland enhancement areas and the continuation of hydrology on the Site. Generally, standing water or saturation has been observed throughout the growing season in wetland enhancement areas. Overall, there has been no visual evidence of impact to existing wetland hydrology due to the project.

2.5 Areas of Concern and Management Activity

MY1 Management Activity: Stream Repair Follow up

In MY1, four repairs were completed across the Site per IRT request and most appear to be functioning and stable in MY2. A coir log check was added at the corner of UT4 and the UT to Crab Creek confluence. A partial baffle was added to the right culvert inlet on the UT to Crab Creek Crossing 2. Along UT to Crab Creek R1, a log sill at station 114+00 was notched to allow flow over the structure, and splash rock was added to the J-hook at station 112+10 to reduce the grade change over the structure. However, in MY2, the log in the J-hook structure has failed. Please see below for further information on proposed structure repairs. Repair documentation was included in the MY1 report (Wildlands, 2022) and per IRT request call outs for MY1 repaired areas were added to the CCPV maps.

MY2 Stream Areas of Concern

Stream areas of concern are documented in Tables 4a-4c, and the MY2 stream areas of concern photographs found in Appendix A. Throughout UT to Crab Creek, UT1A, and UT4 there are multiple failing structures likely due to heavy rainfall in late winter 2022 in addition to being steeply sloped

channels. Despite the needed repairs, 92% of grade control structures and 96% of bank protection structures are performing as intended along UT to Crab Creek (Table 4a). The outstanding MY1 repair on UT to Crab Creek R1 is included in these metrics. Along UT1A, 94% of grade control structures are performing as intended. UT4 R1 and R2 require the most repair work with 80% and 81% of grade control structures respectively performing as intended. Additionally, approximately 92 LF of toe erosion is present along UT4 R2, however 92% of the banks are stable.

It is likely that unless repaired, these areas will continue to erode and add instability to the channel without intervention. All proposed repair areas are documented with a description in the MY2 Stream Area of Concern Photographs located in Appendix A, in addition to being marked on the MY2 CCPV maps. The MY2 Stream Area of Concern Photographs will be used to document the pre and post repair condition moving forward. A more detailed description of the areas of concern, proposed repairs, and proposed monitoring will be submitted in an Adaptive Management Plan (AMP) for the IRT for review.

Vegetation Areas of Concern

In addition to discussing stream areas of concern, the AMP will also detail the vegetation areas of concern and supplemental planting along the underperforming reaches of the Site, as represented by vegetation plots that are not meeting performance standards. The low success rate across the Site is likely due to the low temperatures at the Site during the as-built planting in January 2022 which was documented in the MY0 Annual Report (Wildlands, 2022). Additionally, some areas throughout the floodplain were wetter than anticipated outside of the existing wetland footprints.

Based on the MY2 visual assessments, live stakes planted along the stream banks are surviving across the Site. However, areas in the riparian corridor beyond top of bank have demonstrated low rates of survival after the first growing season (data collected during MY0 and MY1). Areas proposed for supplemental planting have been included as “Low Stem Density Areas” in Table 5 focusing on areas that were open pasture before construction and included in the original planting areas along UT1A, UT4 Reach 1, UT to Crab Creek, and the former pond bed on UT5. The same standards that were used in the Mitigation Plan (Wildlands, 2020) in the areas where planting is proposed in the bog turtle wetlands will be used. Riparian species will be limited to 15 feet from the top of bank on UT5. In areas where the bog turtle wetlands intersected the main channel corridor of UT to Crab Creek, riparian species will be planted 30 feet from the top of bank. Supplemental planting is proposed within 30 feet from top of bank along UT to Crab Creek with some extension in wetland areas where the floodplain was wetter than anticipated. On UT1A and UT4, supplemental planting is proposed from top of bank to the edge of the easement in underperforming areas, except for portions where a mature canopy existed pre-construction.

Wildlands is taking the opportunity to replant all underperforming areas observed on Site at once for a proposed total of 7.1 acres (40% of the planted acreage). The supplemental planting would take place in the 2023/2024 dormant season to improve species diversity and stem height across the Site long-term. A variety of riparian and wetland species as well as proposed monitoring will be included in the AMP for IRT review before being planted on Site. The low stem density/ proposed supplemental planting areas have been added to the MY2 CCPV maps. Please refer to Appendix A for summary data.

MY2 Management Activity: Invasive Treatment and Easement Condition

Treatments in MY1 were effective and there was a reduction in density of invasives. To keep the population in check, re-sprout treatment of multiflora rose (*Rosa multiflora*) took place in October 2023 along UT1, UT3 and UT6. There has been a significant reduction in the population between MY1 and MY2 and woody volunteers such as honey locust (*Gleditsia triacanthos*) and viburnum species are

starting to become established in treated areas. Invasive species will continue to be monitored and treated as necessary in the remaining monitoring years through closeout.

A full boundary inspection has been completed on the Site. All fences on the Site are intact and no encroachments were present as of October 2023.

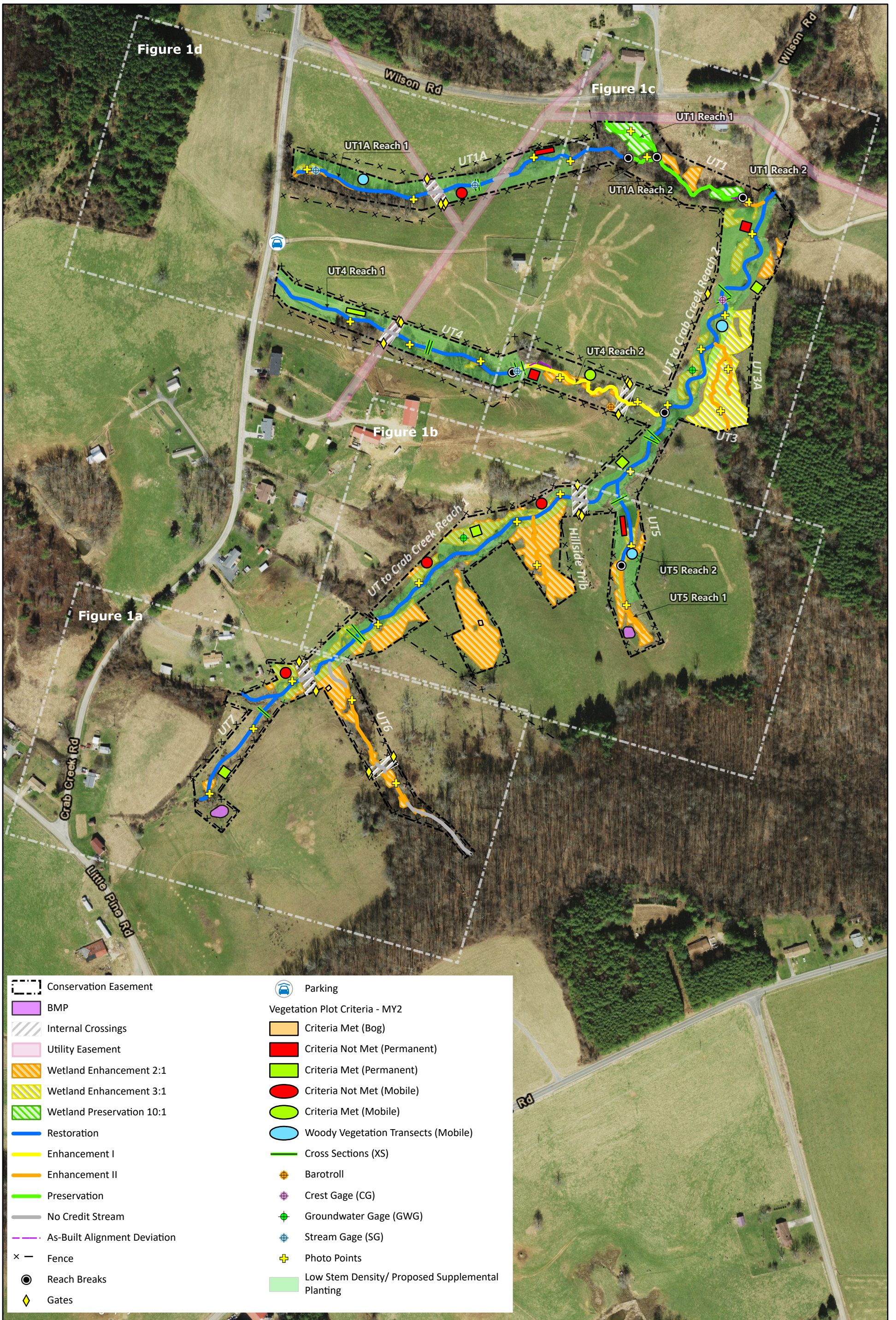
2.6 Monitoring Year 2 Summary

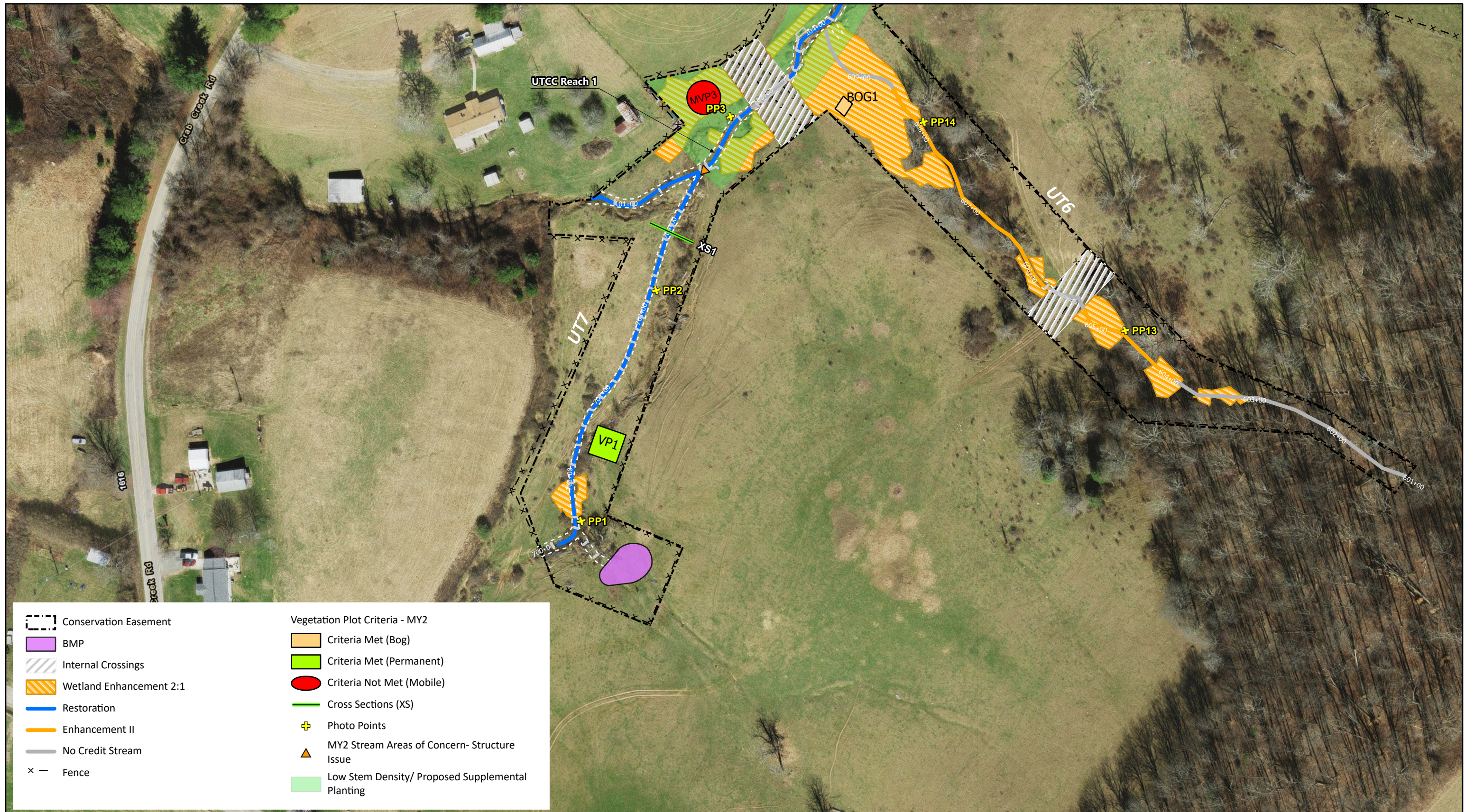
In MY2, the Site is on track to meet the required success criteria, with the exception of vegetation performance. Cross-section survey results indicate that channel dimensions are stable and functioning as designed on all restoration reaches, except for some incision on XS5. However, visual assessments revealed some stream stability issues on UT1A, UT4, and UT to Crab Creek. The Site's average planted stem density was 278 stems per acre and 43% of vegetation plots are on track to meet MY3 criteria. There is a diverse mix of native herbaceous species throughout the Site and both bog vegetation plots are meeting criteria. All three SGs recorded 284 days of consecutive flow, and a bankfull event on the main channel was documented during MY2. Areas treated in MY1 for multiflora rose on UT6 were reduced significantly and treated again for any resprouts in October 2023. All areas of the project will continue to be monitored and adaptive management will be implemented as necessary throughout the remaining monitoring years. An AMP with proposed repairs and supplemental planting plan will be submitted to the IRT for review to address the Site's underperformance in woody vegetation survival and stream stability issues on UT1A, UT4, and UT to Crab Creek.



