



MONITORING YEAR 3 ANNUAL REPORT

Final

ALEXANDER FARM MITIGATION SITE

Alexander County, NC

DEQ Contract No. 7416

DMS Project No. 100048

USACE Action ID No. SAW-2018-00451

NCDEQ DWR Certification No. 18-0665

RFP #: 16-007277

Catawba River Basin

HUC 03050101

Data Collection Period: January 2022 – November 2022

Final Submission Date: January 2023

PREPARED FOR:



NC Department of Environmental Quality

Division of Mitigation Services

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January 09, 2023

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

RE: Final Year 3 Monitoring Report Review
Alexander Farm Mitigation Site, Alexander County
Yadkin River CU 03040101
DMS Project ID No. 100022 / DEQ Contract #007186

Dear Mr. Tsomides:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments from the Draft Year 3 Monitoring Report for the Alexander Farm Mitigation Site. The report and associated digital files have been updated to reflect those comments. The Final MY3 Report is included. DMS' comments are listed below in **bold**. Wildlands' responses to DMS' comments are noted in *italics*.

DMS appreciates the thorough follow up from the May 2022 IRT site meeting in addressing and discussing the various items observed, and actions taken this year (fence repair, plantings, invasives treatments and hand repairs).

Wildlands' response: Thank you!

DMS' comment: WEI notes the area of concern on UT1 Reach 1A where approximately 200 linear feet (LF) of stream lacked sufficient baseflow and indicates that a site visit on November 2nd showed adequate surface flow. Wildlands indicates that the area will be closely monitored moving forward; will this be via visual monitoring? During the May 9, 2022 IRT meeting, the value of adding a game camera in that section was discussed. Please indicate how WEI plans to document and report this area moving forward.

Wildlands' response: Visual monitoring was to be conducted until repairs were finished to a few piping log sills without enough filter fabric. Now that repairs are completed and functioning appropriately, Wildlands plans to install a game camera in early 2023 to continue monitoring the area for issues resulting in insufficient baseflow. Additional text has been added to Section 1.4.5 for clarity.

DMS' comment: During the May 9, 2022 IRT meeting, the value of winter photos was discussed, as oftentimes the photo points do not adequately show localized stream morphology (e.g., UT1 Reach 2, other areas covered by herbaceous vegetation during growing season). Does WEI plan to include winter photos in some or all sections?

Wildlands' response: Due to the number of sites being monitored, sometimes winter photos are not feasible; however, Wildlands will try our best to either take winter photos for the project photo points or if leaf out has occurred, clear and/or pull vegetation out of the way for a better view of the channel/area of intent.

DMS' comment: The visual assessment tables indicate 100% performance across the site for all visual monitoring metrics; can WEI confirm this is the case for MY3? If not, then please update these tables accordingly.



Wildlands' response: Except for one luncker log on UT1 Reach 4B, all channel integrity issues documented in MY1 and MY2 either self-mitigated and/or were repaired prior to the submittal of the MY3 report. The overall integrity metric in Table 4d has been updated to reflect the stable but dislodged luncker log at Station 151+10.

DMS' comment: As a reminder, monitoring providers are responsible for checking the easement integrity across the project site for encroachments, missing markers, adequate signage, fence breaks, etc. Please confirm that the site was fully checked and what the results are.

Wildlands' response: On September 20th, Wildlands assessed the easement perimeter across the project site. Minor fence damage as a result of a fallen tree was discovered along the UT1 Reach 1A and was repaired on November 22nd. All other signage and fencing were found to be in sufficient condition. No easement violations were discovered on either visit. A brief discussion was added in Section 1.4.2.

Digital Support File Comments:

DMS' comment: Please submit the quantities and credits table (missing).

Wildlands' response: Quantities and credits table are included Support Files folder in the digital submittal.

As requested, Wildlands has included two hard copies of the Final Alexander Farm Mitigation Year 3 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'. The signature is fluid and cursive, with the first name 'Kristi' being more prominent than the last name 'Suggs'.

Kristi Suggs
Senior Environmental Scientist
ksuggs@wildlandseng.com

EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) implemented a full-delivery stream mitigation project at the Alexander Farm Mitigation Site (Site) for the North Carolina Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS). The project restored, enhanced, and preserved a total of 6,722 linear feet (LF) of perennial stream in Alexander County, NC. The Site is located within the DMS targeted local watershed (TWL) for the Catawba River Basin HUC 03050101 and the NC Division of Water Resources (DWR) Subbasin 03-08-32. The project is providing 4,258.100 stream mitigation units (SMUs) for the Catawba River Basin Hydrologic Unit Code (HUC) 03050101130010 (Catawba 01).

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 included channel incision and widening, a lack of stabilizing riparian vegetation, a lack of bedform diversity and aquatic habitat, and agricultural related impacts such as channel manipulation or straightening and concentrated run-off inputs from agricultural fields. The effects of these stressors resulted in channel instability, loss of floodplain connection, degraded water quality, and the loss of both aquatic and riparian habitat throughout the Site's watershed when compared to reference conditions. The project approach for the Site focused on evaluating the Site's existing functional condition and evaluating its potential for recovery and need for intervention.

The project goals defined in the Mitigation Plan (Wildlands, 2019) were established with careful consideration of 2009 Upper Catawba River Basin Restoration Priorities (RBRP) goals and objectives to address stressors identified in the watershed through the implementation of stream restoration and enhancement activities and wetland re-establishment and rehabilitation activities, as well as riparian buffer re-vegetation. The established project goals include:

- Improve stream channel stability,
- Reconnect channels with historic floodplains,
- Improve in-stream habitat,
- Reduce sediment and nutrient inputs from adjacent farm fields,
- Restore and enhance native floodplain and wetland vegetation,
- Exclude livestock, and
- Permanently protect the project site from harmful uses.

The Site construction and as-built surveys were completed April - May 2020. Planting and baseline vegetation data collection occurred in April 2020. Fencing installation was completed in July 2020. MY3 assessments and Site visits were completed between January and November 2022 to assess the conditions of the project.

Overall, the Site is on track to meet the required stream, hydrology, and vegetative success criteria for MY3. The average planted stem density for the Site in MY3 is 391 stems per acre, and the majority of the permanent and mobile veg plots are currently exceeding requirements of 320 planted stems per acre. Areas of loosely populated Chinese privet (*Ligustrum sinense*) were documented within the existing wooded areas along UT1 Reach 1A and the upstream portion of UT1 Reach 1B in MY2. These areas were treated in MY3 and are no longer considered as areas of concern. A few isolated, mature stems of princess tree (*Paulownia tomentosa*) and tree of heaven (*Ailanthus altissima*) were also noted within the easement in MY2. They have also been treated and are no longer considered as a concern in MY3. Geomorphic surveys indicate that cross-section bankfull dimensions closely match the baseline monitoring with some minor adjustments, and streams are functioning as intended. In MY3, one bankfull event was documented on UT1 Reach 4A. During the MY3 visual assessments, approximately



200 LF of stream on UT1 Reach 1A was noted as lacking sufficient streamflow from May - October 2022. Within this section of the reach, three piping log sills were repaired, and filter fabric was added in late 2022. Sufficient streamflow returned to the area in the fall of 2022 and continues to flow throughout the entire reach. All areas, throughout the project, are doing well and trending towards success. No easement violations and only one area of fence damage were noted during MY3. The fence was repaired in November 2022. Wildlands will continue to monitor these areas throughout the seven-year monitoring period to benefit the ecological health of the Site.



ALEXANDER FARM MITIGATION SITE
Monitoring Year 3 Annual Report

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Section 1: PROJECT OVERVIEW

1.1 Project Quantities and Credits

The Alexander Farm Mitigation Site (Site) is located in Alexander County approximately 6 miles west of Statesville and 15 miles northeast of Hickory (Figure 1). The Site is located within the Elk Shoals Creek targeted local watershed (TLW) Hydrologic Unit Code (HUC) 03050101130010 and is being submitted for mitigation credit in the Upper Catawba River Basin 03050101. Located in the Northern Inner Piedmont belt within the Piedmont physiographic province (NCGS, 1985), the project watershed is dominated by agricultural and forested land.

The Site contains two unnamed tributaries, UT1 and UT1A, and eighteen riparian wetlands; however, no credit is being sought for project wetlands. For this project UT1 was broken into six reaches (Reach 1A, Reach 1B, Reach 2, Reach 3, Reach 4A, and Reach 4B). The project Site is bisected by Elk Shoals Church Loop Road between Reach 2 and Reach 3.

The final mitigation plan was submitted and accepted by DMS in June of 2019 and the IRT in October of 2019. Construction activities were completed in April 2020 by Baker Grading & Landscaping Inc. Turner Mapping and Surveying completed the as-built survey in May 2020. Planting was completed following construction in April 2020 by Bruton Natural Systems, Inc. A conservation easement has been recorded and is in place on 21.7 acres. The project is providing 4,258.100 stream mitigation units (SMUs) for the Catawba River Basin Hydrologic Unit Code (HUC) 03050101130010 (Catawba 01). Please refer to Table 1 and Table 1.1 for project credits by stream and the credit summary table respectively. Annual monitoring will be conducted for seven years with close-out anticipated to commence in 2027 given the success criteria are met.