Section 3: REFERENCES

- North Carolina Division of Mitigation Services (NCDMS). 2020. Vegetation Data Entry Tool and Vegetation Plot Data Table. Raleigh, NC. https://ncdms.shinyapps.io/Veg_Table_Tool/
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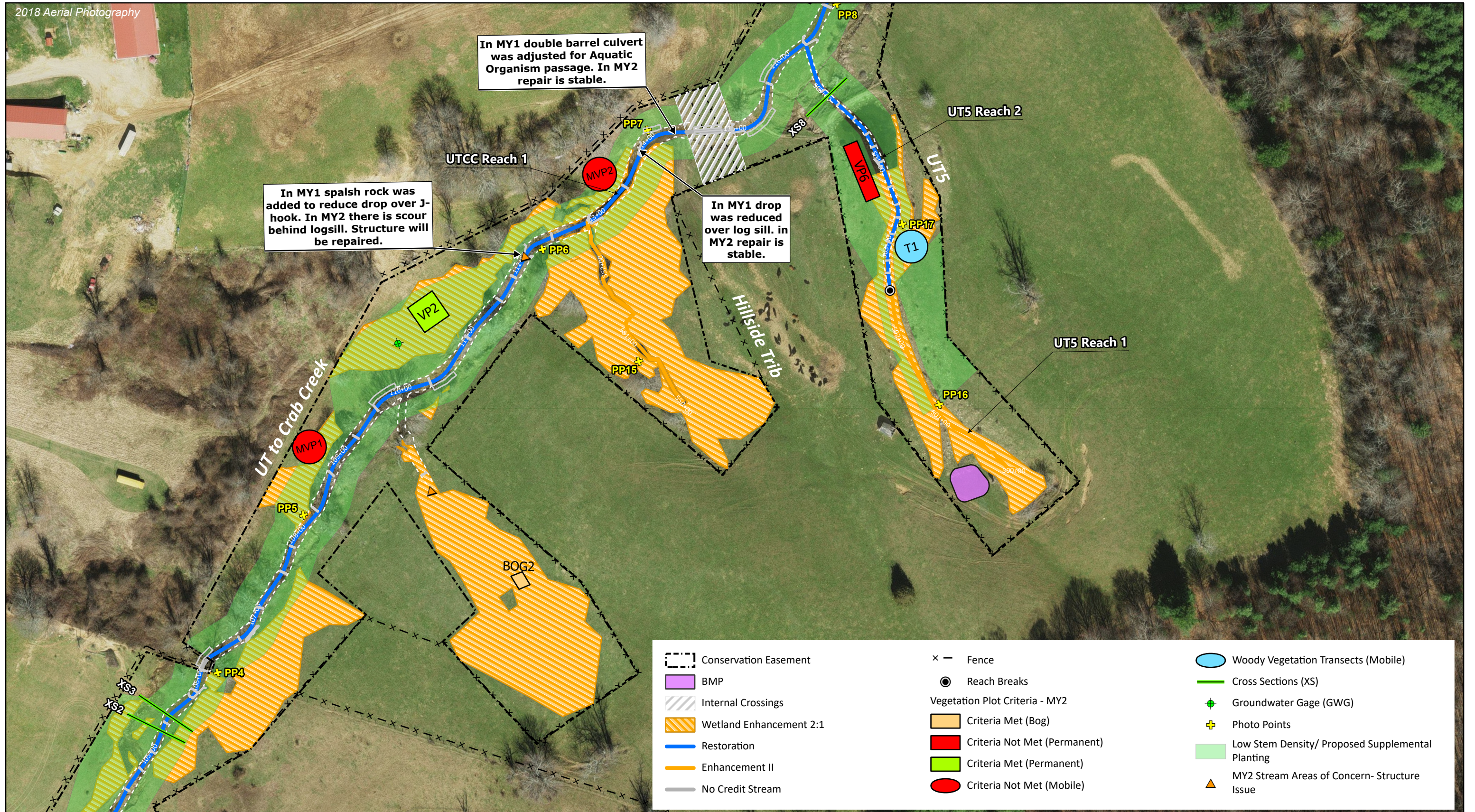


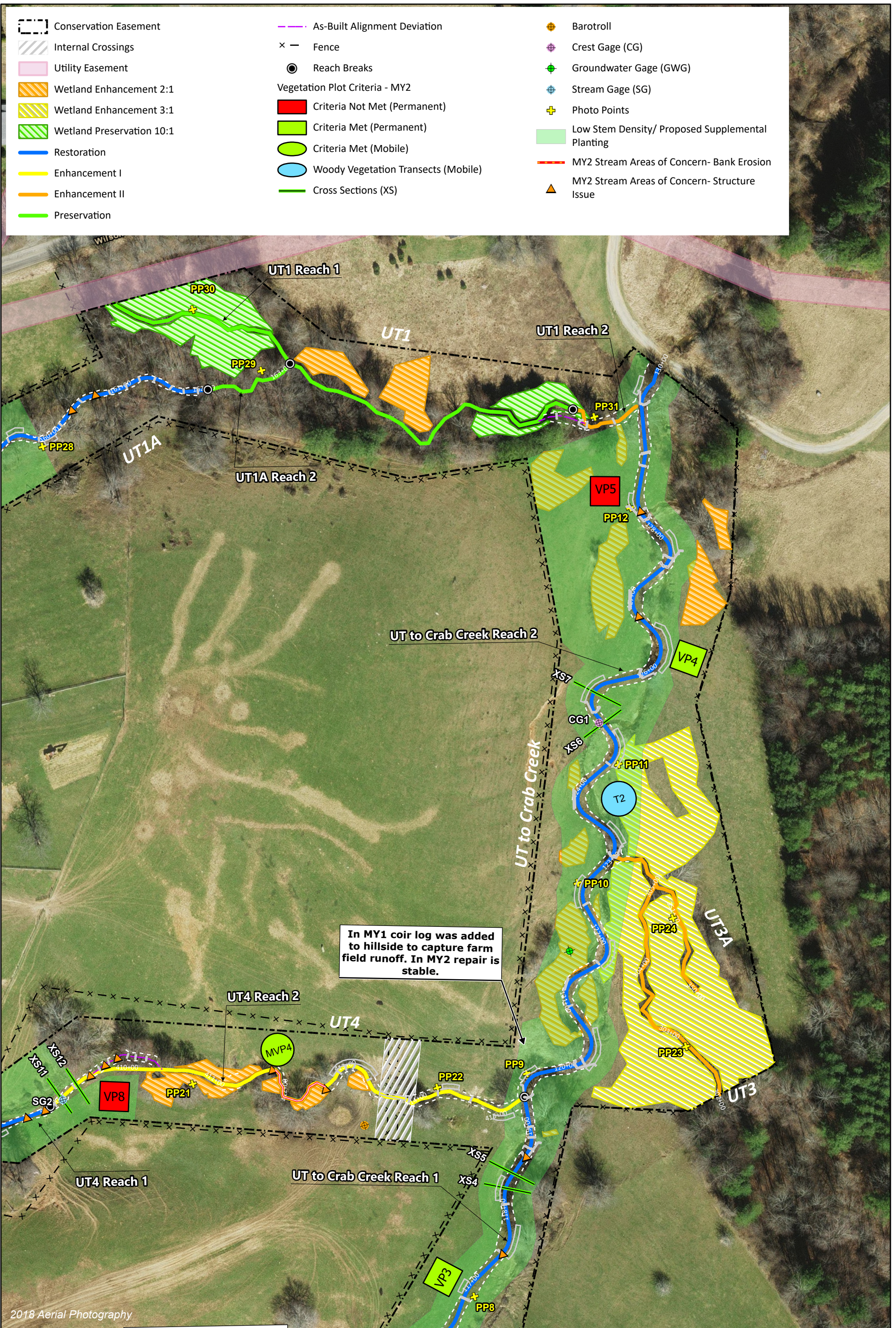


0 100 200 Feet



Figure 1a Current Condition Plan View
 Double H Farms Mitigation Site
 DMS Project No. 100082
 New River Basin (05050001)
 Monitoring Year 2 - 2023
 Alleghany County, NC





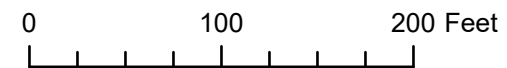


Figure 1d Current Condition Plan View Map
 Double H Farms Mitigation Site
 DMS Project No. 100082
 New River Basin (05050001)
 Monitoring Year 2 - 2023
 Alleghany County, NC

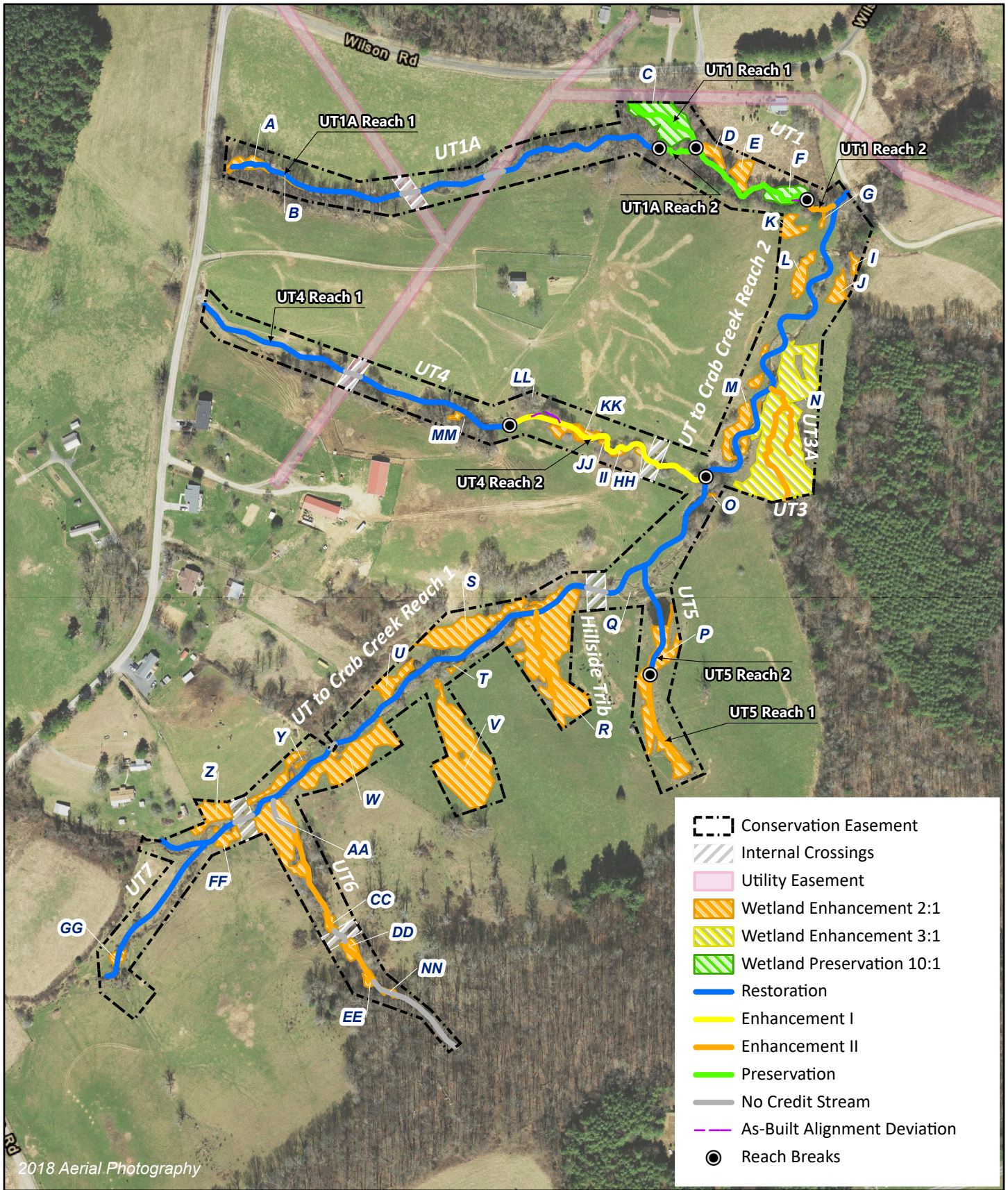


Figure 2a Project Component and Wetland Asset Map
 Double H Farms Mitigation Site
 DMS Project No. 100082
 New River Basin (05050001)



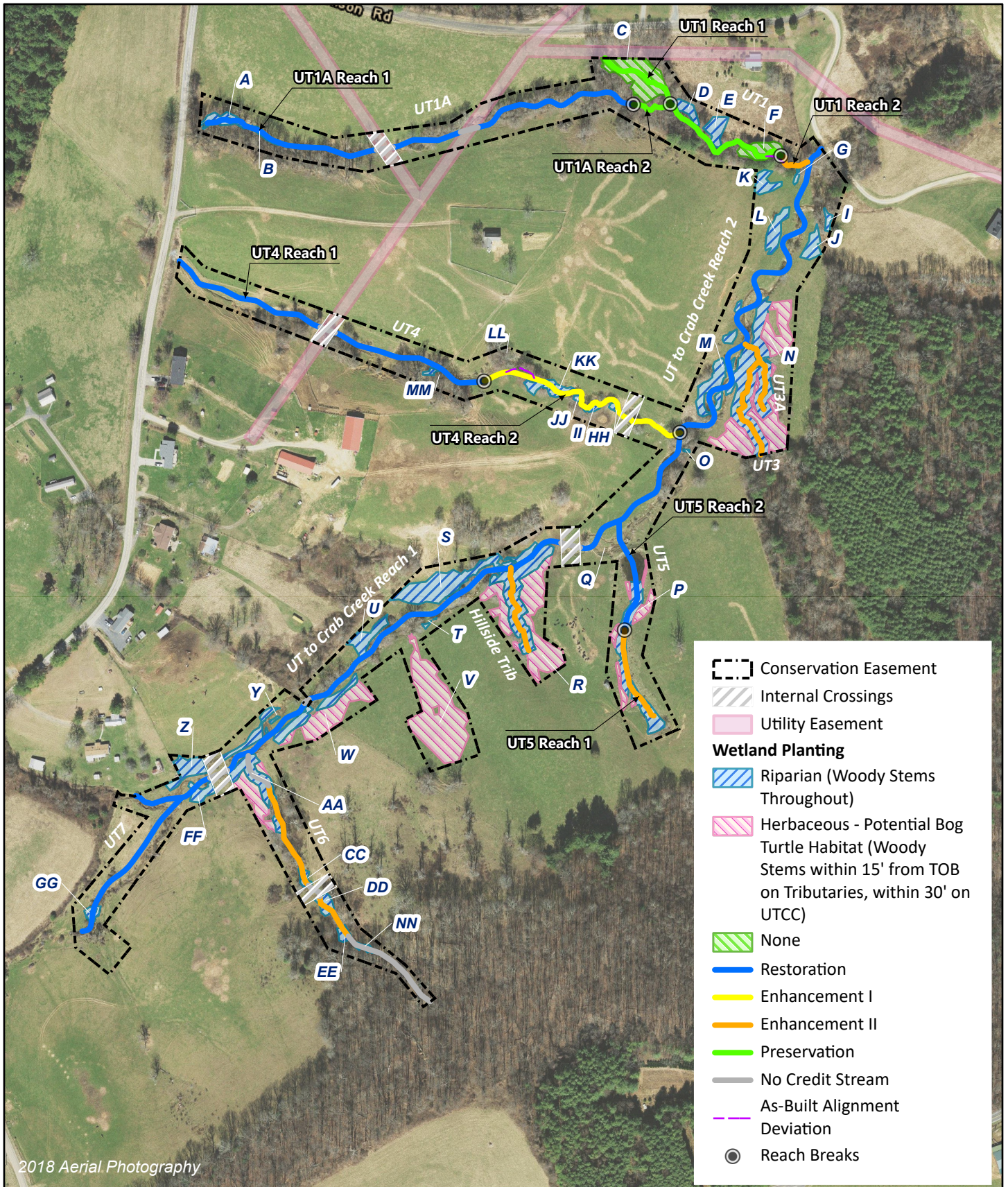


Figure 2b Wetland Planting Map
 Double H Farms Mitigation Site
 DMS Project No. 100082
 New River Basin (05050001)

APPENDIX A. Visual Assessment Data

Table 4a. Visual Stream Morphology Stability Assessment Table

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

UT to Crab Creek Date last assessed: 8/31/2023

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	2,817
					Assessed Bank Length	5,634
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	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	54	59		92%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	24	25		96%

UT1A Reach 1 Date last assessed: 8/31/2023

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	1,114
					Assessed Bank Length	2,228
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	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	61	65		94%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	2	2		100%

Table 4b. Visual Stream Morphology Stability Assessment Table

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

UT4 Reach 1 Date last assessed: 8/31/2023

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	847
					Assessed Bank Length	1,694
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.	33	41		80%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	7	7		100%

UT4 Reach 2 Date last assessed: 8/31/2023

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	602
					Assessed Bank Length	1,204
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.			92	92%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
					Totals:	92
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	13	16		81%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	3	3		100%

Table 4c. Visual Stream Morphology Stability Assessment Table

Double H Farms Mitigation Site
 DMS Project No. 100082
 Monitoring Year 2 - 2023

UT5 Reach 2 Date last assessed: 8/31/2023

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	305
					Assessed Bank Length	610
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.	32	32		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	1	1		100%

UT7 Date last assessed: 8/31/2023

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	452
					Assessed Bank Length	904
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.	22	22		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	0	0		N/A

Table 5. Vegetation Condition Assessment Table

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Date Last Assessed: 10/1/2023

Planted Acreage 17.70

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	7.1	40%
Total			7.1	40%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10	0	0%
Cumulative Total			7.1	40%

Easement Acreage 21.00

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 of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	none	0 Encroachments Noted / 0 ac	

STREAM PHOTOGRAPHS



PHOTO POINT 1 UT7 – upstream (4/3/2023)



PHOTO POINT 1 UT7 – downstream (4/3/2023)



PHOTO POINT 2 UT7 – upstream (4/3/2023)



PHOTO POINT 2 UT7 – downstream (4/3/2023)



PHOTO POINT 3 UT to CC Reach 1 – upstream (4/3/2023)



PHOTO POINT 3 UT to CC Reach 1 – downstream (4/3/2023)



PHOTO POINT 4 UT to CC Reach 1 – upstream (4/3/2023)



PHOTO POINT 4 UT to CC Reach 1 – downstream (4/3/2023)



PHOTO POINT 5 UT to CC Reach 1 – upstream (4/3/2023)



PHOTO POINT 5 UT to CC Reach 1 – downstream (4/3/2023)



PHOTO POINT 6 UT to CC Reach 1 – upstream (4/3/2023)



PHOTO POINT 6 UT to CC Reach 1 – downstream (4/3/2023)



PHOTO POINT 7 UT to CC Reach 1 – upstream (4/3/2023)



PHOTO POINT 7 UT to CC Reach 1 – downstream (4/3/2023)



PHOTO POINT 8 UT to CC Reach 1 – upstream (4/3/2023)



PHOTO POINT 8 UT to CC Reach 1 – downstream (4/3/2023)



PHOTO POINT 9 UT to CC Reach 2 – upstream (4/3/2023)



PHOTO POINT 9 UT to CC Reach 2 – downstream (4/3/2023)



PHOTO POINT 10 UT to CC Reach 2 – upstream (4/3/2023)



PHOTO POINT 10 UT to CC Reach 2 – downstream (4/3/2023)



PHOTO POINT 11 UT to CC Reach 2 – upstream (4/3/2023)



PHOTO POINT 11 UT to CC Reach 2 – downstream (4/3/2023)



PHOTO POINT 12 UT to CC Reach 2 – upstream (4/3/2023)



PHOTO POINT 12 UT to CC Reach 2 – downstream (4/3/2023)



PHOTO POINT 13 UT6– upstream (4/3/2023)



PHOTO POINT 13 UT6 – downstream (4/3/2023)



PHOTO POINT 14 UT6 – upstream (4/3/2023)



PHOTO POINT 14 UT6 – downstream (4/3/2023)



PHOTO POINT 15 Hillside Tributary– upstream (4/3/2023)



PHOTO POINT 15 Hillside Tributary– downstream (4/3/2023)



PHOTO POINT 16 UT5 Reach 1 – upstream (4/3/2023)



PHOTO POINT 16 UT5 Reach 1 – downstream (4/3/2023)



PHOTO POINT 17 UT5 Reach 2 – upstream (4/3/2023)



PHOTO POINT 17 UT5 Reach 2– downstream (4/3/2023)



PHOTO POINT 18 UT4 Reach 1 – upstream (4/3/2023)



PHOTO POINT 18 UT4 Reach 1 – downstream (4/3/2023)



PHOTO POINT 19 UT4 Reach 1 – upstream (4/3/2023)



PHOTO POINT 19 UT4 Reach 1 – downstream (4/3/2023)



PHOTO POINT 20 UT4 Reach 1 – upstream (4/3/2023)



PHOTO POINT 20 UT4 Reach 1 – downstream (4/3/2023)



PHOTO POINT 21 UT4 Reach 2 – upstream (4/3/2023)



PHOTO POINT 21 UT4 Reach 2 – downstream (4/3/2023)



PHOTO POINT 22 UT4 Reach 2 – upstream (4/3/2023)



PHOTO POINT 22 UT4 Reach 2 – downstream (4/3/2023)



PHOTO POINT 23 UT3 – upstream (4/3/2023)



PHOTO POINT 23 UT3 – downstream (4/3/2023)



PHOTO POINT 24 UT3A – upstream (4/3/2023)



PHOTO POINT 24 UT3A – downstream (4/3/2023)



PHOTO POINT 25 UT1A Reach 1– upstream (4/3/2023)



PHOTO POINT 25 UT1A Reach 1 – downstream (4/3/2023)



PHOTO POINT 26 UT1A Reach 1– upstream (4/3/2023)



PHOTO POINT 26 UT1A Reach 1– downstream (4/3/2023)



PHOTO POINT 27 UT1A Reach 1– upstream (4/3/2023)



PHOTO POINT 27 UT1A Reach 1– downstream (4/3/2023)



PHOTO POINT 28 UT1A Reach 1– upstream (4/3/2023)



PHOTO POINT 28 UT1A Reach 1– downstream (4/3/2023)



PHOTO POINT 29 UT1A Reach 2 – upstream (4/3/2023)



PHOTO POINT 29 UT1A Reach 2– downstream (4/3/2023)



PHOTO POINT 30 UT1 Reach 1– upstream (4/3/2023)



PHOTO POINT 30 UT1 Reach 1– downstream (4/3/2023)



PHOTO POINT 31 UT1 Reach 2– upstream (4/3/2023)



PHOTO POINT 31 UT1 Reach 2 – downstream (4/3/2023)

INTERNAL CROSSING PHOTOGRAPHS



UT to Crab Creek Reach 1 Crossing 1 (102+83) – inlet (4/3/2023)



UT to Crab Creek Reach 1 Crossing 1 (103+33) – outlet (4/3/2023)



UT to Crab Creek R1 Crossing 2 (114+46) – inlet (4/3/2023)



UT to Crab Creek R1 Crossing 2 (114+98) – outlet (4/3/2023)



UT1A Reach 1 Crossing (154+73) – inlet (4/3/2023)



UT1A Reach 1 Crossing (155+17) – outlet (4/3/2023)



UT4 Reach 1 Crossing (404+33) – inlet (4/3/2023)



UT4 Reach 1 Crossing (404+74) – outlet (4/3/2023)



UT4 Reach 2 Crossing (413+54) – inlet (4/3/2023)



UT4 Reach 2 Crossing (413+96) – outlet (4/3/2023)










UT6 Crossing (605+26) – inlet (4/3/2023)






UT6 Crossing (605+71) – outlet (4/3/2023)




MY2 STREAM AREAS OF CONCERN PHOTOGRAPHS




Reach/Location	Station	Problem	Repair	Pre-repair MY2 photo (s) taken 9/2023
UT to CC R1	101+91	Piping under and around rock sills into bank double drop structure.	Proposed repair is to re-build rock sills and decrease drop.	
	112+10	Downstream head of riffle raised in MY1 per IRT request to reduce drop over structure. Channel has adjusted by widening under log sill but has remained stable.	Stabilize bank behind logsill and repair structure.	
UT to CC R2	117+47	Piping around log sill and incision in riffle.	Re-build riffle and replace structure.	

Reach/Location	Station	Problem	Repair	Pre-repair MY2 photo (s) taken 9/2023
UT to CC R2	118+67	Riffle piping under bottom log sill and actively inciisng.	Re-build riffle and replace structure.	
	129+51	Riffle piping under bottom log J-hook sill.	Re-build j-hook, lay bank back, reduce drop, repair bank and re-build riffle.	
UT1A	154+10, approximatley 2-3 structures from 160+00 to 161+00	Piping around log sill and incision in riffle.	Re-build riffle and replace structure. Reduce drop over steps.	
Wetland V	N/A	Heacut above stabilized wetland outlet to main channel.	Add a grade control structure.	

Reach/Location	Station	Problem	Repair	Pre-repair MY2 photo (s) taken 4/2023
UT4 R1	402+00	piping sill	reduce drop over structure, lay back bank, re-build riffle	
	402+10	piping sill	reduce drop over structure, lay back bank, re-build riffle	
	402+70	piping sill	reduce drop over structure, lay back bank, re-build riffle	

Reach/Location	Station	Problem	Repair	Pre-repair MY2 photo (s) taken 4/2023
UT4 R1	403+70	piping sill	reduce drop over structure, lay back bank, re-build riffle	
	404+30	piping sill and channel incising above culvert	reduce drop over structure, lay back bank, re-build riffle	
	408+80	Too much drop over riffle and incision below.	reduce drop over structure, lay back bank, re-build downstream head of riffle	

Reach/Location	Station	Problem	Repair	Pre-repair MY2 photo (s) taken 4/2023
UT4 R1	408+90	right bank collapsing around rock sill.	re-build bank	
UT4 R2	409+60	piping sill	reduce drop over structure, lay back bank, re-build riffle	
	409+80	piping sill	reduce drop over structure, lay back bank, re-build riffle	

Reach/Location	Station	Problem	Repair	Pre-repair MY2 photo (s) taken 4/2023
UT4 R2	410+00	piping sill	reduce drop over structure, lay back bank, re-build riffle	
	411+70	channel incising	add structures	
	412+60	channel incising	add structures	

SUPPLEMENTAL PHOTOGRAPHS



UT1A R1 Start of Stream Flow below wetland seep, looking upstream – (04/05/2023)



Area surrounding GWG 1. GWG1 is located on edge of wetland surrounded by wetland vegetation– (08/31/2023)



Area surrounding GWG2 – (08/31/2023)



UT to CC Wrackline – (04/05/2023)

PERMANENT VEGETATION PLOT PHOTOGRAPHS



PERMANENT VEGETATION PLOT 1 (7/10/2023)



PERMANENT VEGETATION PLOT 2 (7/10/2023)



PERMANENT VEGETATION PLOT 3 (7/10/2023)



PERMANENT VEGETATION PLOT 4 (7/10/2023)



PERMANENT VEGETATION PLOT 5 (7/10/2023)



PERMANENT VEGETATION PLOT 6 (7/10/2023)



PERMANENT VEGETATION PLOT 7 (7/10/2023)



PERMANENT VEGETATION PLOT 8 (7/10/2023)



PERMANENT VEGETATION PLOT 9 (7/10/2023)

MOBILE VEGETATION PLOT PHOTOGRAPHS



MOBILE VEGETATION PLOT 1 FACING NORTH (7/10/2023)



MOBILE VEGETATION PLOT 2 FACING NORTH (7/10/2023)



MOBILE VEGETATION PLOT 3 FACING NORTH (7/10/2023)



MOBILE VEGETATION PLOT 4 FACING NORTH (7/10/2023)



MOBILE VEGETATION PLOT 5 FACING NORTH (7/10/2023)

BOG VEGETATION PLOT PHOTOGRAPHS



BOG VEGETATION PLOT 1 (7/10/2023)



BOG VEGETATION PLOT 2 (7/10/2023)



VEGETATION TRANSECT 1 FACING EAST (7/10/2023)



VEGETATION TRANSECT 2 FACING NORTH (7/10/2023)



VEGETATION TRANSECT 3 FACING NORTH (7/10/2023)

APPENDIX B. Vegetation Plot Data

Table 6a. Vegetation Plot Data

Double H Farms Mitigation Site
DMS Project No. 100082
Monitoring Year 2 - 2023

Planted Acreage	17.7
Date of Initial Plant	2022-01-25
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2023-07-10
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F		Veg Plot 5 F		Veg Plot 6 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	<i>Acer negundo</i>	boxelder	Tree	FAC					2	2					1	1
	<i>Alnus serrulata</i>	hazel alder	Tree	OBL			3	3	4	4						
	<i>Carpinus caroliniana</i>	American hornbeam	Tree	FAC							2	2	2	2		
	<i>Diospyros virginiana</i>	common persimmon	Tree	FAC	1	1					1	1	2	2		
	<i>Euonymus americanus</i>	bursting-heart	Shrub	FAC							1	1				
	<i>Liriodendron tulipifera</i>	tuliptree	Tree	FACU												
	<i>Platanus occidentalis</i>	American sycamore	Tree	FACW	1	1	6	6	2	2	4	4			4	4
	<i>Prunus serotina</i>	black cherry	Tree	FACU							1	1				
	<i>Quercus alba</i>	white oak	Tree	FACU	2	2										
	<i>Quercus rubra</i>	northern red oak	Tree	FACU	1	1										
	<i>Salix nigra</i>	black willow	Tree	OBL												
<i>Sambucus canadensis</i>	American black elderberry	Tree				1	1	2	2					1	1	
Sum	Performance Standard				5	5	10	10	10	10	9	9	4	4	6	6
Post Mitigation Plan Species	<i>Aesculus sylvatica</i>	painted buckeye	Tree	FAC												
	Morus rubra	red mulberry	Tree	FACU	4	4							1	1		
	<i>Viburnum dentatum</i>	<i>southern arrowwood</i>	Tree	FAC		1										
Sum	Proposed Standard				9	9	10	10	10	10	9	9	5	5	6	6
Mitigation Plan Performance Standard	Current Year Stem Count					5		10		10		9		4		6
	Stems/Acre					202		364		405		364		162		202
	Species Count					4		3		4		5		2		3
	Dominant Species Composition (%)					40		60		40		44		40		67
	Average Plot Height (ft.)					2		2		2		1		1		2
	% Invasives					0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					9		10		10		9		5		6
	Stems/Acre					364		364		405		364		202		202
	Species Count					5		3		4		5		3		3
	Dominant Species Composition (%)					40		60		40		44		40		67
	Average Plot Height (ft.)					1		2		2		1		1		2
	% Invasives					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 6b. Vegetation Plot Data Continued

Double H Farms Mitigation Site
DMS Project No. 100082
Monitoring Year 2 - 2023

Planted Acreage	17.7
Date of Initial Plant	2022-01-25
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2023-07-10
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 7 F		Veg Plot 8 F		Veg Plot 9 F		Veg Plot 1 R	Veg Plot 2 R	Veg Plot 3 R	Veg Plot 4 R	Veg Plot 5 R
					Planted	Total	Planted	Total	Planted	Total	Total	Total	Total	Total	Total
Species Included in Approved Mitigation Plan	<i>Acer negundo</i>	boxelder	Tree	FAC											
	<i>Alnus serrulata</i>	hazel alder	Tree	OBL									3		
	<i>Carpinus caroliniana</i>	American hornbeam	Tree	FAC											
	<i>Diospyros virginiana</i>	common persimmon	Tree	FAC					1	1		1		1	1
	<i>Euonymus americanus</i>	bursting-heart	Shrub	FAC			2	2	1	1					
	<i>Liriodendron tulipifera</i>	tuliptree	Tree	FACU										1	
	<i>Platanus occidentalis</i>	American sycamore	Tree	FACW	3	3	2	2	3	3	4	2	4	2	
	<i>Prunus serotina</i>	black cherry	Tree	FACU	2	2									
	<i>Quercus alba</i>	white oak	Tree	FACU	3	3	1	1			1	1		2	1
	<i>Quercus rubra</i>	northern red oak	Tree	FACU			1	1						3	3
	<i>Salix nigra</i>	black willow	Tree	OBL								2			
<i>Sambucus canadensis</i>	American black elderberry	Tree												1	
Sum	Performance Standard				8	8	6	6	5	5	5	6	7	9	6
Post Mitigation Plan Species	<i>Aesculus sylvatica</i>	painted buckeye	Tree	FAC			1	1							1
	<i>Morus rubra</i>	red mulberry	Tree	FACU					1	1		1			
	<i>Viburnum dentatum</i>	<i>southern arrowwood</i>	<i>Tree</i>	<i>FAC</i>											
Sum	Proposed Standard				8	8	7	7	6	6	5	7	7	9	7
Mitigation Plan Performance Standard	Current Year Stem Count				8		6		5	5	6	7	9	6	
	Stems/Acre				324		243		202	121	243	243	364	243	
	Species Count				3		4		3	2	4	2	5	4	
	Dominant Species Composition (%)				38		29		50	80	29	57	33	43	
	Average Plot Height (ft.)				3		1		3	2	3	2	3	2	
	% Invasives				0		0		0	0	0	0	0	0	
Post Mitigation Plan Performance Standard	Current Year Stem Count				8		7		6	5	7	7	9	7	
	Stems/Acre				324		283		243	121	283	243	364	283	
	Species Count				3		5		4	2	5	2	5	5	
	Dominant Species Composition (%)				38		29		50	80	29	57	33	43	
	Average Plot Height (ft.)				3		2		2	2	3	2	3	2	
	% Invasives				0		0		0	0	0	0	0	0	

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

Table 7a. Vegetation Performance Standards Summary Table

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 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												
Monitoring Year 2	202	2	4	0	364	2	3	0	405	2	4	0
Monitoring Year 1	283	2	4	0	364	2	3	0	526	2	5	0
Monitoring Year 0	324	2	5	0	567	2	4	0	648	2	6	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	364	1	5	0	162	1	2	0	202	2	3	0
Monitoring Year 1	445	2	5	0	243	2	3	0	445	2	5	0
Monitoring Year 0	445	2	5	0	364	2	5	0	688	2	7	0
	Veg Plot 7 F				Veg Plot 8 F				Veg Plot 9 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	324	3	3	0	243	1	4	0	202	3	3	0
Monitoring Year 1	364	3	4	0	324	2	4	0	324	2	4	0
Monitoring Year 0	405	2	5	0	405	2	5	0	364	2	4	0
	Veg Plot Group 1 R				Veg Plot Group 2 R				Veg Plot Group 3 R			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	121	2	2	0	243	3	4	0	243	2	2	0
Monitoring Year 1	81	2	2	0	283	2	6	0	405	2	5	0
Monitoring Year 0	364	2	7	0	567	2	10	0	567	2	7	0
	Veg Plot Group 4 R				Veg Plot Group 5 R							
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives				
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	364	3	5	0	243	2	4	0				
Monitoring Year 1	202	1	4	0	202	2	4	0				
Monitoring Year 0	445	2	7	0	324	2	6	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.