Table 1: Project Quantities and Credits

Project Components						
Project Area	Mitigation Plan Footage	As-Built Footage	Restoration Level	Mitigation Ratio (X:1) ¹	Project Credit	Notes/Comments
UT1 Reach 1A	770	770.000	R	2.000	385.000	Full channel restoration with planted buffer. Livestock excluded, and invasive species treated.
UT1 Reach 1B	969	957.000	R	2.000	478.500	Full channel restoration with planted buffer. Livestock excluded, and invasive species treated.
UT1 Reach 2	1260	1,253.000	EII	2.000	626.500	Channel stabilization with planted buffer. Livestock excluded, and invasive species treated.
UT1 Reach 3	718	701.000	P	10.000	70.100	Invasive species treated.

Table 1: Project Quantities and Credits

Project Components						
Project Area	Mitigation Plan Footage	As-Built Footage	Restoration Level	Mitigation Ratio (X:1) ¹	Project Credit	Notes/Comments
UT1 Reach 4A	252	252.000	R	2.500	100.800	Channel stabilized. Floodplain bench cut to reconnect channel with floodplain and transition preservation reach to Priority 1 restoration. Planted buffer, livestock exclusion, and invasive species treated.
UT1 Reach 4A	920	920.000	R	1.000	920.000	Full channel restoration with planted buffer. Livestock excluded, and invasive species treated.
UT1 Reach 4B	1666	1,666.000	R	1.000	1,666.000	Full channel restoration with planted buffer. Livestock excluded, and invasive species treated.
UT1A	203	203.000	EII	-	0.000	Channel reconnected with floodplain. Livestock excluded, invasive species treated, and planted buffer.
BMP	262	262.000	N/A	-	N/A	Step-pool conveyance system implemented to treat pasture stormwater run-off. Livestock excluded, and invasive species treated.

Notes:

1. No direct credit for BMP or UT1A.
2. Internal culvert crossing and external break excluded from stationing listed.

Table 1.1: Credit Summary Table

Project Credits							
Restoration Level	Stream			Riparian Wetland		Non-Riparian Wetland	Coastal Marsh
	Warm	Cool	Cold	Riverine	Non-Riv		
Restoration	3,556.300	N/A	N/A	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				N/A	N/A	N/A	N/A
Enhancement I	-	N/A	N/A				
Enhancement II	630.000	N/A	N/A				
Preservation	71.800	N/A	N/A	N/A	N/A	N/A	
Totals	4,258.100	N/A	N/A	N/A	N/A	N/A	N/A

1.2 Project Goals and Objectives

The Site is providing numerous ecological benefits within the Upper Catawba Basin. The project goals were established with careful consideration to address stressors that were identified in the 2009 Upper Catawba River Basin Restoration Priorities (RBRP) report. The project has improved stream functions through stream restoration and the conversion of maintained agricultural fields into riparian buffer within the Upper Catawba River Basin, while creating a functional riparian corridor at the Site.

The following project specific goals and objectives outlined in the Mitigation Plan (Wildlands, 2019) include:

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 stable cross-sections, patterns, and profiles over time.	Reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary.	BHR remain below 1.2 over the monitoring period with visual assessments showing progression towards stability.	14 Cross-sections will be assessed during MY1, MY2, MY3, MY5, and MY7 and visual inspections will be assessed annually.	All cross sections have a BHR <1.2. Channels are stable and have maintained the constructed riffle and pool sequence.
Reconnect channels with historic floodplains.	Reconstruct stream channels with designed bankfull dimensions and depth based on reference reach data.	Allow more frequent flood flows to disperse on the floodplain.	Four bankfull events in separate years within the 7-year monitoring period.	2 automated crest gages were installed on restoration reaches. The automated gages will record flow elevations and durations.	Crest gage 1 on UT1 Reach 1A did not meet criteria this year; However, Crest gage 2 on UT1 Reach 4A did meet criteria with one bankfull event.
Restore and enhance native floodplain, streambank, and wetland vegetation.	Plant native tree and understory species in riparian zones and plant native shrub and herbaceous species on streambanks.	Reduce sediment inputs from bank erosion and runoff. Increase nutrient cycling and storage in floodplain. Provide riparian habitat. Add a source of LWD and organic material to stream.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7.	Nine (9) permanent and nine (9) mobile one hundred square meter vegetation plots are monitored during MY1, MY2, MY3, MY5, and MY7.	15 of the 18 vegetation plots have a planted stem density greater than 320 stems per acre. The overall planted stems per acre for MY3 come out to 391.

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Improve instream habitat.	Install habitat features such as constructed riffles, cover logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	Increase and diversify available habitats for macroinvertebrates, fish, and amphibians leading to colonization and increase in biodiversity over time.	There is no required performance standard for this metric.	Visual assessment.	N/A
Reduce sediment and fecal coliform and nutrient input from adjacent farm fields.	Install stormwater BMPs in areas of concentrated agricultural runoff to diffuse and provide vegetated infiltration for runoff before it enters the stream channel.	Reduce agricultural and sediment inputs to the project, which will reduce likelihood of accumulated fines and excessive algal blooms from nutrients.	There is no required performance standard for this metric.	N/A	N/A
Permanently protect the project Site from harmful uses.	Establish conservation easements on the Site.	Protect Site from encroachment on the riparian corridor and direct impact to streams and wetlands.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	No easement encroachments.
Exclude livestock from stream channels.	Install livestock fencing and watering systems as needed to exclude livestock from stream channels and riparian areas.	Reduced agricultural runoff and cattle trampling in streams.	There is no required performance standard for this metric.	Visually monitor fenced portions of the site to ensure no cattle are entering the easement.	No cattle observed in easement.

1.3 Project Attributes

Prior to construction activities, the streams throughout the Site were in various stages of impairment related to the current and historical agricultural uses. UT1 Reaches 1 and 2 were severely impacted by cattle. On both reaches bedform diversity and habitat was very poor, primarily due to sedimentation and incision. UT1 Reach 3 was wooded and the majority of the reach consisted of low, stable stream banks with a few scour pockets located near ATV crossings. UT1 Reach 4 was extensively eroded, incised, and disconnected from its historic floodplain.

The overall Site topography consists of a gradually sloped valley running through the center of the project. Upstream of Elk Shoals Church Loop Road, the Site is characterized by a moderate slope. UT1 Reach 1 originates within the Site limits at a spring head and flows downslope through a

moderately confined valley surrounded by open pasture. Approximately 600 feet downstream of the headwaters, the valley widens and continues downstream as a broad gently sloping floodplain to Elk Shoals Church Loop Road. Downstream of the road crossing, UT1 continues flowing south within a broad gently sloping floodplain to its confluence with UT1A from the left floodplain, where it originates as a wetland seep. At the confluence, UT1A joins UT1 and continues south to its confluence with Elk Shoals Creek within a broad alluvial floodplain. The site drains approximately 256 acres of rural land.

A map of the Site with project components illustrated is provided in Figures 1 – 1c.

Table 3: Project Attributes

Project Information					
Project Name	Alexander Farm Mitigation Site		County	Alexander County	
Project Area (acres)	21.7		Project Coordinates	35° 48' 42.36"N 81° 7' 14.46"W	
Planted Acreage	17.5				
Project Watershed Summary Information					
Physiographic Province	Piedmont		River Basin	Catawba River	
USGS Hydrologic Unit 8-digit	3050101		USGS Hydrologic Unit 14-digit	3050101130010	
Project Watershed Summary Information					
DWR Sub-basin	03-08-32		2011 NLCD Land Use Classification	Forest (20%), Cultivated (73%), Grassland (1%), Shrubland (1%), Urban (5%), Open Water (0%)	
Project Drainage Area (acres)	UT1 - 256, UT1A - 7.4		Project Drainage Area Percentage of Impervious Area	1.00%	
Reach Summary Information					
Parameters	UT1 Reach 1A and 1B	UT1 Reach 2	UT1 Reach 3	UT1 Reach 4A and 4B	UT1A
Length of reach (linear feet) - Post-Restoration	1,727	1,253	701	2,838	203
Valley confinement (Confined, moderately confined, unconfined)	Confined	Unconfined	Moderately Confined	Unconfined	Unconfined
Drainage area (acres)	71	117	141	256	7
Perennial (P), Intermittent (I), Ephemeral (E)	P	P	P	P	I
NCDWR Water Quality Classification	WS-IV				
Morphological Description (stream type) - Pre-Restoration	B4	B4	N/A	C4c/G4c	N/A
Morphological Description (stream type) - Post-Restoration	B4	B4	N/A	C4	N/A
Evolutionary trend (Simon's Model) - Pre-Restoration	III	V	I/II	IV	III
FEMA classification	N/A	N/A	N/A	Zone AE	N/A

Table 3: Project Attributes

Regulatory Considerations			
Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States - Section 404	Yes	Yes	USACE Action ID #SAW-2018-00451
Waters of the United States - Section 401	Yes	Yes	DWR# 18-0665
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	Yes	Yes	Alexander County Floodplain Development Permit #01-2019
Essential Fisheries Habitat	No	N/A	N/A

1.4 Monitoring Year 3 Data Assessment

Annual monitoring for MY3 was conducted between January and November 2022 to assess the condition of the project. The stream, vegetation, and hydrologic success criteria for the Site follows the approved success criteria presented in the Alexander Farm Mitigation Plan (Wildlands, 2019).