*For stem densities and number of species in plots that include post-mitigation plan approved species please refer to Table 6 for the "Post Mitigation Plan Performance Standard" referenced in the text.

7b. Bog Herbaceous Wetland Vegetation Plot Data

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Bog Plot 1					
Absolute Plot Cover	Species			Wetland Indicator Status	Dominant Species?
	Scientific Name	Common Name	% of total cover		
100%	<i>Juncus effusus</i>	Soft Rush	65%	FACW	Y
	<i>Impatiens capensis</i>	Jewelweed	15%	FACW	N
	<i>Persicaria sagittata</i>	Tearthumb	5%	OBL	N
	<i>Leersia oryzoides</i>	Rice Cutgrass	5%	OBL	N
	<i>Panicum clandestinum</i>	Deertongue	5%	FAC	N
	<i>Eleocharis sp.</i>	Spike-Rush	5%	FACW - OBL	N

Bog Plot 2					
Absolute Plot Cover	Species			Wetland Indicator Status	Dominant Species?
	Scientific Name	Common Name	% of total cover		
95%	<i>Juncus effusus</i>	Soft Rush	20%	FACW	Y
	<i>Carex lurida</i>	Shallow Sedge	10%	OBL	Y
	<i>Verbesina sp.</i>	Crownbeard	25%	FACU - FAC	Y
	<i>Polygonum sp.</i>	Smartweed	5%	FAC - OBL	N
	<i>Persicaria sagittata</i>	Tearthumb	15%	OBL	Y
	<i>Eupatorium perfoliatum</i>	Boneset	5%	FACW	N
	<i>Lycopus uniflorus</i>	Northern Horehound	5%	OBL	N
	<i>Vernonia noveboracensis</i>	Ironweed	5%	FACW	N
	<i>Eleocharis sp.</i>	Spike-Rush	5%	FACW - OBL	N

Table 7c. Vegetation Transect Table

Vegetation Plot Data

DMS Project No. 100082

Monitoring Year 2 - 2023

Transect 1: UT5 Wetland P		
Scientific Name	Performance Standard Approval	Stems
<i>Platanus occidentalis</i>	Approved Mit Plan	3
<i>Quercus alba</i>	Approved Mit Plan	1
<i>Salix nigra</i>	Approved Mit Plan	1
<i>Diospyros virginiana</i>	Approved Mit Plan	1
<i>Viburnum dentatum</i>	Volunteer	1
	TOTAL STEM COUNT:	7
	TOTAL SPECIES COUNT:	5
	AVERAGE PLOT HEIGHT (Meters)	0.6

Transect 2: Wetland N: UT3/ UT to Crab Creek Confluence		
Scientific Name	Performance Standard Approval	Stems
<i>Platanus occidentalis</i>	Approved Mit Plan	2
<i>Salix nigra</i>	Approved Mit Plan	1
	TOTAL STEM COUNT:	3
	TOTAL SPECIES COUNT:	2
	AVERAGE PLOT HEIGHT (Meters)	1.3

Transect 3: UT1A hillslope		
Scientific Name	Performance Standard Approval	Stems
<i>Aesculus sylvatica</i>	Approved Mit Plan	1
<i>Platanus occidentalis</i>	Approved Mit Plan	2
<i>Gleditsia triacanthos</i>	Volunteer	1
	TOTAL STEM COUNT:	4
	TOTAL SPECIES COUNT:	3
	AVERAGE PLOT HEIGHT (Meters)	0.6

Transects are not held to density or height requirements per the MY1 report (Wildlands, 2022).

APPENDIX C. Stream Geomorphology Data

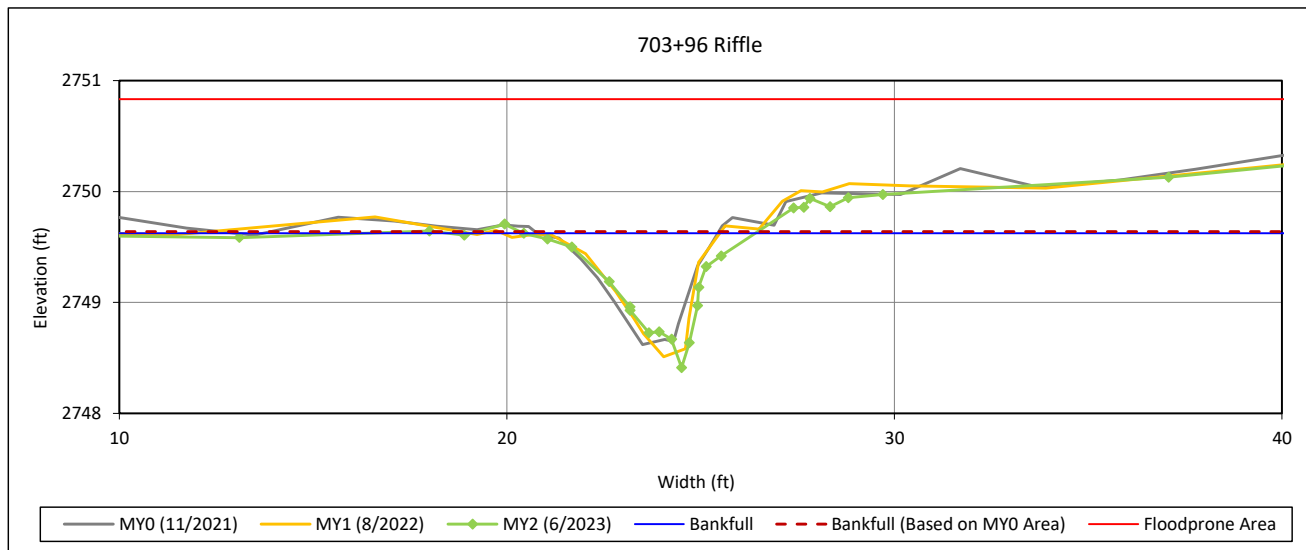
Cross-Section Plots

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Cross-Section 1 - UT7



Bankfull Dimensions

2.5	x-section area (ft.sq.)
6.0	width (ft)
0.4	mean depth (ft)
1.2	max depth (ft)
6.8	wetted perimeter (ft)
0.4	hydraulic radius (ft)
14.3	width-depth ratio
51.7	W flood prone area (ft)
8.7	entrenchment ratio
1.0	low bank height ratio

Survey Date: 6/2023

Field Crew: Wildlands Engineering



View Downstream

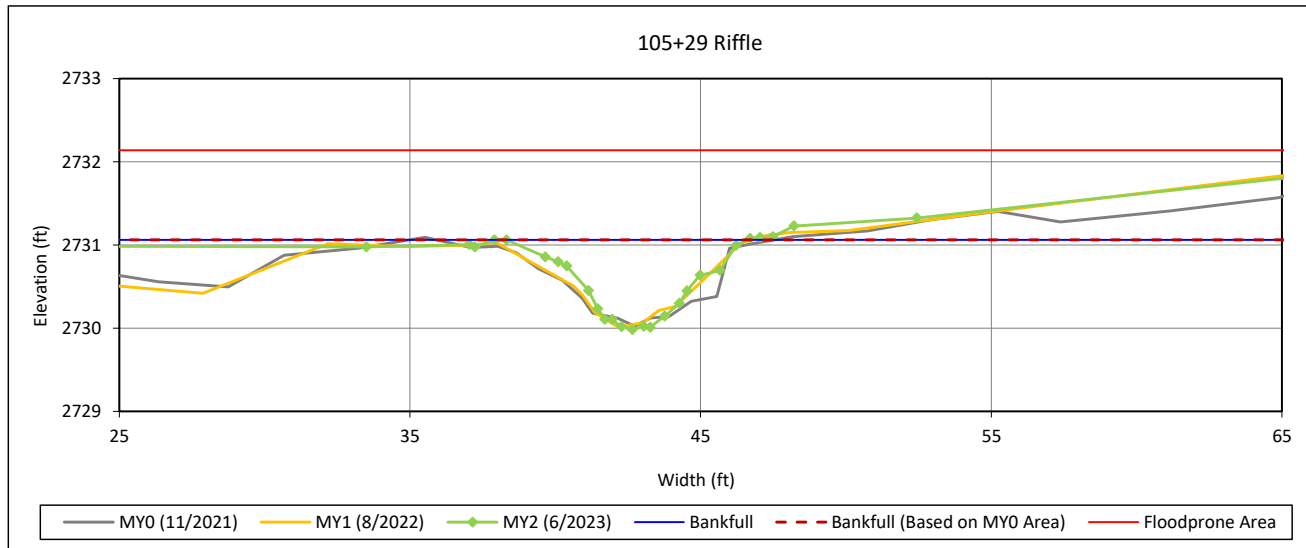
Cross-Section Plots

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Cross-Section 2 - UT to Crab Creek R1



Bankfull Dimensions

4.5	x-section area (ft.sq.)
8.3	width (ft)
0.5	mean depth (ft)
1.1	max depth (ft)
8.7	wetted perimeter (ft)
0.5	hydraulic radius (ft)
15.4	width-depth ratio
70.3	W flood prone area (ft)
8.5	entrenchment ratio
1.0	low bank height ratio

Survey Date: 6/2023

Field Crew: Wildlands Engineering



View Downstream

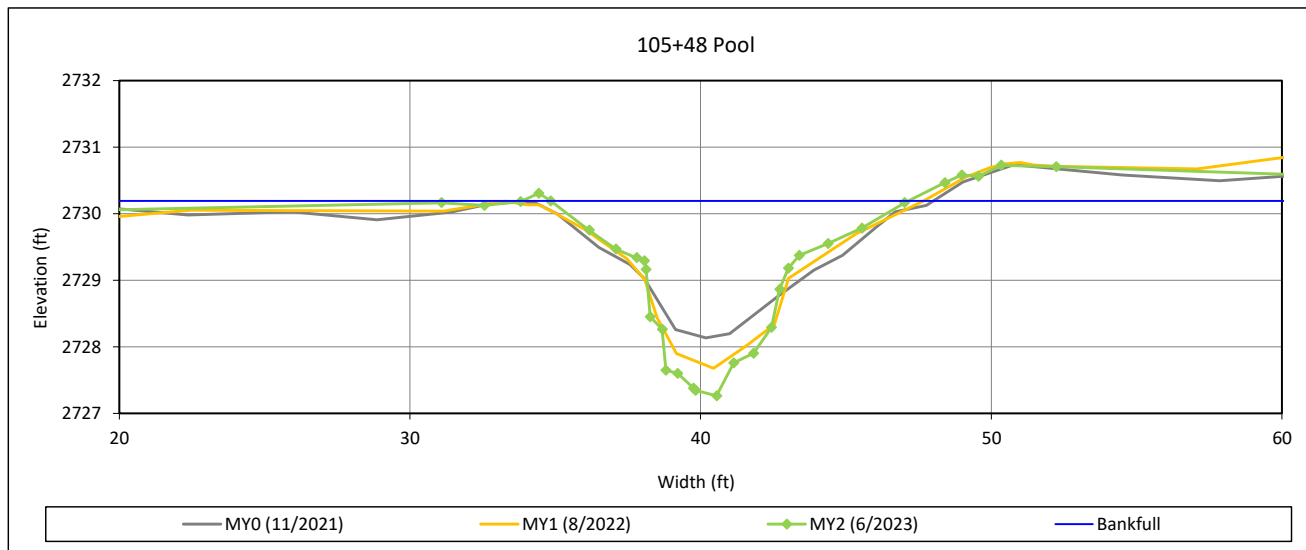
Cross-Section Plots

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Cross-Section 3 - UT to Crab Creek R1



Bankfull Dimensions

15.0	x-section area (ft.sq.)
12.3	width (ft)
1.2	mean depth (ft)
2.9	max depth (ft)
14.6	wetted perimeter (ft)
1.0	hydraulic radius (ft)
10.1	width-depth ratio

Survey Date: 6/2023

Field Crew: Wildlands Engineering



View Downstream

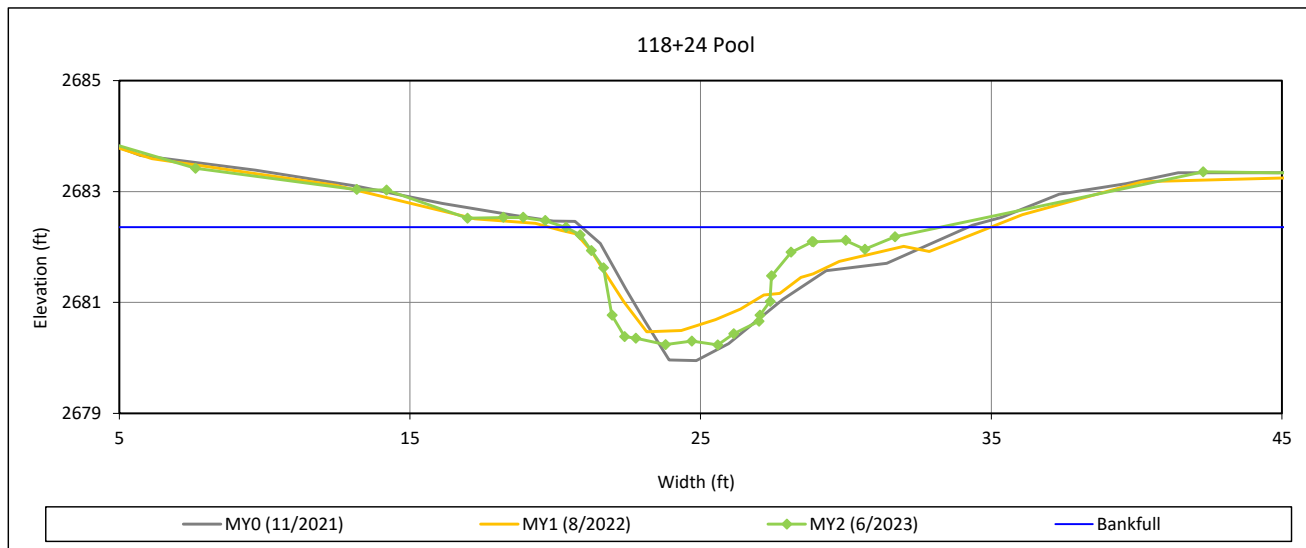
Cross-Section Plots

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Cross-Section 4 - UT to Crab Creek R1



Bankfull Dimensions

12.1	x-section area (ft.sq.)
8.5	width (ft)
1.4	mean depth (ft)
2.1	max depth (ft)
10.2	wetted perimeter (ft)
1.2	hydraulic radius (ft)
5.9	width-depth ratio

Survey Date: 6/2023

Field Crew: Wildlands Engineering



View Downstream

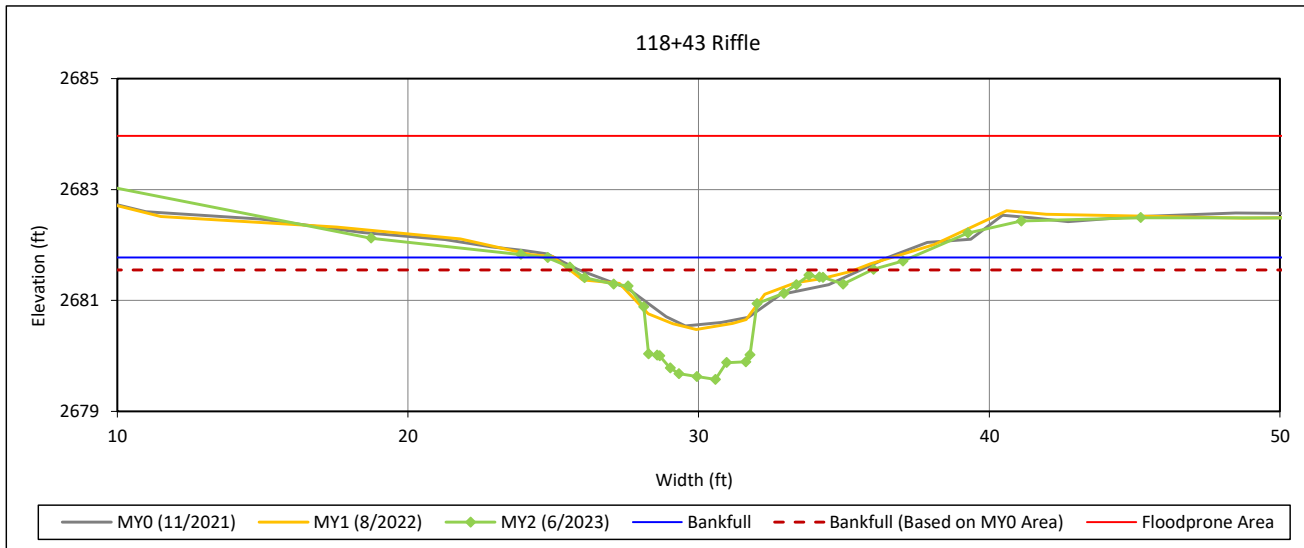
Cross-Section Plots

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Cross-Section 5 - UT to Crab Creek R1



Bankfull Dimensions

10.8	x-section area (ft.sq.)
12.5	width (ft)
0.9	mean depth (ft)
2.2	max depth (ft)
14.5	wetted perimeter (ft)
0.7	hydraulic radius (ft)
14.5	width-depth ratio
56.2	W flood prone area (ft)
4.5	entrenchment ratio
1.1	low bank height ratio

Survey Date: 6/2023

Field Crew: Wildlands Engineering



View Downstream

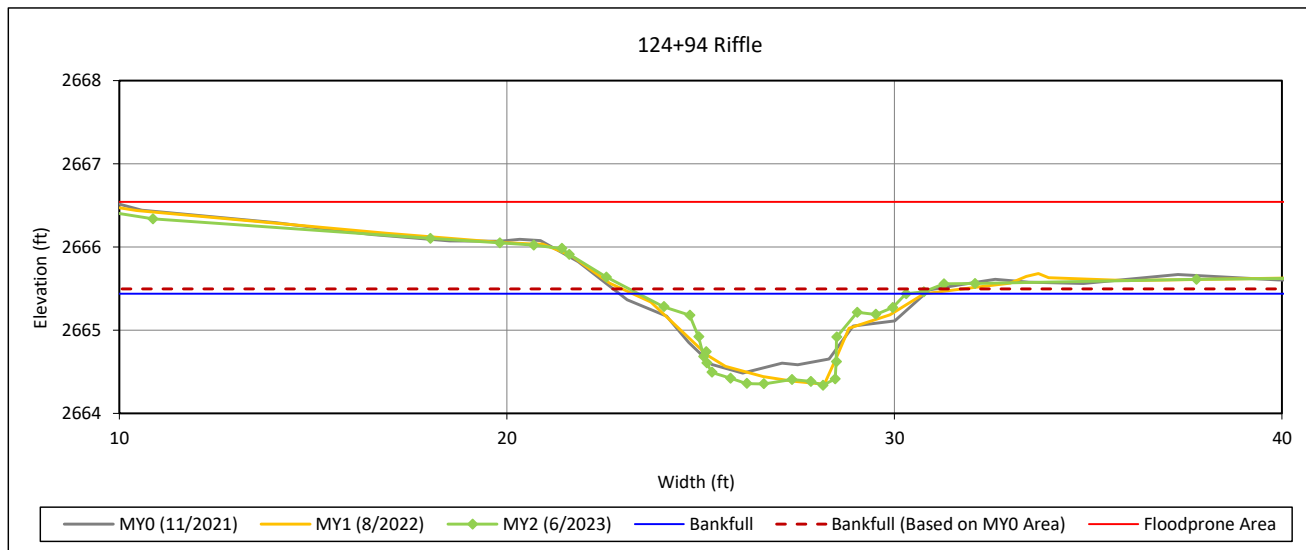
Cross-Section Plots

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Cross-Section 6 - UT to Crab Creek R2



Bankfull Dimensions

4.3	x-section area (ft.sq.)
6.9	width (ft)
0.6	mean depth (ft)
1.1	max depth (ft)
8.0	wetted perimeter (ft)
0.5	hydraulic radius (ft)
11.0	width-depth ratio
43.0	W flood prone area (ft)
6.2	entrenchment ratio
1.0	low bank height ratio

Survey Date: 6/2023

Field Crew: Wildlands Engineering



View Downstream

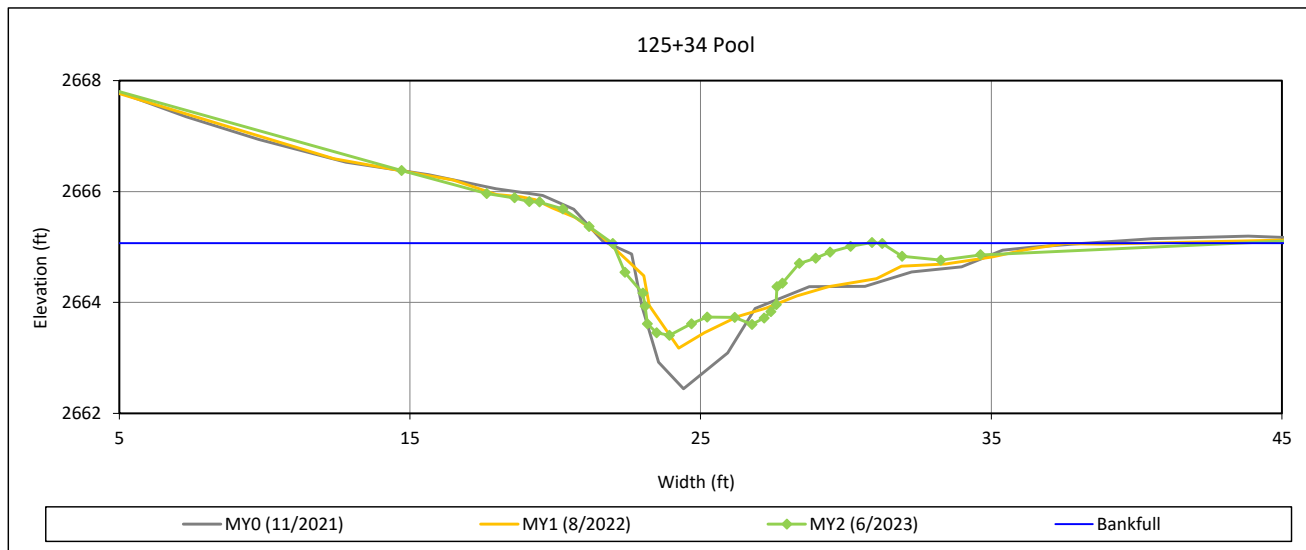
Cross-Section Plots

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Cross-Section 7 - UT to Crab Creek R2



Bankfull Dimensions

7.9	x-section area (ft.sq.)
8.8	width (ft)
0.9	mean depth (ft)
1.7	max depth (ft)
10.1	wetted perimeter (ft)
0.8	hydraulic radius (ft)
9.7	width-depth ratio

Survey Date: 6/2023

Field Crew: Wildlands Engineering



View Downstream

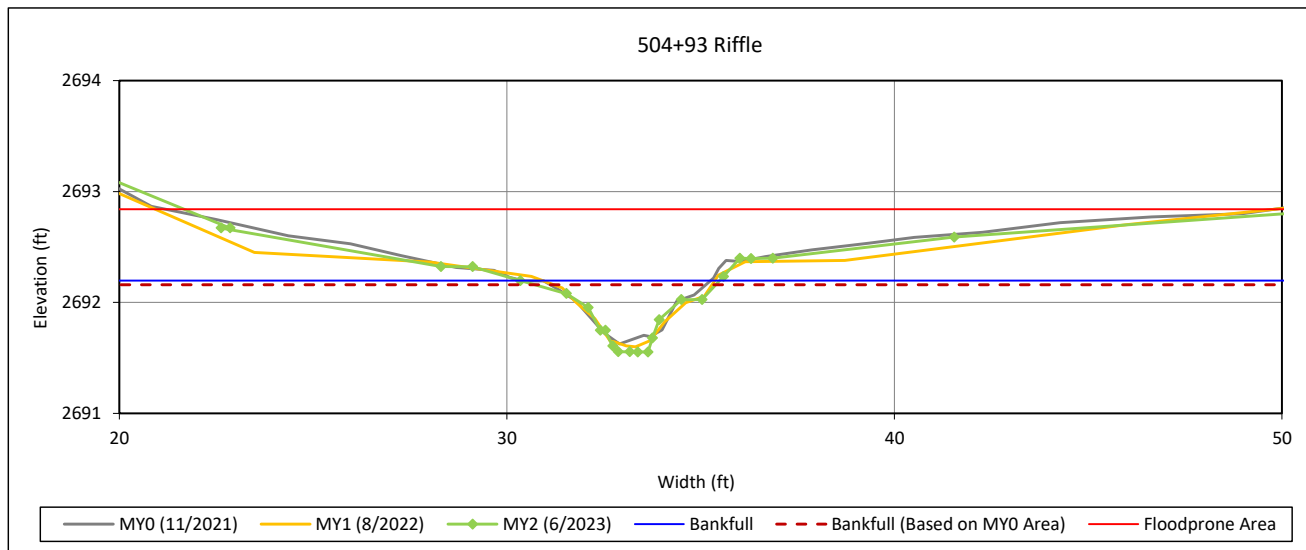
Cross-Section Plots

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Cross-Section 8 - UT5 R2



Bankfull Dimensions

1.4	x-section area (ft.sq.)
5.1	width (ft)
0.3	mean depth (ft)
0.6	max depth (ft)
5.5	wetted perimeter (ft)
0.3	hydraulic radius (ft)
18.4	width-depth ratio
30.0	W flood prone area (ft)
5.8	entrenchment ratio
1.1	low bank height ratio

Survey Date: 6/2023

Field Crew: Wildlands Engineering



View Downstream

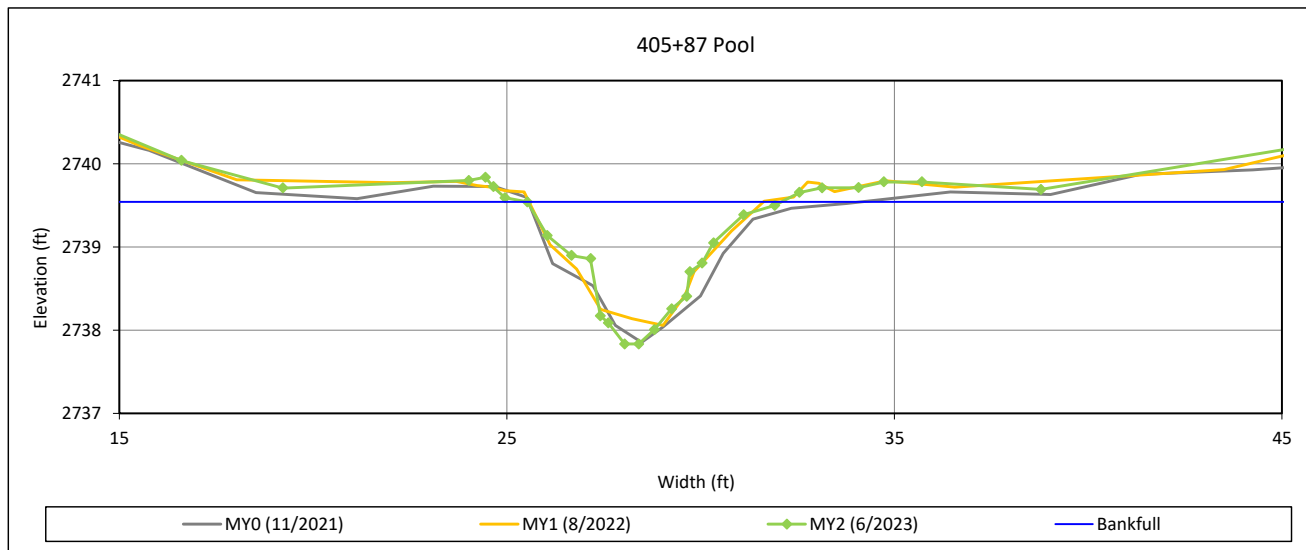
Cross-Section Plots

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Cross-Section 9 - UT4 R1



Bankfull Dimensions

5.2	x-section area (ft.sq.)
6.6	width (ft)
0.8	mean depth (ft)
1.7	max depth (ft)
7.8	wetted perimeter (ft)
0.7	hydraulic radius (ft)
8.3	width-depth ratio

Survey Date: 6/2023

Field Crew: Wildlands Engineering



View Downstream

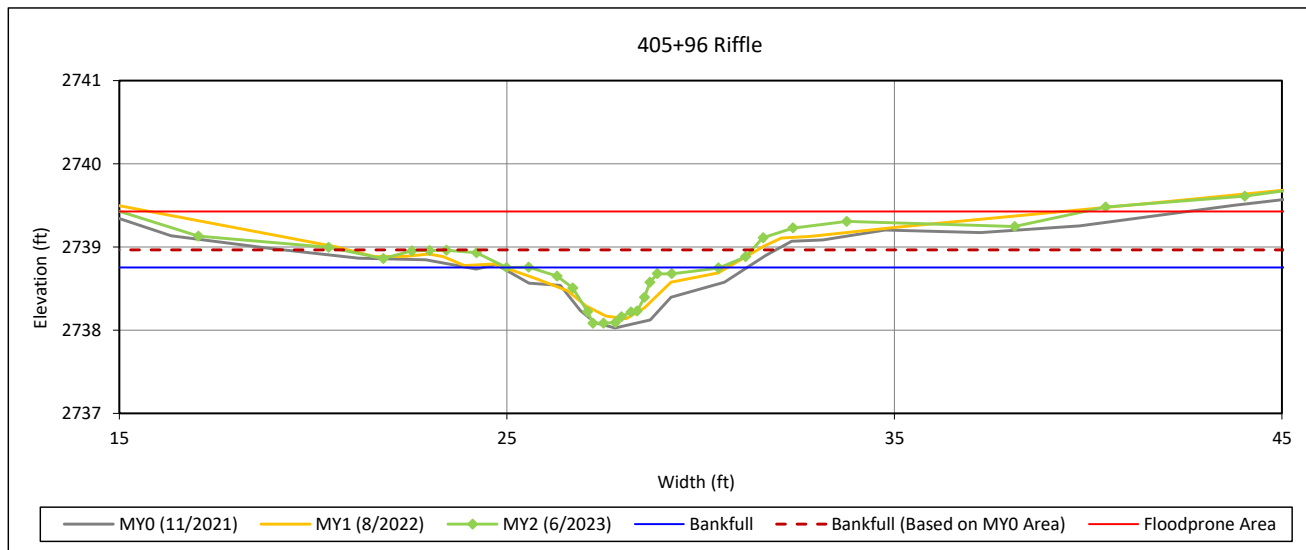
Cross-Section Plots

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Cross-Section 10 - UT4 R1



Bankfull Dimensions

1.3	x-section area (ft.sq.)
4.9	width (ft)
0.3	mean depth (ft)
0.7	max depth (ft)
5.3	wetted perimeter (ft)
0.2	hydraulic radius (ft)
18.9	width-depth ratio
24.8	W flood prone area (ft)
5.1	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 6/2023