1.4.1 Vegetation 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 9 permanent vegetation plots were established within the project easement area using either a 10-meter by 10-meter square plot or a 5-meter by 20-meter rectangular plot. In addition, 9 mobile and supplemental vegetation plots were relocated in MY3 throughout the planted conservation easement. To evaluate the random vegetation performance for the Site, mobile plots will continue to be reestablished in different random locations in monitoring years 5 and 7. Mobile vegetation plot assessments will document stems, species, and height using 100-meter² circular, square, or rectangular plots. The final vegetative performance standard will be the survival of 210 planted stems per acre in the planted riparian areas at the end of the required seven-year monitoring period. The interim measure of vegetative success for the Site will be the survival of at least 320 planted stems per acre at the end of MY3 and at least 260 stems per acre at the end of MY5.

The MY3 vegetation survey was completed in August 2022, resulting in a total average planted density of 391 stems per acre for all monitored permanent (VPs) and mobile vegetation plots (MPs). The Site had 7 out of 9 permanent vegetation plots individually exceeded the interim MY3 requirement of 320 planted stems per acre, with densities ranging from 324 to 567 planted stems per acre. The two permanent plots that did not meet the MY3 planted stem density requirements were VP7 and VP9 with an average of 243 and 283, respectively. However, these plots are on track to meet the MY5 and MY7 vegetative success criteria with the help of additional volunteers being added in the upcoming years.

In MY3 after the IRT walk in May 2022, it was decided that Wildlands add one more additional mobile plot (MP9) to show the success of a semi-bare area that was noted during the site visit. Currently, 8 out

of 9 mobile plots individually exceeded the interim MY3 requirement of 320 planted stems per acre, with densities ranging from 364 to 486 planted stems per acre. Mobile plot 7 did not meet the MY3 requirements with an average stem density of 202 stems per acre. All replanted areas are showing success and are thriving. Wildlands will conduct an extra year of monitoring for the supplementally planted areas outlined in the AMP during MY6 (Wildlands, 2021). If the data collected in these areas suggest that vegetative performance is not on a trajectory for success, an additional year of monitoring may be required in MY8.

In both the permanent and mobile vegetation plots, the majority of the surviving stems appear to be thriving with a vigor of 3 or greater and have an overall stem height averaging at 4.5 feet. Please refer to Section 1.4.2 for the discussion of the MY3 vegetative areas of concern. Appendix A for vegetation plot photographs, Appendix B for vegetation data tables, and Appendix F for meeting minutes from the Alexander Farm MY3 IRT Credit Release Site Walk.

1.4.2 Vegetation Areas of Concern

In general, the Site has responded well to supplemental planting and vegetation is establishing throughout the easement. Currently there are no vegetative areas of concern in MY3.

Vegetative Cover

Overall, herbaceous ground cover is well established throughout the Site and stabilizing the soil. In 2022, observations during Site visits in MY3 identified that a majority of the areas outlined in the AMP from the MY2 report (Wildlands, 2021) for supplemental planting are doing very well with high survival rates.

The two areas of concern that were noted in MY2, located along the left floodplain of UT1 Reach 4B from Station 152+00 - 157+10 and 163+75 - 166+66, are trending towards success and the newly planted stems are starting to thrive in the wetter conditions. For more information refer to the Monitoring Year 2 report (Wildlands, 2021).

Invasive Species

In the beginning of February 2022, Wildlands contracted out the Ecoforesters to treat the areas noted in the MY2 visual assessments which had indicated approximately 0.40 acres of loosely populated Chinese privet (*Ligustrum sinense*) within some of the existing wooded areas along UT1 Reach 1A and the upstream portion of UT1 Reach 1B. In addition, during June 2022, Ecoforesters treated a few isolated, mature stems of princess tree (*Paulownia tomentosa*) and completed a sitewide application of small distinct areas of in-stream vegetation. As well, during this time the tree of heaven (*Ailanthus altissima*) and the cattails (*Typha latifolia*) that were also noted within the easement have been treated by Wildlands. As of the MY3 visual assessment walk, all of the areas of Chinese privet, princess tree, and tree of heaven that had been treated have not yet shown signs of regrowth. Wildlands did not conduct any ring sprays this year as the fescue areas within the easement were not affecting the survival of the bare roots. Wildlands will continue to monitor these areas for resprouts throughout the seven-year monitoring period.

Conservation Easement

On September 20th, Wildlands assessed the entire easement perimeter across the project site. Minor fence damage as a result of a fallen tree was discovered along the UT1 Reach 1A and was repaired on November 22nd. All other signage and fencing were found to be in sufficient condition. No easement violations were discovered.



1.4.3 Stream Assessment

Riffle cross-sections on the restoration reaches should be stable and show little 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. Remedial action would not be taken if channel changes indicate a movement toward stability.

Morphological surveys for MY3 were conducted in May 2022. Cross-section survey results indicate that channel dimensions are stable and functioning as designed on all restoration reaches with minimal adjustments. Minor changes occurring within some cross-sections are normal for a dynamic system and are examples of how a channel adjusts to maintain stability from natural processes. Bank height ratios (BHR) at surveyed cross-sections were at or near 1.0 for all. These changes can be attributed to the establishment of vegetation along the tops of banks, point bar development, and in-stream bench development. These minor changes do not indicate channel instability. The fact that cross-sections have incurred only minor adjustments shows that the system is functioning as designed. It is able to move sediment through the system and access its floodplain thereby negating aggradational and degradational stressors such as an influx of sediment to the system and higher discharges and increased velocities.

Please refer to CCPV Figures 1 – 1c, Appendix A for the visual stability assessment tables and stream photographs, and Appendix C for the morphological tables and plots.

1.4.4 Stream Hydrology Assessment

Two automated pressure transducers were installed to document stream hydrology throughout the seven-year monitoring period. Henceforth, these devices are referred to as “crest gages (CG)” for those recording bankfull events. At the end of the seven-year monitoring period, four or more bankfull flow events must have occurred in separate years. In MY3, one bankfull event was documented at crest gage 2 (CG2) on UT1 Reach 4A.

Over the past 3 monitoring years, the Site has used the daily precipitation data from the closest United States Geological Survey (USGS) rainfall gage 354616081085145, located at Oxford RS NR in Claremont, NC. When retrieving the rainfall data in early November, it was noted that the station did not include any precipitation data after the end of September 2022. As directed on the USGS website (South Atlantic WSC, 2022), Wildlands emailed the National Groundwater Networks Coordinator, Jason Fine, about the status of the rainfall station. Mr. Fine responded noting that this station has been decommissioned due to the lack of funding and there are no plans to reinstate it (Fine, 2022). Wildlands plans to locate and use data from another nearby rainfall gage station for the MY4 and subsequent monitoring reports. Please refer to Appendix D for hydrology summary data, gage plots, monthly rainfall totals for 2022, and email correspondence with USGS.

1.4.5 Stream Areas of Concern and Management Activity

All streams on the Site, including the three areas of concern that were recorded in MY1, are remaining stable. Streambank vegetation has become established, and these areas are no longer an issue. During the MY2 visual stream assessment approximately 110 LF of aggradation from station 138+75 to 139+85 was noted on UT1 Reach 4A. In MY3 on June 17, 2022, a large tree that was impeding flow in this section of the stream was cut down, allowing for normal stream flows to return; thereby, flushing the sediment through the system. This area is no longer of concern.

In early May 2022, prior to the IRT Credit Release Site Walk, Wildlands documented the lack of sufficient baseflow on approximately 200 linear feet (LF) of UT1 Reach 1A. Because this area, nor any other area of the project had experienced baseflow issues in the past, Wildlands discussed the anomaly with the IRT during the on-site meeting. In the short term, Wildlands decided to visually monitor the section of stream, the baseflow upstream and downstream of the area, the functionality of bounding grade control, and the hydrologic conditions within the immediate floodplain and contributing drainage area. Based on this approach and shallow baseflow returning to the riffles and pools within this area of the reach, in early September of 2022, Wildlands believed that structure piping, noted in MY2, was allowing stream flow to move subsurface. Therefore, between October 10th and December 16th before any other additional monitoring measures were implemented, Wildlands repaired three piping log sills within the area and replaced the filter fabric. Since these measures were implemented surface flow has increased to sufficient levels throughout the reach. Previously piping structures along UT1 Reach 1A are no longer of concern. Wildlands plans to install a game camera to monitor the area moving forward.