Field Crew: Wildlands Engineering



View Downstream

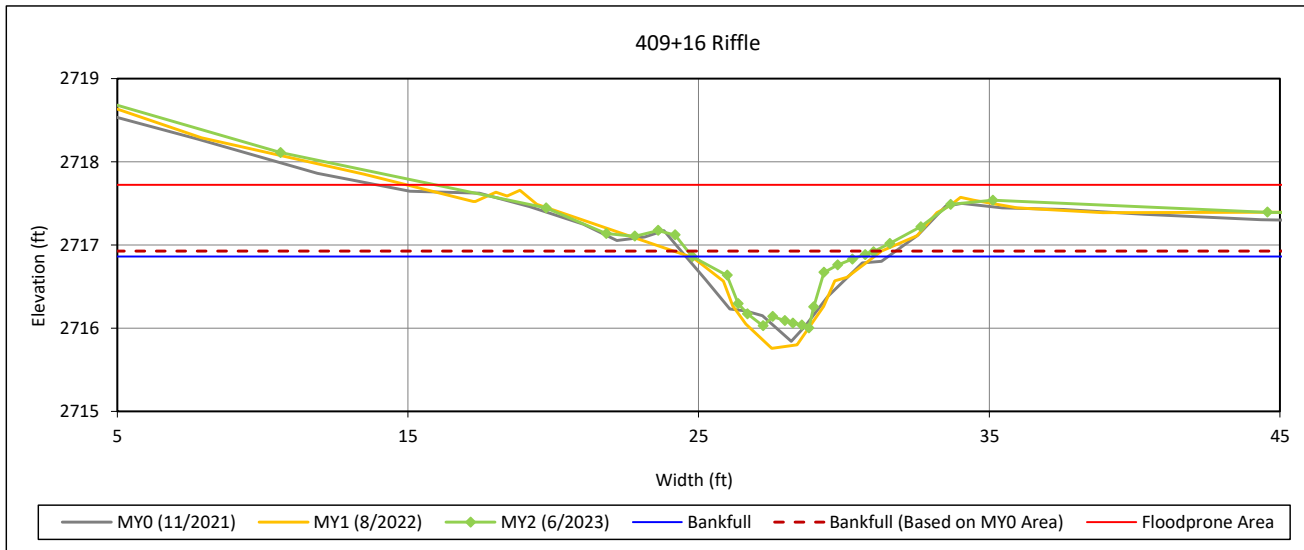
Cross-Section Plots

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Cross-Section 11 - UT4 R2



Bankfull Dimensions

2.5	x-section area (ft.sq.)
5.8	width (ft)
0.4	mean depth (ft)
0.9	max depth (ft)
6.3	wetted perimeter (ft)
0.4	hydraulic radius (ft)
13.3	width-depth ratio
31.8	W flood prone area (ft)
5.5	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 6/2023

Field Crew: Wildlands Engineering



View Downstream

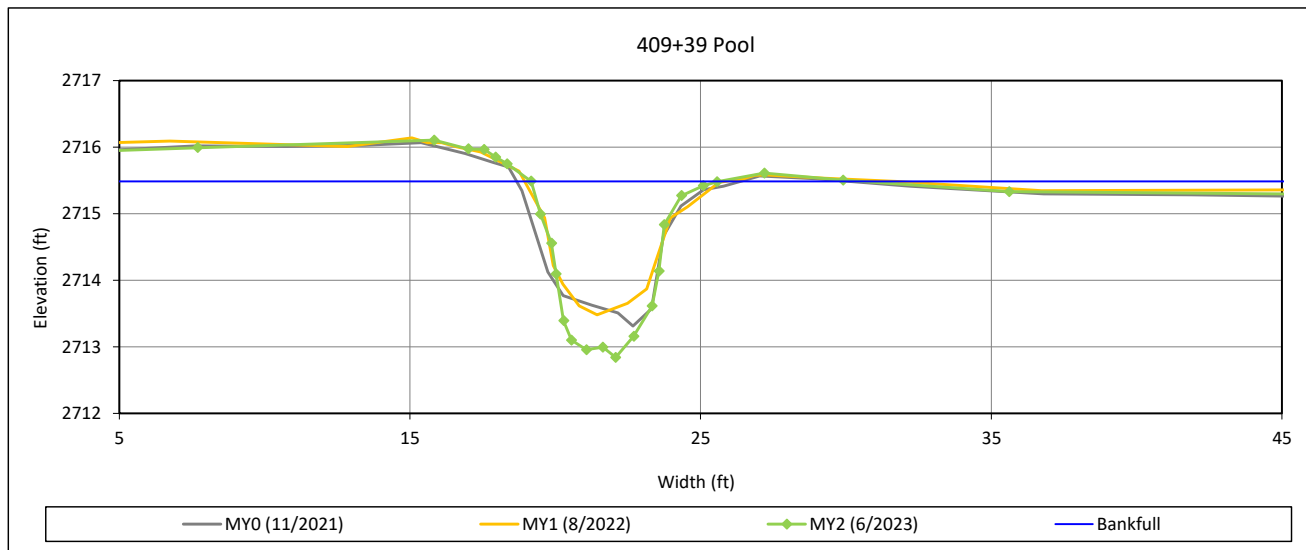
Cross-Section Plots

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Cross-Section 12 - UT4 R2



Bankfull Dimensions

9.2	x-section area (ft.sq.)
6.4	width (ft)
1.4	mean depth (ft)
2.6	max depth (ft)
9.1	wetted perimeter (ft)
1.0	hydraulic radius (ft)
4.5	width-depth ratio

Survey Date: 6/2023

Field Crew: Wildlands Engineering

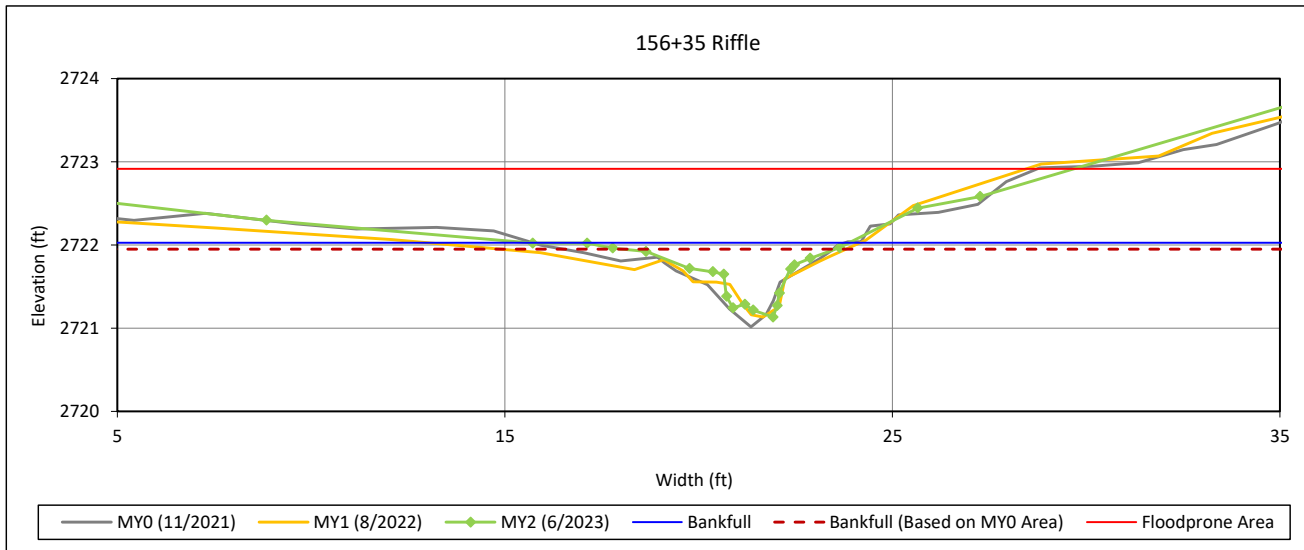


View Downstream

Cross-Section Plots

Double H Farms Mitigation Site
 DMS Project No. 100082
Monitoring Year 2 - 2023

Cross-Section 13 - UT1A R1



Bankfull Dimensions

2.0	x-section area (ft.sq.)
5.8	width (ft)
0.3	mean depth (ft)
0.9	max depth (ft)
6.4	wetted perimeter (ft)
0.3	hydraulic radius (ft)
16.7	width-depth ratio
29.7	W flood prone area (ft)
5.2	entrenchment ratio
1.1	low bank height ratio

Survey Date: 6/2023
 Field Crew: Wildlands Engineering



View Downstream

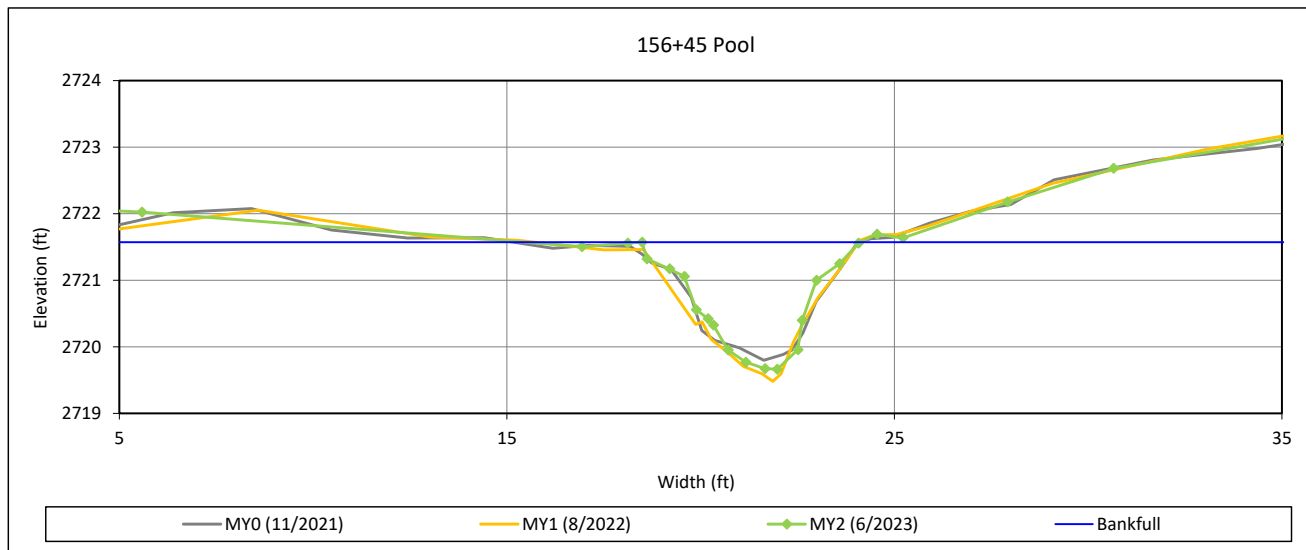
Cross-Section Plots

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Cross-Section 14 - UT1A R1



Bankfull Dimensions

5.7	x-section area (ft.sq.)
5.6	width (ft)
1.0	mean depth (ft)
1.9	max depth (ft)
7.3	wetted perimeter (ft)
0.8	hydraulic radius (ft)
5.6	width-depth ratio

Survey Date: 6/2023

Field Crew: Wildlands Engineering



View Downstream

Table 8. Baseline Stream Data Summary

Double H Farms Mitigation Site
 DMS Project No. 100082
 Monitoring Year 2 - 2023

Pre-Existing Condition																					
Parameter	UT to Crab Creek Reach			UT to Crab Creek Reach			UT1A Reach 1			UT4 Reach 1			UT4 Reach 2			UT5 Reach 2			UT7		
	Min	Max	n	Min	Max	n	Min	Max	n	Min	Max	n	Min	Max	n	Min	Max	n	Min	Max	n
Dimension and Substrate - Riffle																					
Bankfull Width (ft)	10.2		1	8.9		1	2.8		1	7.6		1	12.7		1	2.1		1	6.3		1
Floodprone Width (ft)	43		1	26		1	3		1	8		1	34		1	14		1	12		1
Bankfull Mean Depth (ft)	0.5		1	0.9		1	0.5		1	0.6		1	0.7		1	0.4		1	0.6		1
Bankfull Max Depth (ft)	0.9		1	1.3		1	0.7		1	1.2		1	1.3		1	0.8		1	1.0		1
Bankfull Cross-sectional Area (ft ²)	4.8		1	7.9		1	1.5		1	4.3		1	8.4		1	0.9		1	4.0		1
Width/Depth Ratio	21.9		1	10.2		1	5.2		1	13.2		1	19.1		1	4.8		1	10.0		1
Entrenchment Ratio ¹	4.2		1	2.9		1	1.2		1	1.1		1	2.7		1	6.7		1	1.8		1
Bank Height Ratio	1.7		1	2.3		1	6.8		1	1.7		1	1.0		1	1.0		1	3.5		1
Max part size (mm) mobilized at bankfull	---		1	---		1	---		1	---		1	---		1	---		1	---		1
Rosgen Classification	C4b			C4b			B4a			B4a			B4a			B4a			B4a		
Bankfull Discharge (cfs)	20			40			6			7			9			6			7		
Sinuosity	1.20			1.20			1.02			1.03			1.09			1.02			1.05		
Bankfull/Channel Slope (ft/ft) ²	0.0370			0.0245			0.0645			0.0569			0.0499			0.0840			0.0741		
Design																					
Parameter	UT to Crab Creek Reach			UT to Crab Creek Reach			UT1A Reach 1			UT4 Reach 1			UT4 Reach 2			UT5 Reach 2			UT7		
	Min	Max	n	Min	Max	n	Min	Max	n	Min	Max	n	Min	Max	n	Min	Max	n	Min	Max	n
Dimension and Substrate - Riffle																					
Bankfull Width (ft)	8.0		1	11.0		1	4.3		1	5.0		1	5.0		1	4.3		1	4.5		1
Floodprone Width (ft)	16		1	24	110+	1	9		1	10		1	10		1	9		1	---		1
Bankfull Mean Depth (ft)	0.5		1	0.8		1	0.3		1	0.4		1	0.4		1	0.3		1	0.3		1
Bankfull Max Depth (ft)	0.8		1	1.2		1	0.5		1	0.5		1	0.5		1	0.4		1	---		1
Bankfull Cross-sectional Area (ft ²)	4.3		1	8.7		1	1.4		1	1.9		1	1.9		1	1.2		1	1.5		1
Width/Depth Ratio	14.8		1	13.9		1	13.2		1	13.3		1	13.3		1	15.9		1	13.5		1
Entrenchment Ratio ¹	2.0		1	2.2	10+	1	2.0		1	2.0		1	2.0		1	2.0		1	1.4+		1
Bank Height Ratio	1.0		1	1.0		1	1.0		1	1.0		1	1.0		1	1.0		1	1.0-1.1		1
Max part size (mm) mobilized at bankfull	237.0		1	130.0		1	180.0		1	214.0		1	208.0		1	95.0		1	132.0		1
Rosgen Classification	B4			C4			B4a			B4a			B4a			B4a			B4a		
Bankfull Discharge (cfs)	20			40			6			7			9			5			7		
Sinuosity	1.05			1.28			1.03			1.05			1.17			1.02			1.04		
Bankfull/Channel Slope (ft/ft) ²	0.0380			0.0170	0.0440		0.0650	0.1760		0.0700			0.0670			0.0310	0.1150		0.0410	0.0740	
As-Built/ Baseline																					
Parameter	UT to Crab Creek Reach			UT to Crab Creek Reach			UT1A Reach 1			UT4 Reach 1			UT4 Reach 2			UT5 Reach 2			UT7		
	Min	Max	n	Min	Max	n	Min	Max	n	Min	Max	n	Min	Max	n	Min	Max	n	Min	Max	n
Dimension and Substrate - Riffle																					
Bankfull Width (ft)	7.8	12.0	2	8.1		1	4.2		1	6.6		1	5.9		1	4.3		1	5.3		1
Floodprone Width (ft)	50	66	2	42		1	28		1	31		1	34		1	24		1	52		1
Bankfull Mean Depth (ft)	0.6	0.7	2	0.6		1	0.4		1	0.4		1	0.5		1	0.3		1	0.5		1
Bankfull Max Depth (ft)	0.9	1.3	2	1.0		1	0.8		1	0.8		1	0.9		1	0.6		1	1.1		1
Bankfull Cross-sectional Area (ft ²) ¹	4.4	8.3	2	4.7		1	1.6		1	2.5		1	2.9		1	1.3		1	2.6		1
Width/Depth Ratio	13.7	17.4	2	14.0		1	11.5		1	17.1		1	11.9		1	14.4		1	10.6		1
Entrenchment Ratio ¹	4.2	8.4	2	5.1		1	6.5		1	4.7		1	5.8		1	5.6		1	9.9		1
Bank Height Ratio	1.0		2	1.0		1	1.0		1	1.0		1	1.0		1	1.0		1	1.0		1
Max part size (mm) mobilized at bankfull	63.0	79.0	2	39.0		1	86.0		1	78.0		1	95.0		1	61.0		1	86.0		1
Rosgen Classification	B4			C4b			B4a			B4a			B4a			B4a			B4a		
Bankfull Discharge (cfs)	21.3	46.4		17.9			8.1			12.8			16.7			5.5			14.2		
Sinuosity	0.913			0.913			1.05			1.02			1.39			0.984			0.985		
Bankfull/Channel Slope (ft/ft) ²	0.0382			0.0227			0.0838			0.0681			0.0664			0.0696			0.0634		