Per the request of the IRT during the project's MY2 Credit Release Site Walk, Wildlands added 3 photo points across the Site. Photo point 21 was added to monitor a dislodged but currently stable lunker log and bank at station 151+10 on UT1 Reach 4B. Photo point 22 was added to monitor the linear wetland area on UT1 Reach 4B during the winter months. Photo point 23 was added to UT1 Reach 2 in order to help monitor this area and catch any erosion or incision that may occur in the future. Wildlands also plans to install additional live stakes near the upper extent of UT1 Reach 1A in the winter of 2022/2023.

Please refer to CCPV Figures 1 – 1c and Appendix A for stream stability tables, added photo points, and photographs of repaired MY2 areas of concern, and Appendix F for the meeting minutes from the Alexander Farm IRT Credit Release Site Walk. Wildlands will continue to monitor these areas and remedial actions will be implemented if these areas threaten the stability of the project.

1.4.6 Wetland Assessment

During baseline monitoring, two In-situ Level TROLL[®] 100 pressure transducers, hereby referenced as ground water monitoring gages (GWGs), were installed within existing wetlands where Priority 1 restoration was conducted. This was done solely to verify the continuation of hydrologic wetland functions during the growing season, since no wetland credits are being sought for this project and no performance criteria have been established.

All GWGs are downloaded on a quarterly basis and maintained as needed. Calibration was completed by manually measuring water levels on all gages which confirmed the downloaded data. The NRCS Climate Analysis for Wetlands Tables (WETS) does not list a defined growing season for Alexander County due to insufficient data; therefore, the nearest WETS Station is Statesville 2 NNE (USDA, 2020) in Iredell County which is approximately 13.5 miles from the project site was used. The growing season based on data compiled from this WETS Station (1980 – 2020) is from April 4 through November 2 under typical precipitation conditions. The Site does not contain a rainfall gage; therefore, the daily precipitation data was collected from closest USGS gage, 354616081085145, located at Oxford RS NR in Claremont, NC. Due to the decommissioning of this rain gage (Fine, 2022), as previously discussed in Section 1.4.4, rainfall data was only available through the end of September 2022. Therefore, rainfall data will be obtained from another nearby rainfall gage station for the MY4 and subsequent monitoring reports. Please refer to Appendix D for email correspondence with USGS.

Results from both GWGs, during MY3, show that riparian wetlands maintained free groundwater within 12 inches of the ground surface for 30 consecutive days or 14.1% of the growing season for GWG1 and the entire growing season, 213 consecutive days, for GWG2.

Please refer to Figures 1 – 1c for the groundwater gage locations and to Appendix D for the groundwater gage photographs, groundwater hydrology data, and plots.

1.5 Monitoring Year 3 Summary

Overall, the Site is performing well. The average planted stem density for the Site is 391 stems per acre and the majority of plots are currently exceeding the MY3 requirements and are on track to meet the MY5 requirement of 260 stems per acre. As previously mentioned, vegetative success rates have greatly improved throughout the whole Site in MY3. As of February 2022, all areas noted in MY2 of loosely populated Chinese privet along UT1 Reach 1A and the upstream portion of UT1 Reach 1B have been treated along with a few isolated, mature stems of princess tree and tree of heaven. These treated areas are trending toward success; however, Wildlands will continue to monitor them and spot treat where necessary. During the easement assessment on September 20, 2022, no easement violations were documented. All easement signage was found to be in good condition, and only one area of fence damage, due to a fallen tree, was noted. The fence was repaired on November 22, 2022.

Geomorphic surveys, conducted in May 2022, indicate that cross-section bankfull dimensions closely match baseline monitoring with some minor adjustments, and the streams are functioning as intended. However, it was also noted in early May 2022 that approximately 200 LF of stream along UT1 Reach 1A was lacking baseflow. Within this section of the reach, three piping log sills were repaired and filter fabric was added. Sufficient streamflow returned in the fall of 2022 and continues to flow throughout the entire reach. A game camera will be installed to monitor stream flow in this area moving forward. Wildlands will continue to monitor the Site, and additional adaptive maintenance will be implemented, as necessary, throughout the seven-year monitoring period to benefit the ecological health of the Site.

Section 2: METHODOLOGY

Geomorphic data were collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). All Integrated Current Condition Mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcGIS. Crest gages and groundwater gages are monitored quarterly. Hydrologic instrument installations are in accordance with the United States Army Corps of Engineers (USACE, 2005) standards and monitoring with the IRT's Stream and Wetland Mitigation Update (2016). Vegetation monitoring protocols followed the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008).



Section 3: REFERENCES

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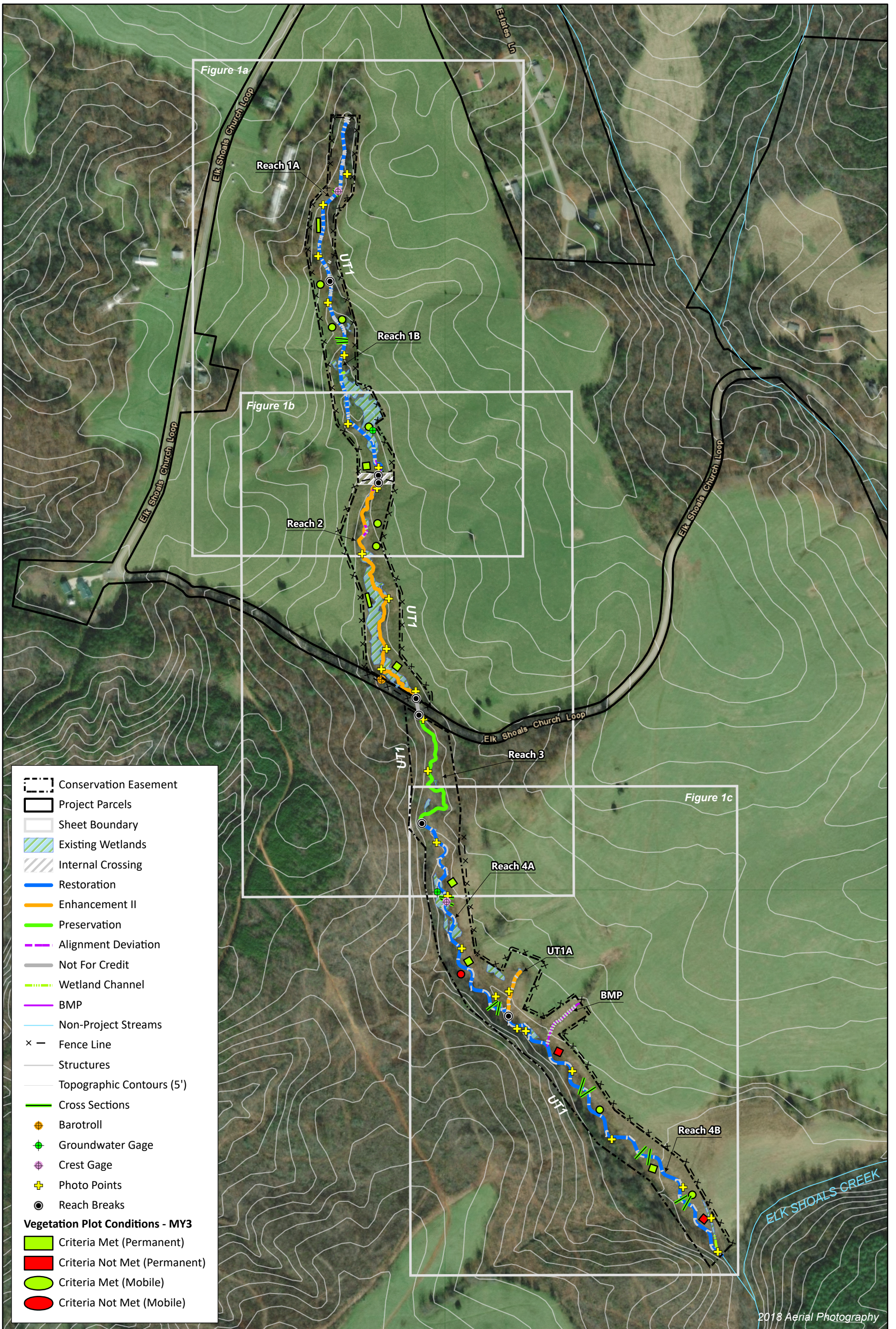
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FIGURES



- Conservation Easement
- Project Parcels
- Sheet Boundary
- Existing Wetlands
- Internal Crossing
- Restoration
- Enhancement II
- Preservation
- Alignment Deviation
- Not For Credit
- Wetland Channel
- BMP
- Non-Project Streams
- Fence Line
- Structures
- Topographic Contours (5')
- Cross Sections
- Barotroll
- Groundwater Gage
- Crest Gage
- Photo Points
- Reach Breaks
- Vegetation Plot Conditions - MY3**
- Criteria Met (Permanent)
- Criteria Not Met (Permanent)
- Criteria Met (Mobile)
- Criteria Not Met (Mobile)

Figure 1. Current Condition Plan View (Key)
 Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 3 - 2022
 Alexander County, NC