1. ER for the baseline/monitoring parameters are based on the width of the cross-section, in lieu of assuming the width across the floodplain.

2. Channel slope is calculated from the surface of the channel bed rather than water surface.

(---): Data was not provided, N/A: Not Applicable

Table 9. Cross-Section Morphology Monitoring Summary

Double H Farms Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

	UT7 Cross-Section 1 Riffle						UT to Crab Creek R1 Cross-Section 2 Riffle						UT to Crab Creek R1 Cross-Section 3 Pool						UT to Crab Creek R1 Cross-Section 4 Pool					
Dimensions	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	2749.7	2749.7	2749.6				2731.0	2731.0	2731.1				N/A	N/A	N/A				N/A	N/A	N/A			
Bank Height Ratio - Based on AB Bankfull ¹ Area	1.0	1.0	1.0				1.0	1.0	1.0				N/A	N/A	N/A				N/A	N/A	N/A			
Thalweg Elevation	2748.6	2748.5	2748.4				2730.0	2730.0	2730.0				2728.1	2727.7	2727.3				2679.9	2680.5	2680.2			
LTOB ² Elevation	2749.7	2749.6	2749.6				2731.0	2731.0	2731.1				2730.0	2730.0	2730.2				2682.4	2682.2	2682.4			
LTOB ² Max Depth (ft)	1.1	1.1	1.2				0.9	1.0	1.1				1.9	2.4	2.9				2.4	1.8	2.1			
LTOB ² Cross Sectional Area (ft ²)	2.6	2.3	2.5				4.4	4.5	4.5				11.7	12.9	15.0				15.7	11.8	12.1			
	UT to Crab Creek R1 Cross-Section 5 Riffle						UT to Crab Creek R2 Cross-Section 6 Riffle						UT to Crab Creek R2 Cross-Section 7 Pool						UT5 R2 Cross-Section 8 Riffle					
Dimensions	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	2681.8	2681.9	2681.6				2665.5	2665.5	2665.5				N/A	N/A	N/A				2692.2	2692.2	2692.2			
Bank Height Ratio - Based on AB Bankfull ¹ Area	1.0	1.0	1.1				1.0	1.0	1.0				N/A	N/A	N/A				1.0	1.1	1.1			
Thalweg Elevation	2680.5	2680.5	2679.6				2664.5	2664.4	2664.4				2662.4	2663.2	2663.5				2691.6	2691.6	2691.6			
LTOB ² Elevation	2681.8	2681.8	2681.8				2665.5	2665.4	2665.4				2664.9	2665.0	2665.1				2692.2	2692.2	2692.2			
LTOB ² Max Depth (ft)	1.3	1.3	2.2				1.0	1.1	1.1				2.5	1.8	1.7				0.6	0.6	0.6			
LTOB ² Cross Sectional Area (ft ²)	8.3	8.1	10.8				4.7	4.5	4.3				12.1	9.8	7.9				1.3	1.6	1.4			
	UT4 R1 Cross Section 9 Pool						UT4 R1 Cross Section 10 Riffle						UT4 R2 Cross-Section 11 Riffle						UT4 R2 Cross-Section 12 Pool					
Dimensions	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	N/A	N/A	N/A				2738.8	2738.9	2739.0				2716.8	2716.8	2716.9				N/A	N/A	N/A			
Bank Height Ratio - Based on AB Bankfull ¹ Area	N/A	N/A	N/A				1.0	0.9	0.8				1.0	1.1	0.9				N/A	N/A	N/A			
Thalweg Elevation	2737.9	2738.1	2737.8				2738.0	2738.1	2738.1				2715.8	2715.8	2716.0				2713.3	2713.5	2712.8			
LTOB ² Elevation	2739.3	2739.6	2739.5				2738.8	2738.8	2738.8				2716.8	2716.9	2716.9				2715.4	2715.5	2715.5			
LTOB ² Max Depth (ft)	1.5	1.5	1.7				0.8	0.7	0.7				0.9	1.1	0.9				2.1	2.0	2.6			
LTOB ² Cross Sectional Area (ft ²)	4.7	5.2	5.2				2.5	1.9	1.3				2.9	3.5	2.5				7.7	7.5	9.2			
	UT1A R1 Cross-Section 13 Riffle						UT1A R1 Cross-Section 14 Pool																	
Dimensions	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7												
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	2721.9	2721.9	2722.0				N/A	N/A	N/A															
Bank Height Ratio - Based on AB Bankfull ¹ Area	1.0	0.9	1.1				N/A	N/A	N/A															
Thalweg Elevation	2721.0	2721.1	2721.1				2719.8	2719.5	2719.7															
LTOB ² Elevation	2721.9	2721.8	2722.0				2721.5	2721.5	2721.6															
LTOB ² Max Depth (ft)	0.8	0.7	0.9				1.7	2.0	1.9															
LTOB ² Cross Sectional Area (ft ²)	1.6	1.2	2.0				5.6	5.9	5.7															

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

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

APPENDIX D. Hydrology Data

Tables 10-13. Hydrology Summary Tables

Double H Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

Table 10. Bankfull Event Summary

Reach	MY1 (2022)	MY2 (2023)	MY3 (2024)	MY4 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
UT to Crab Creek Reach 2 (CG1)	5/27/2022 8/19/2022	6/22/2023					
UT4 Reach 1 (CG2)*	N/A	N/A					
UT1A Reach 1 (CG3)*							

*CG2 and CG3 are located on B-channels and have been relocated in-stream to capture flow on 10/14/22 per the MY1 report (Wildlands, 2022) and therefore are not being evaluated for bankfull criteria.

Table 11. Rainfall Summary

	MY1 (2022)	MY2 (2023)	MY3 (2024)	MY4 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
Annual Precip Total ¹	57.85	41.39*					
WETS 30th Percentile	47.56	47.56					
WETS 70th Percentile	58.53	58.53					
Type of Year ²	Average	*					

WETS 30th and 70th percentile data downloaded from the SPARTA 3.5 SSW, NC WETS Station (1971-2000).

*Annual precipitation total was collected up until 10/12/2023. Data will be updated in MY3.

1- Precipitation data collected from 318158 - Sparta 2 Se. The gage is located approximately 7 miles from the Site.

2 - Type of year refers to amount of rainfall in the current year compared to the average percentiles i.e. Below Average, Average, Above Average

Table 12. Recorded In-Stream Flow Events Summary

Reach	Max Consecutive Days/Cumulative Days						
	MY1 (2022)	MY2 (2023)	MY3 (2024)	MY4 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
UT1A Reach 1 (SG1)	271 Days	284 Days					
UT4 Reach 1 (SG2)*	271 Days	284 Days					
UT1A Reach 1 (SG3)*	271 Days	284 Days					

1 - Success criteria is 30 consecutive days of flow.

2 - Data collected through 10/12/2023.

*CG2 and CG3 are located on perennial channels and have been relocated in-stream to capture flow on 10/14/22 per the MY1 report (Wildlands, 2022).

Table 13. Recorded Groundwater Gage Summary

Gage	Max Consecutive Days/Cumulative Days above 12 inches during growing season						
	MY1 (2022)	MY2 (2023)	MY3 (2024)	MY4 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
GWG1	169/169	169/169					
GWG2	2/10	5/12					

Groundwater Gages are not held to criteria per the Mitigation Plan (Wildlands, 2020).

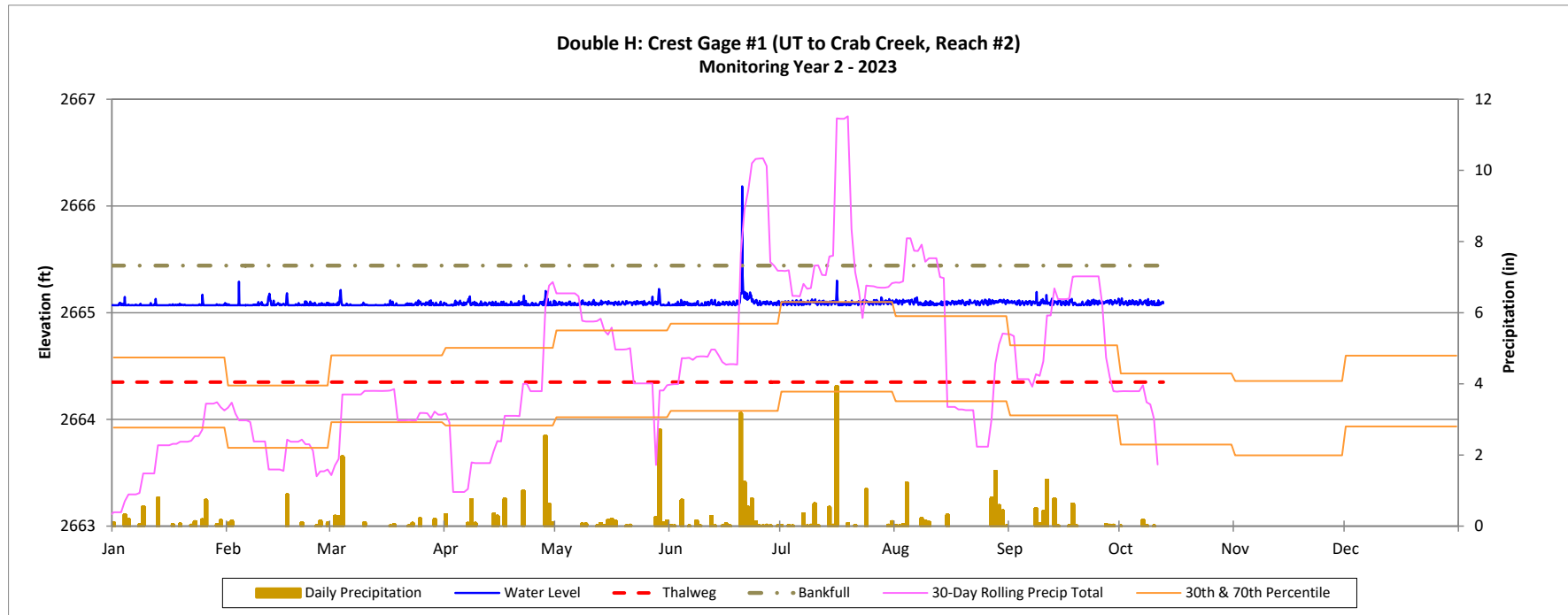
There are 169 days in the growing season defined from April 26 through October 11 under typical precipitation conditions compiled from the SPARTA 3.5 SSW, NC WETS Station (1971 – 2000).