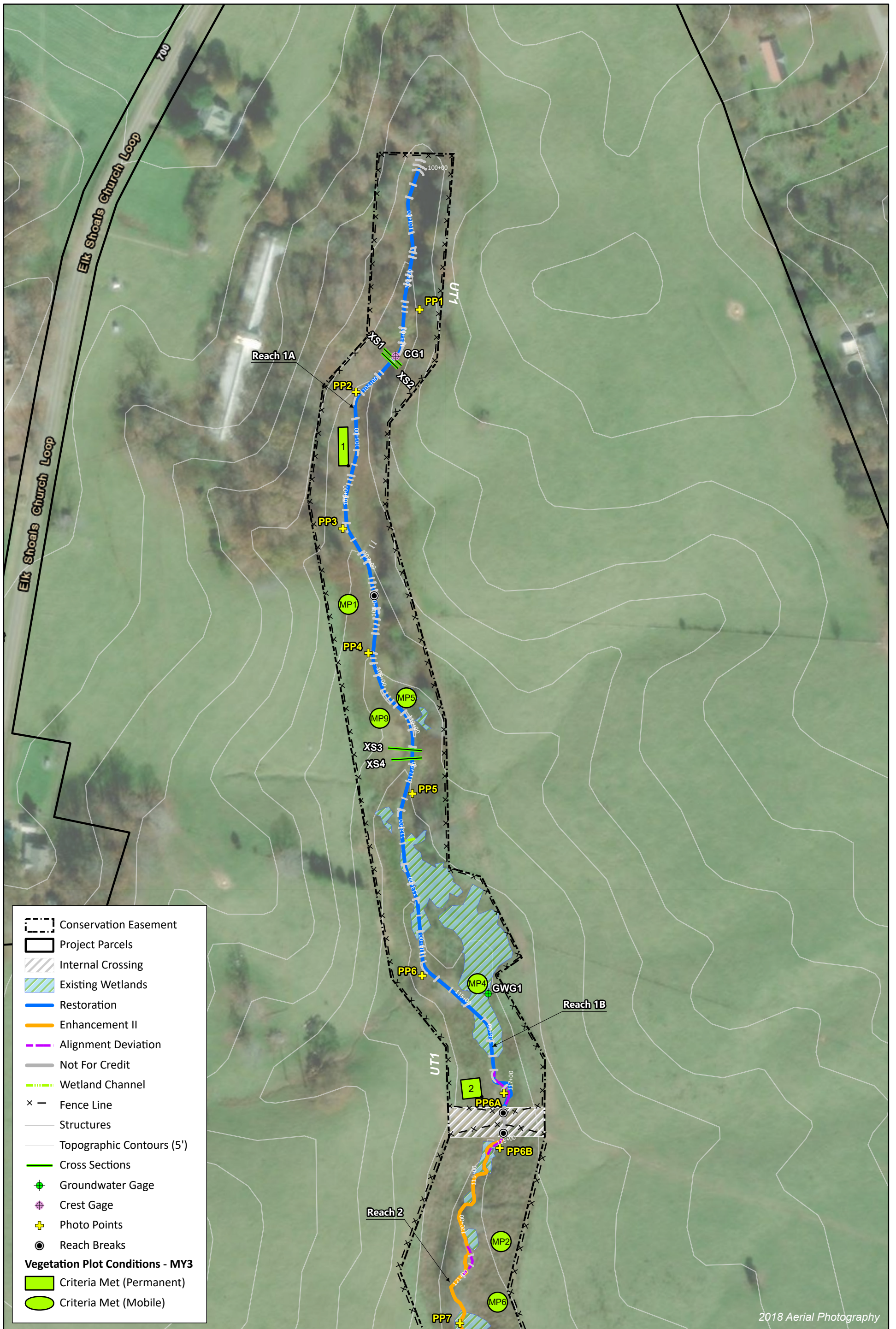


Figure 1a. Current Condition Plan View
 Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 3 - 2022
 Alexander County, NC

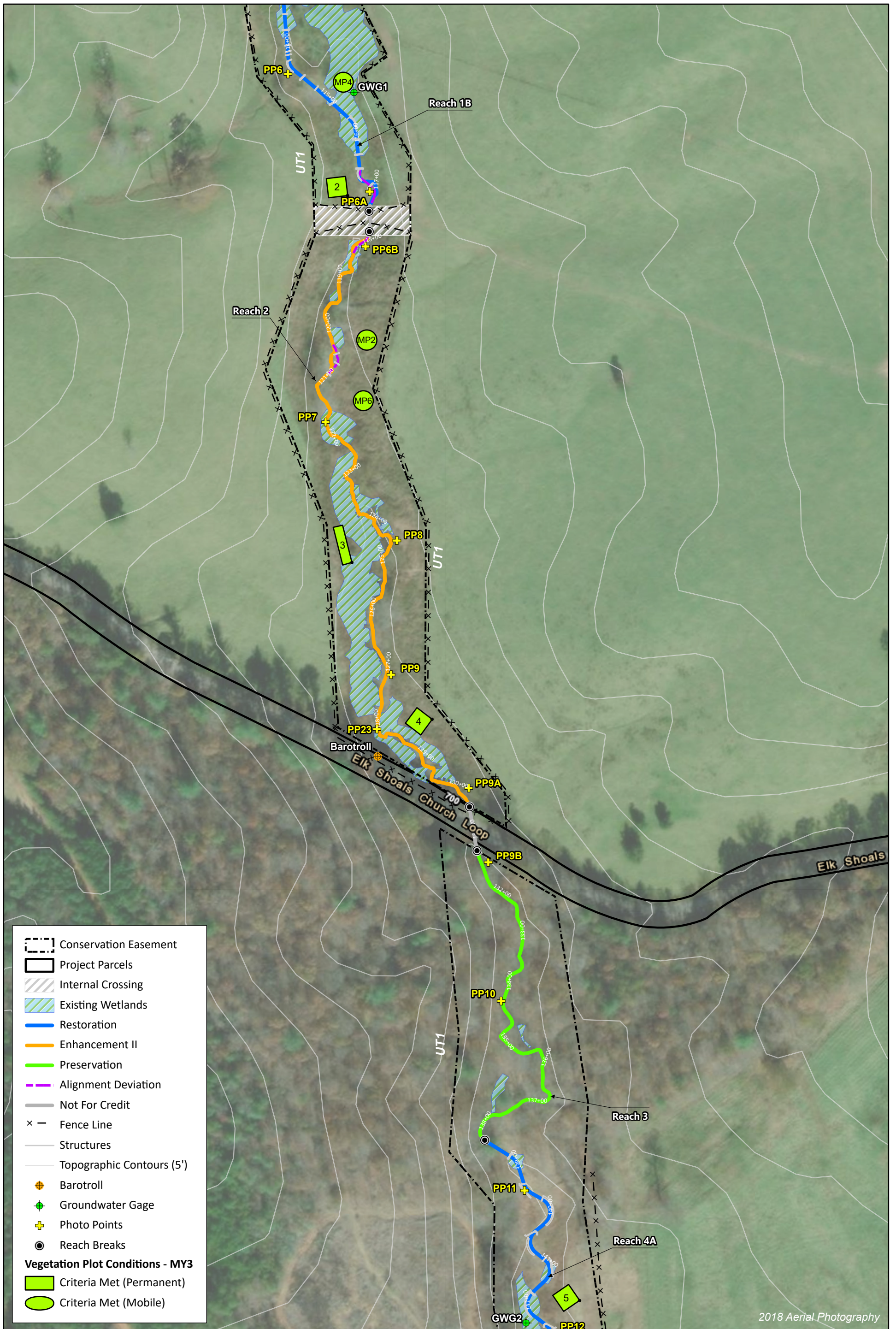


Figure 1b. Current Condition Plan View
 Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 3 - 2022
 Alexander County, NC

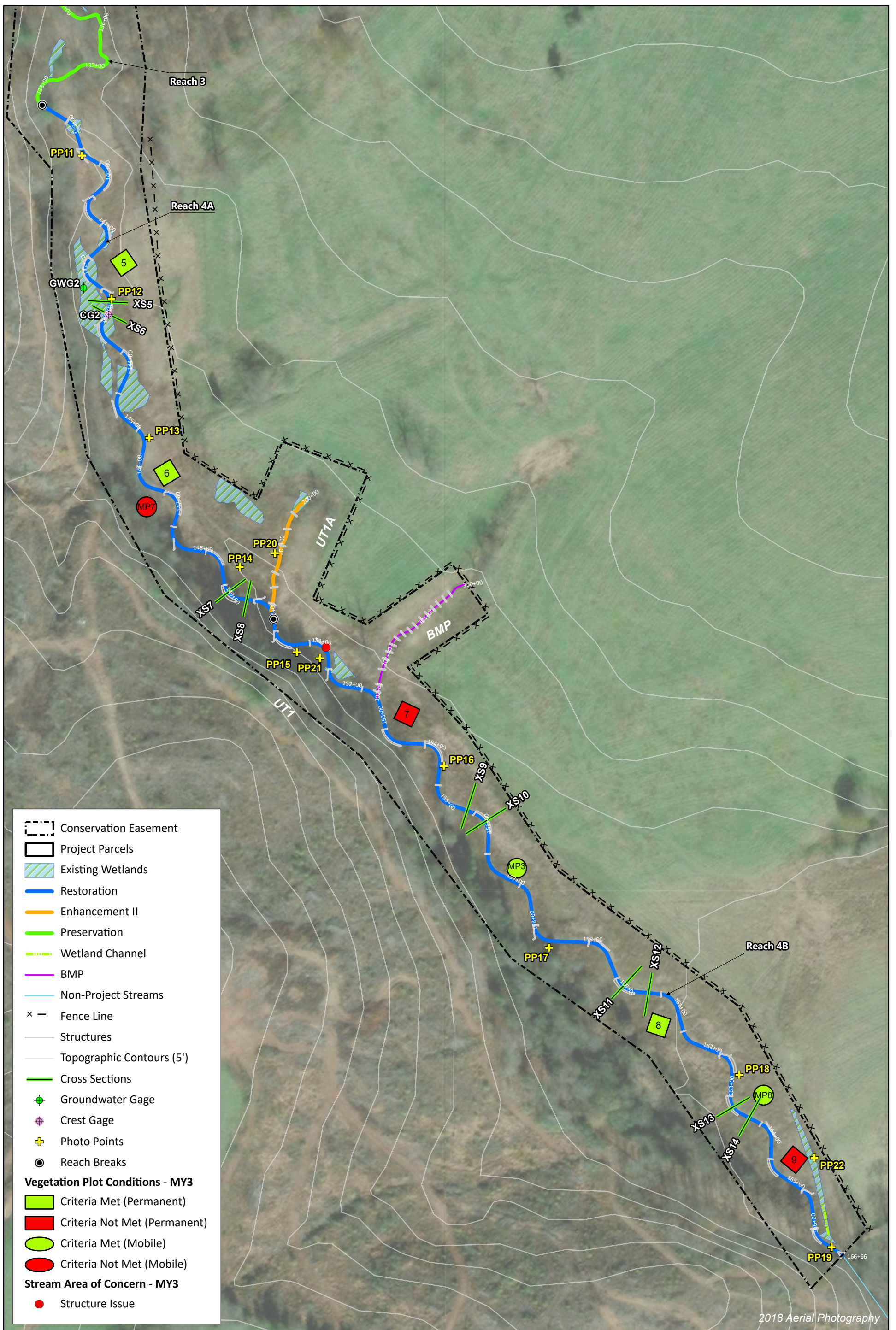


Figure 1c. Current Condition Plan View
 Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 3 - 2022
 Alexander County, NC

APPENDIX A. Visual Assessment Data

Table 4a. Visual Stream Morphology Stability Assessment Table

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Date of visual assessment: November 10, 2022

Reach: UT1 Reach 1A

Assessed Length: 770

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	37	37			100%			
	3. Pool Condition ¹	Depth Sufficient	37	37			100%			
		Length Appropriate	37	37			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	6	6			100%			
Thalweg centering at downstream of meander bend (Glide)		6	6	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion					0	0	100%	0
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	47	47			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	39	39			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	39	39			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	47	47			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	47	47			100%			

¹Pool condition includes both types of pools: step pools and meander pools

Table 4b. Visual Stream Morphology Stability Assessment Table

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Date of visual assessment: September 20, 2022

Reach: UT1 Reach 1B

Assessed Length: 957

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	43	43			100%			
	3. Pool Condition ¹	Depth Sufficient	40	40			100%			
		Length Appropriate	40	40			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	6	6			100%			
Thalweg centering at downstream of meander bend (Glide)		6	6	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	52	52			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	42	42			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	42	42			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	52	52			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	52	52			100%			

¹Pool condition includes both types of pools: step pools and meander pools

Table 4c. Visual Stream Morphology Stability Assessment Table

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Date of visual assessment: September 20, 2022

Reach: UT1 Reach 4A

Assessed Length: 1,172

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	17	17			100%			
	3. Meander Pool Condition	Depth Sufficient	17	17			100%			
		Length Appropriate	17	17			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	16	16			100%			
Thalweg centering at downstream of meander bend (Glide)		16	16	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	30	30			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	18	18			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	18	18			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	30	30			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	30	30			100%			

Table 4d. Visual Stream Morphology Stability Assessment Table

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Date of visual assessment: September 20, 2022

Reach: UT1 Reach 4B

Assessed Length: 1,666

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	22	22			100%			
	3. Meander Pool Condition	Depth Sufficient	21	21			100%			
		Length Appropriate	21	21			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	21	21			100%			
Thalweg centering at downstream of meander bend (Glide)		21	21	100%						
Totals										
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals										
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	33	34			97%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	22	22			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	22	22			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	34	34			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	34	34			100%			

Table 5. Vegetation Condition Assessment Table

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Date of visual assessment: September 20, 2022

Planted Acreage **17.5**

Vegetation Category	Definitions	Mapping Threshold (acres)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	0	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 5, or 7 stem count criteria.	0.1	0	0.00	0.0%
Total			0	0.0	0.0%
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.1	0	0.0	0.0%
Cumulative Total			0	0.0	0.0%

Easement Acreage **21.7**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000	0	0.00	0.0%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	0	0.00	0.0%

Stream Photographs
Monitoring Year 3



PP1 – view upstream—UT1 Reach 1A (04/05/2022)



PP1 – view downstream—UT1 Reach 1A (04/05/2022)



PP2 – view upstream—UT1 Reach 1A (04/05/2022)



PP2 – view downstream—UT1 Reach 1A (04/05/2022)



PP3 – view upstream—UT1 Reach 1A (04/05/2022)



PP3 – view downstream—UT1 Reach 1A (04/05/2022)



PP4 – view upstream- UT1 Reach 1B (04/05/2022)



PP4 – view downstream— UT1 Reach 1B (04/05/2022)



PP5 – view upstream- UT1 Reach 1B (04/05/2022)



PP5 – view downstream—UT1 Reach 1B (04/05/2022)



PP6- view upstream—UT1 Reach 1B (04/05/2022)



PP6 – view downstream—UT1 Reach 1B (04/05/2022)



PP6A- view upstream—UT1 Reach 1B (04/05/2022)



PP6A – view downstream—UT1 Reach 1B (04/05/2022)



PP6B- view upstream—UT1 Reach 2 (04/05/2022)



PP6B – view downstream—UT1 Reach 2 (04/05/2022)



PP7 – view upstream—UT1 Reach 2 (04/05/2022)



PP7 – view downstream-UT1 Reach 2 (04/05/2022)



PP8 – view upstream—UT1 Reach 2 (04/05/2022)



PP8 – view downstream—UT1 Reach 2 (04/05/2022)



PP9 – view upstream—UT1 Reach 2 (04/05/2022)



PP9 – view downstream—UT1 Reach 2 (04/05/2022)



PP9A – view upstream—UT1 Reach 2 (04/05/2022)



PP9A – view downstream—UT1 Reach 2 (04/05/2022)



PP9B – view upstream—UT1 Reach 3 (04/05/2022)



PP9B – view downstream—UT1 Reach 3 (04/05/2022)



PP10 – view upstream—UT1 Reach 3 (04/05/2022)



PP10 – view downstream—UT1 Reach 3 (04/05/2022)



PP11 – view upstream—UT1 Reach 4A (04/05/2022)



PP11 – view downstream—UT1 Reach 4A (04/05/2022)



PP12 – view upstream— UT1 Reach 4A (04/05/2022)



PP12 – view downstream—UT1 Reach 4A (04/05/2022)



PP13 – view upstream—UT1 Reach 4A (04/05/2022)



PP13 – view downstream— UT1 Reach 4A (04/05/2022)



PP14 – view upstream— UT1 Reach 4A (04/05/2022)



PP14 – view downstream— UT1 Reach 4A (04/05/2022)



PP15 – view upstream— UT1 Reach 4B (04/05/2022)



PP15 – view downstream— UT1 Reach 4B (04/05/2022)



PP16 – view upstream— UT1 Reach 4B (04/05/2022)



PP16 – view downstream— UT1 Reach 4B (04/05/2022)



PP17 – view upstream— UT1 Reach 4B (04/05/2022)



PP17 – view downstream— UT1 Reach 4B (04/05/2022)



PP18 – view upstream— UT1 Reach 4B (04/05/2022)



PP18 – view downstream— UT1 Reach 4B (04/05/2022)



PP19 – view upstream— UT1 Reach 4B (04/05/2022)



PP19 – view downstream— UT1 Reach 4B (04/05/2022)



PP20 – view upstream— UT1A (04/05/2022)



PP20 – view downstream— UT1A (04/05/2022)



PP21 – view upstream— UT1 Reach 4B (09/20/2022)



PP22 – view NW – Linear Wetland (08/15/2022)



PP22 – view SE – Linear Wetland (08/15/2022)



PP23 – view upstream— UT1 Reach 2 (11/10/2022)



PP23 – view downstream— UT1 Reach 2 (11/10/2022)

Vegetation Plot Photographs
Monitoring Year 3



Permanent Vegetation Plot 1 (8/15/2022)