Recorded Bankfull Event Plot

Double H Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

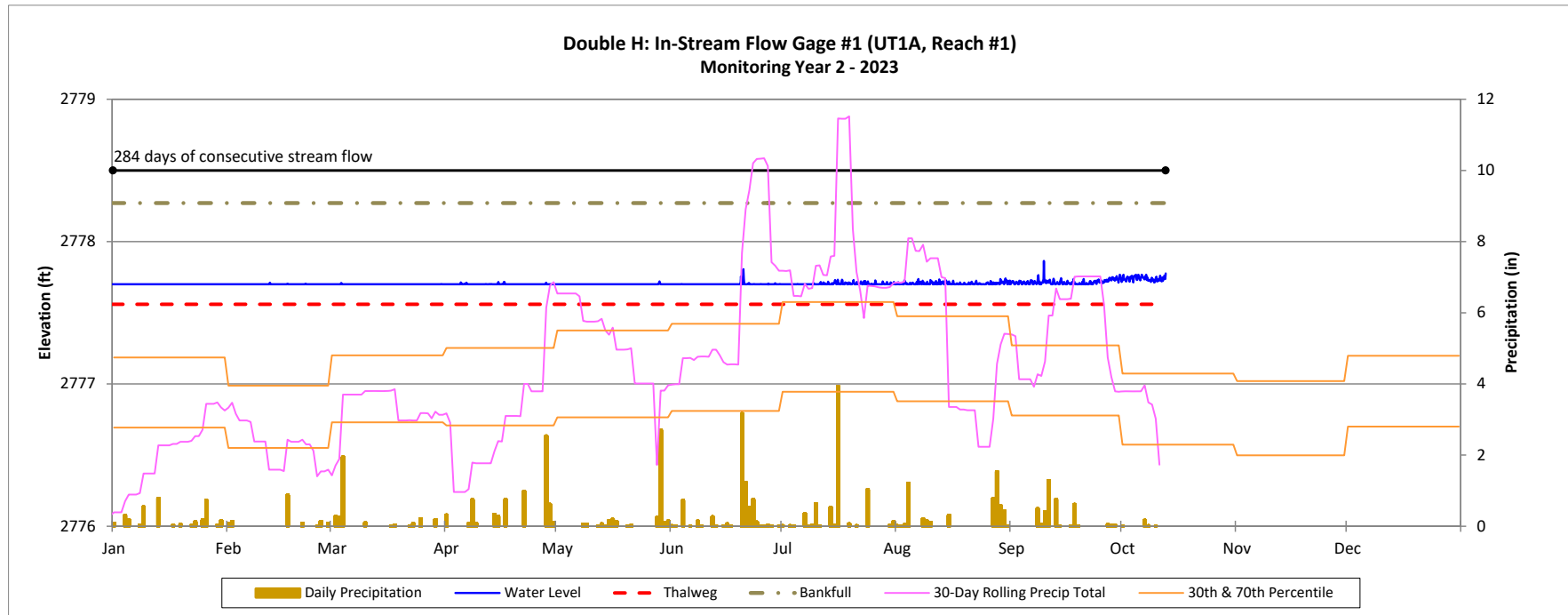


Recorded In-Stream Flow Events Plot

Double H Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

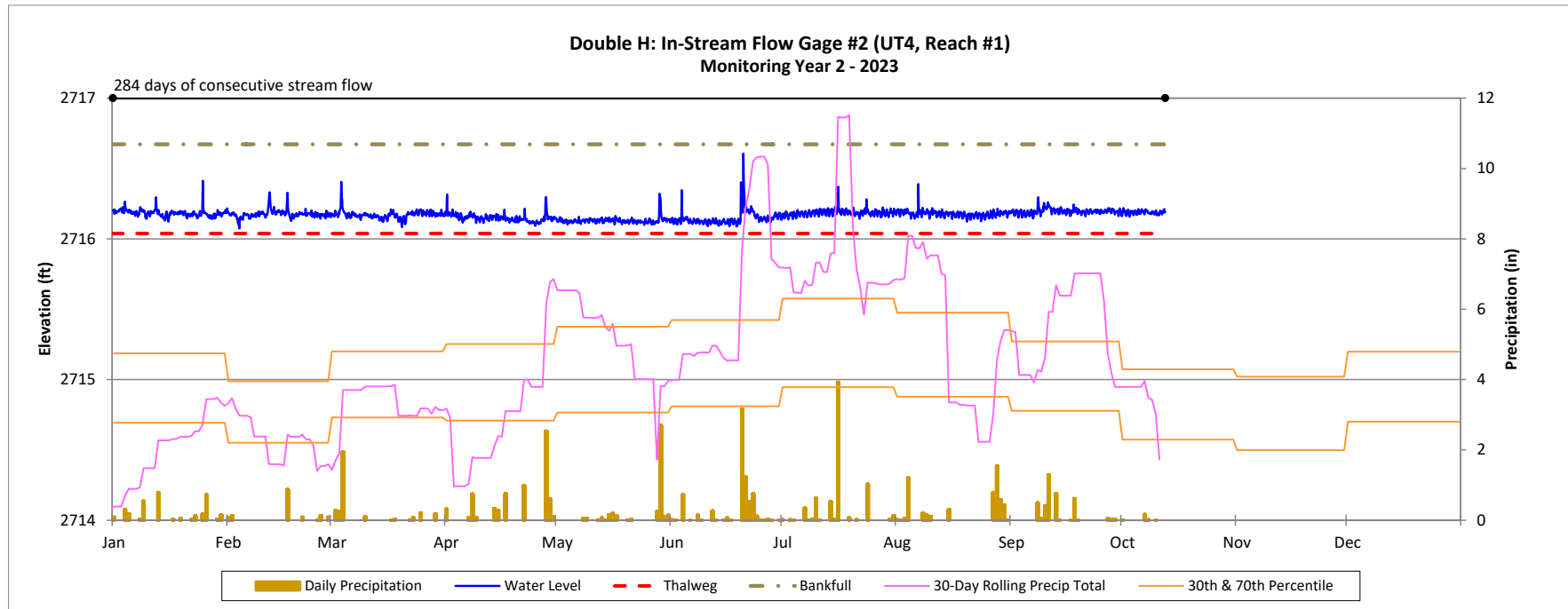


Recorded In-Stream Flow Events Plot

Double H Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

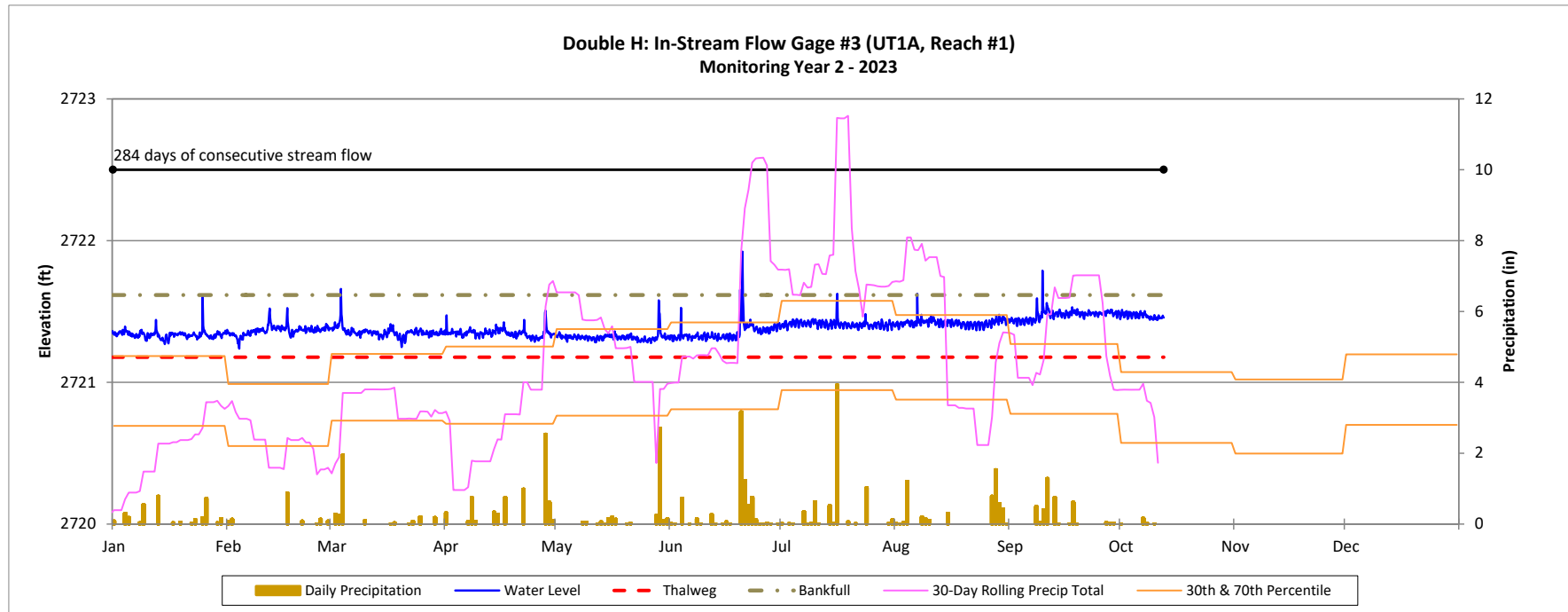


Recorded In-Stream Flow Events Plot

Double H Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023

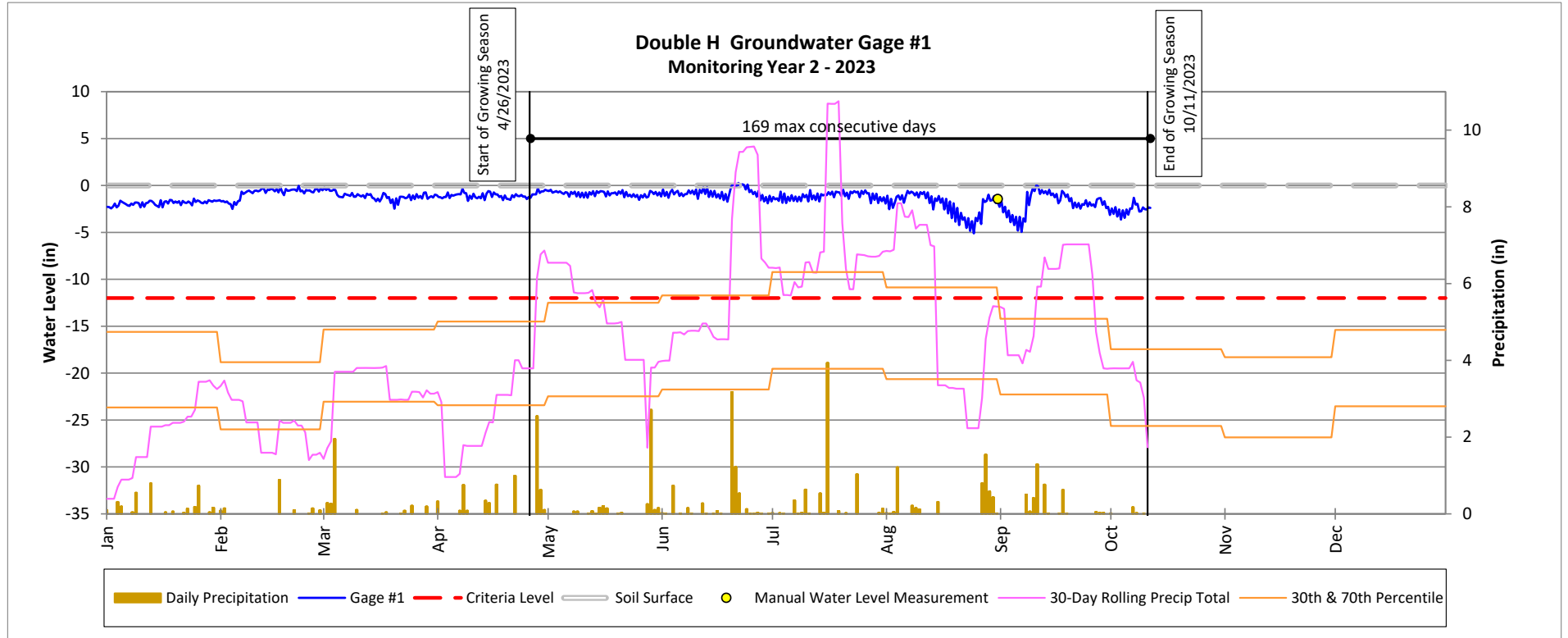


Groundwater Gage Plots

Double H Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023



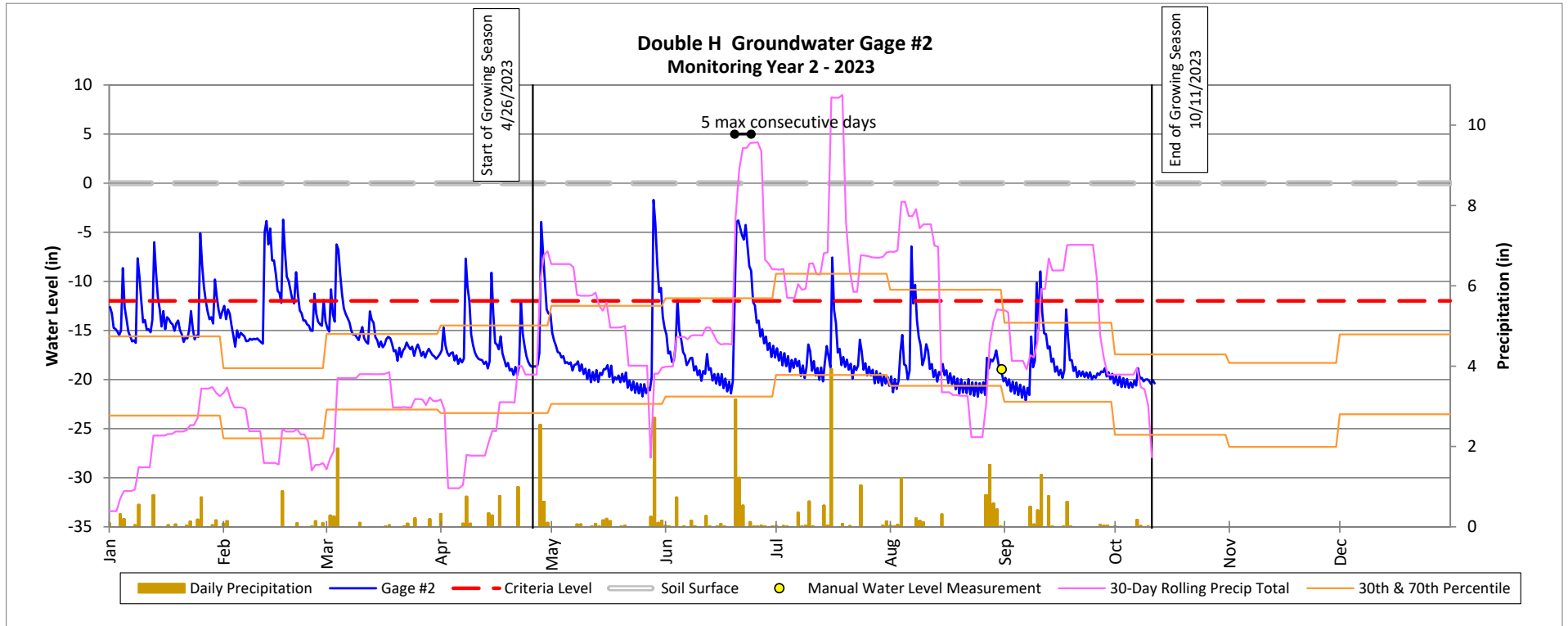
Groundwater gages are not held to hydrology criteria per the Mitigation Plan (Wildlands, 2020.)

Groundwater Gage Plots

Double H Mitigation Site

DMS Project No. 100082

Monitoring Year 2 - 2023



Groundwater gages are not held to hydrology criteria per the Mitigation Plan (Wildlands, 2020.)

APPENDIX E. Project Timeline and Contact Info

Table 14. Project Activity and Reporting History

Double H Farms Mitigation Site
 DMS Project No. 100082
Monitoring Year 2 - 2023

Activity or Deliverable		Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted		N/A	February 2021
Mitigation Plan Approved		January 2018 - November 2020	November 2020
Construction (Grading)		April - September 2021	September 2021
Planting		January 2022	January 2022
As-Built Survey		October 2021 - December 2021	December 2021
Baseline Monitoring Document (Year 0)	Stream Survey	October 2021 - February 2022	February 2022
	Vegetation Survey	January 2022 - February 2022	February 2022
	Encroachment	April - September 2021	March 2022
Year 1 Monitoring	Fencing Repair	March 2022	November 2022
	Stream Survey	August 2022	
	Vegetation Survey	August- October 2022	
	Invasive Treatment	October 2022	
Year 2 Monitoring	Stream Survey	June 2023	November 2023
	Vegetation Survey	July 2023	
	Invasive Treatment	October 2023	
Year 3 Monitoring	Stream Survey		
	Vegetation Survey		
Year 5 Monitoring	Stream Survey		
	Vegetation Survey		
Year 7 Monitoring	Stream Survey		
	Vegetation Survey		

Table 15. Project Contact Table

Double H Farms Mitigation Site
 DMS Project No. 100082
Monitoring Year 2 - 2023

Designers Aaron Earley, PE, CFM	Wildlands Engineering, Inc. 1430 South Mint Street, Suite 104 Charlotte, NC 28203 704.332.7754
Construction Contractors	Wildlands Construction, Inc. 312 W. Millbrook Rd, Suite 225 Raleigh, NC 27609
Planting Contractor	Bruton Natural Systems, Inc. PO Box 1197 Fremont, NC 27830
Seeding Contractor	Wildlands Construction, Inc. 312 W. Millbrook Rd, Suite 225 Raleigh, NC 27609
Seed Mix Sources	Garrett Wildflower Seed Farm
Nursery Stock Suppliers Bare Roots & Live Stakes Herbaceous Plugs	Dykes and Sons Nursery Bruton Natural Systems, Inc. Wetland Plants Inc.
Monitoring Performers Monitoring, POC	Wildlands Engineering, Inc. Mimi Caddell (828) 774.5547 x.107