Permanent Vegetation Plot 2 (8/15/2022)



Permanent Vegetation Plot 3 (8/15/2022)



Permanent Vegetation Plot 4 (8/15/2022)



Permanent Vegetation Plot 5 (8/15/2022)



Permanent Vegetation Plot 6 (8/15/2022)



Permanent Vegetation Plot 7 (8/15/2022)



Permanent Vegetation Plot 8 (8/15/2022)



Permanent Vegetation Plot 9 (8/15/2022)



Mobile Vegetation Plot 1 (8/15/2022)



Mobile Vegetation Plot 2 (8/15/2022)



Mobile Vegetation Plot 3 (8/15/2022)



Mobile Vegetation Plot 4 (8/15/2022)



Mobile Vegetation Plot 5 (8/15/2022)



Mobile Vegetation Plot 6 (8/15/2022)



Mobile Vegetation Plot 7 (8/15/2022)



Mobile Vegetation Plot 8 (8/15/22)

**Repaired MY2 Areas of Concern Photographs
Monitoring Year 3**



UT1 R4A (STA 139+00-139+75) – view downstream of aggradation area reported in MY2 (09/20/2022)



UT1 R4A (STA 139+00-139+75) – view downstream of channel after the sediment was flushed out of the system in MY3 (09/20/2022)



UT1 R1A Structure Piping (STA 104+00) – view upstream (09/20/2022)



UT1 R1A Structure Repaired (STA 104+00) – view upstream (11/10/2022)



UT1 R1A Structure Piping (STA 104+05) – view upstream (09/20/2022)



UT1 R1A Structure Repaired (STA 104+05) – view upstream (11/10/2022)

APPENDIX B. Vegetation Plot Data

Table 6. Vegetation Plot Criteria Attainment

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Permanent Vegetation Plot	MY3 Success Criteria Met (Y/N)	Tract Mean (MY3 - 2022)	
1	Y	78%	83%
2	Y		
3	Y		
4	Y		
5	Y		
6	Y		
7	N		
8	Y		
9	N		
Mobile Vegetation Plot	MY3 Success Criteria Met (Y/N)	89%	
1	Y		
2	Y		
3	Y		
4	Y		
5	Y		
6	Y		
7	N		
8	Y		
9	Y		

Table 7. CVS Permanent Vegetation Plot Metadata

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Report Prepared By	Freddy Ortega
Date Prepared	8/19/2022 9:15
Database Name	cvs-eep-entrytool-v2.5.0_AlexanderFarms_MY2.mdb
Database Location	\\192.168.3.7\projects\ActiveProjects\005-02169 Alexander Farm\Monitoring\Monitoring Year 3 (2022)\Vegetation Assessment
Computer Name	FREDDY
File Size	75628544
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes supplemental planting from 2021.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes supplemental planting from 2021, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY-----	
Project Code	100048
Project Name	Alexander Farm Mitigation Site
Description	The Alexander Farm Mitigation Site (Site) is in Alexander County approximately 6 miles west of Statesville and 15 miles northeast of Hickory.
Sampled Plots	18

Table 8a. Planted and Total Stem Counts
 Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 3 - 2022

Current Permanent Vegetation Plot Data (MY3 2022)																					
Scientific Name	Common Name	Species Type	Permanent Plot 1			Permanent Plot 2			Permanent Plot 3			Permanent Plot 4			Permanent Plot 5			Permanent Plot 6			
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	
<i>Acer negundo</i>	Box elder	Tree	3	3	3																
<i>Acer rubrum</i>	Red maple	Tree						4			15								13		
<i>Alnus serrulata</i> ⁵	Smooth alder	Tree																			
<i>Betula nigra</i>	River birch	Tree	1	1	1					5	5	5	3	3	3	1	1	1	4	4	4
<i>Carpinus caroliniana</i> ²	American hornbeam	Shrub Tree																			
<i>Cornus amomum</i> ⁴	Silky Dogwood	Tree																			
<i>Diospyros virginiana</i>	Persimmon	Tree							1	1	1			1	1	1	3	2	2	2	
<i>Gleditsia triacanthos</i>	Honey locust	Tree																			
<i>Juglans nigra</i>	Black Walnut	Tree																			
<i>Platanus occidentalis</i>	Sycamore	Tree	1	1	2	2	2	2	1	1	1			1	5	5	9			1	
<i>Populus deltoides</i>	Cottonwood	Tree																		2	
<i>Quercus sp. (unknown)</i>	Oak species (unknown)	Tree																			
<i>Quercus alba</i> ¹	White oak	Tree											1	1	1						
<i>Quercus pagoda</i>	Cherrybark oak	Tree	4	4	4	6	6	6	3	3	6	1	1	1	2	2	2	1	1	1	
<i>Quercus phellos</i>	Willow oak	Tree			1	1	1	1	2	2	2	3	3	3							
<i>Quercus rubra</i>	Northern Red oak	Tree			1	1	1	1	1	1	1										
<i>Robinia pseudoacacia</i>	Black Locust	Tree																			
<i>Salix nigra</i> ³	Black willow	Tree																			
<i>Salix sericea</i>	Silky Willow	Shrub Tree																			
<i>Ulmus alata</i>	Winged elm	Tree																			
<i>Ulmus americana</i> ²	American Elm	Tree																	1	1	1
		Stem count	9	9	11	10	10	14	13	13	31	8	8	10	14	14	28	8	8	24	
		size (ares)		1			1			1			1				1				
		size (ACRES)		0.0247			0.0247			0.0247			0.0247				0.0247				
		Species count	4	4	5	4	4	5	6	6	7	4	4	6	5	5	5	4	4	7	
		Stems per ACRE	364	364	445	405	405	567	526	526	1255	324	324	405	567	567	1133	324	324	971	

Current Permanent Vegetation Plot Data (MY3 2022)												Annual Mean											
Scientific Name	Common Name	Species Type	Permanent Plot 7			Permanent Plot 8			Permanent Plot 9			MY3 (2022)			MY2 (2021)			MY1 (2020)			MY0 (2020)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer negundo</i>	Box elder	Tree	1	1	1	2	2	2				11	11	19	11	11	12	6	6	7	15	15	15
<i>Acer rubrum</i>	Red maple	Tree												32			37						
<i>Alnus serrulata</i> ⁵	Smooth alder	Tree							1	1				1									
<i>Betula nigra</i>	River birch	Tree	2	2	2	3	3	3	1	1		19	20	20	20	20	20	15	15	15	17	17	17
<i>Carpinus caroliniana</i> ²	American hornbeam	Shrub Tree													1	1	1						
<i>Cornus amomum</i> ⁴	Silky Dogwood	Tree		3	3								3	3									
<i>Diospyros virginiana</i>	Persimmon	Tree										4	4	7	5	5	7						1
<i>Gleditsia triacanthos</i>	Honey locust	Tree																					1
<i>Juglans nigra</i>	Black Walnut	Tree																					
<i>Platanus occidentalis</i>	Sycamore	Tree							3	3	3	12	12	19	12	12	16	8	8	10	9	9	9
<i>Populus deltoides</i>	Cottonwood	Tree												2									
<i>Quercus sp. (unknown)</i>	Oak species (unknown)	Tree																			7	7	7
<i>Quercus alba</i> ¹	White oak	Tree										1	1	1	1	1	3	3	3				
<i>Quercus pagoda</i>	Cherrybark oak	Tree				1	1	1	1	3	3	19	21	24	18	18	22	22	22	33	33	33	
<i>Quercus phellos</i>	Willow oak	Tree				5	5	5	2	3	3	13	14	15	13	13	17	17	17	28	28	28	
<i>Quercus rubra</i>	Northern Red oak	Tree										2	2	2	2	2	2	2	2	2	2	2	
<i>Robinia pseudoacacia</i>	Black Locust	Tree																					
<i>Salix nigra</i>	Black willow	Tree	3	8	8				1	3	8	9											20
<i>Salix sericea</i>	Silky Willow	Shrub Tree																					10
<i>Ulmus alata</i>	Winged elm	Tree																					1
<i>Ulmus americana</i> ²	American Elm	Tree		2	2				1	1	1	2	4	4									
		Stem count	6	16	16	11	11	11	7	12	13	86	101	158	83	83	141	73	73	134	111	111	111
		size (ares)		1			1			1			9				9						
		size (ACRES)		0.0247			0.0247			0.0247			0.2224				0.2224						
		Species count	3	5	5	4	4	4	4	6	7	10	12	14	9	9	15	7	7	12	7	7	7
		Stems per ACRE	243	647	647	445	445	445	283	486	526	387	454	710	373	373	634	328	328	603	499	499	499

¹ Prior to leaf out in MY0, the species were identified as *Quercus sp.* (unknown).
² *Ulmus americana* was incorrectly identified as *Carpinus caroliniana* in MY2.
³ *Salix nigra* was added to the list due to supplemental planting in MY2.
⁴ *Cornus amomum* was added to the list due to supplemental planting in MY2.
⁵ *Alnus serrulata* was added to the list due to supplemental planting in MY2.

Color for Density
 Exceeds requirements by 10%
 Exceeds requirements, but by less than 10%
 Fails to meet requirements, by less than 10%
 Fails to meet requirements by more than 10%
 Volunteer species included in total

PnoLS: Number of planted stems excluding live stakes and the planted stems over the 50% rule
 P-all: Number of planted stems including live stakes and the planted stems over the 50% rule
 T: Total stems (All planted stems, live stakes, and volunteers)

Table 8b. Planted and Total Stem Counts

Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 3 - 2022

Current Mobile Vegetation Plot (MP) Data (MY3 2022)												Annual Mean			
Scientific Name	Common Name	Species Type	MP1	MP2	MP3	MP4	MP5	MP6	MP7	MP8	MP9	MY3 (2022)	MY2 (2021)	MY1 (2020)	MY0 (2020)
			T	T	T	T	T	T	T	T	T	T	T	T	T
<i>Acer negundo</i>	Box elder	Tree	1	1				1				5	11	2	6
<i>Acer rubrum</i>	Red maple	Tree											3		
<i>Acer saccharinum</i>	Silver maple	Tree						1			2	3			
<i>Alnus serrulata</i> ⁵	Smooth alder	Tree											7		
<i>Betula nigra</i>	River birch	Tree	1	4	3	3	4	2	2	4	1	24	23	4	12
<i>Carpinus caroliniana</i>	American hornbeam	Shrub Tree											1		
<i>Cornus amomum</i> ²	Silky Dogwood	Tree			1							1			
<i>Diospyros virginiana</i>	Persimmon	Tree		1		1						2	9		
<i>Ilex opaca</i>	American Holly	Tree											3		
<i>Juniperus virginiana</i>	Eastern red cedar	Tree											3		
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree	2									2			
<i>Platanus occidentalis</i>	Sycamore	Tree	4	1	1	1	2	6	2	4	3	24	15	3	4
<i>Populus deltoides</i>	Eastern Cottonwood	Tree			1							1	1		
<i>Quercus sp. (unknown)</i> ¹	Oak species (unknown)	Tree													4
<i>Quercus alba</i> ¹	White oak	Tree				1	1					2	1		
<i>Quercus pagoda</i>	Cherrybark oak	Tree	1	2	2	3	1	1		1	3	14	6	7	8
<i>Quercus phellos</i>	Willow oak	Tree		1			1	1			1	4	1	1	3
<i>Quercus rubra</i>	Northern Red oak	Tree											11		2
<i>Salix nigra</i> ⁴	Black Willow	Tree			1				1		2	4			
<i>Ulmus americana</i> ³	American Elm	Tree		1		1						2			
Stem count			9	11	9	10	9	12	5	11	12	88	79	17	39
size (ares)			1	1	1	1	1	1	1	1	1	9	8	3	3
size (ACRES)			0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.1977	0.1977	0.0741	0.0741
Species count			5	7	6	6	5	6	3	4	6	13	14	5	7
Stems per ACRE			364	445	364	405	364	486	202	445	486	445	400	229	526

Overall Site Annual Mean						
Scientific Name	Common Name	Species Type	MY3 (2022)	MY2 (2021)	MY1 (2020)	MY0 (2020)
			PnoLS	PnoLS	PnoLS	PnoLS
<i>Acer negundo</i>	Box elder	Tree	16	22	8	21
<i>Acer saccharinum</i>	Silver maple	Tree	3			
<i>Alnus serrulata</i> ⁵	Smooth alder	Tree				
<i>Betula nigra</i>	River birch	Tree	43	43	19	29
<i>Carpinus caroliniana</i>	American hornbeam	Shrub Tree		2		
<i>Cornus amomum</i> ²	Silky Dogwood	Tree	1			
<i>Diospyros virginiana</i>	Persimmon	Tree	6	14		
<i>Ilex opaca</i>	American Holly	Tree				
<i>Juniperus virginiana</i>	Eastern red cedar	Tree		3		
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree	2			
<i>Platanus occidentalis</i>	Sycamore	Tree	36	27	11	13
<i>Populus deltoides</i>	Eastern Cottonwood	Tree	1	1		
<i>Quercus sp. (unknown)</i> ¹	Oak species (unknown)	Tree				11
<i>Quercus alba</i> ¹	White oak	Tree	3	2	3	
<i>Quercus pagoda</i>	Cherrybark oak	Tree	33	24	29	41
<i>Quercus phellos</i>	Willow oak	Tree	17	14	18	31
<i>Quercus rubra</i>	Northern Red oak	Tree	2	13	2	4
<i>Salix nigra</i> ⁴	Black Willow	Tree	7			
<i>Ulmus americana</i> ³	American Elm	Tree	4			
Stem count			174	165	90	150
size (ares)			18	17	12	12
size (ACRES)			0.4448	0.4201	0.2965	0.2965
Species count			14	11	7	7
Stems per ACRE			391	393	304	506

¹ Prior to leaf out in MY0, the species were identified as *Quercus sp.* (unknown).
² *Cornus amomum* was added to the list due to supplemental planting in MY2.
³ *Ulmus americana* was added to the list due to supplemental planting in MY2.
⁴ *Salix nigra* was added to the list due to supplemental planting in MY2.
⁵ *Alnus serrulata* was added to the list due to supplemental planting in MY2.

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of planted stems excluding live stakes and the planted stems over the 50% rule
 T: Total stems

APPENDIX C. Stream Geomorphology Data

Table 9. Baseline Stream Data Summary

Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 3 - 2022

Parameter	Gage	Pre-Restoration Condition								Design								As-Built/Baseline									
		UT1 R1A		UT1 R1B		UT1 R4A		UT1 R4B		UT1 R1A		UT1 R1B		UT1 R4A		UT1 R4B		UT1 R1A		UT1 R1B		UT1 R4A		UT1 R4B			
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Dimension and Substrate - Riffle																											
Bankfull Width (ft)	N/A	5.8	7.2	5.8	7.2	6.0	9.1	8.2	8.6	6.5	8.0	11.5	12.0	6.6	7.9	11.6	12.9	11.4	12.5								
Floodprone Width (ft)		7	9	7	9	24	54	8	10	9	14	11	18	25	58	26	60	23	25	64	68	75	83				
Bankfull Mean Depth (ft)		0.6	0.7	0.6	0.7	1.0	1.4	1.2		0.5		0.5		0.9		0.9		0.4	0.7	0.8	1.0	1.0	1.1				
Bankfull Max Depth (ft)		0.8	0.9	0.8	0.9	1.9	2.0	2.0	2.1	0.6	0.7	0.6	0.8	1.1	1.3	1.1	1.4	0.9	0.9	1.3	1.4	1.3	1.6				
Bankfull Cross-sectional Area (ft ²) ¹		4.0	4.4	4.0	4.4	8.6	8.8	10.1	10.3	3.0		4.3		10.1		11.3		2.7	5.5	10.6	12.0	11.9	12.6				
Width/Depth Ratio		8.5	12.0	8.5	12.0	8.0	14.1	6.6	7.2	14.0		15.0		13.0		13.0		16.3	11.4	11.3	15.8	10.3	13.1				
Entrenchment Ratio ³		1.2		1.2		3.0	9.1	1.0	1.1	1.4	2.2	1.4	2.2	2.2	5.0	2.2	5.0	3.5	3.2	5.3	5.5	6.0	6.6				
Bank Height Ratio		5.9	6.4	5.9	6.4	1.0	2.1	2.0	2.1	1.0	1.1	1.0	1.1	1.0	1.1	1.0	1.1	1.0	1.0	1.0		1.0					
D ₅₀ (mm)		13.6	22.6	13.6	22.6	17.7	22.6	17.7	22.6	---		---		---		---		49.6	65.3	59.4	71.0	55.6	69.1				
Profile																											
Riffle Length (ft)	N/A	---		---		---		---		0.009	0.052	0.018	0.049	0.002	0.024	0.002	0.026	0.006	0.052	0.002	0.063	0.001	0.037	0.004	0.021		
Riffle Slope (ft/ft)		---		---		---		---		---		---		---		---		---		---		---		---			
Pool Length (ft)		---		---		---		---		---		---		---		---		---		---		---		---			
Pool Max Depth (ft)		1.0	1.0	2.1		N/A		0.9	1.4	1.1	1.6	1.8	2.6	1.9	2.8	0.9	2.1	1.2	2.4	1.9	2.8	1.8	3.9				
Pool Spacing (ft)		8	24	8	24	11	19	N/A		7.0	33.0	8.0	40.0	26.0	81.0	28.0	84.0	7.8	49.9	7.8	49.7	28.0	97.5	47.2	115.3		
Pool Volume (ft ³)		---		---		---		---		---		---		---		---		---		---		---		---			
Pattern																											
Channel Beltwidth (ft)	N/A	N/A		N/A		9.0	99.0	9.0	99.0	N/A		N/A		23.0	92.0	24.0	96.0	N/A		N/A		23.0	92.0	24.0	96.0		
Radius of Curvature (ft)		N/A		N/A		27.0	65.0	27.0	65.0	N/A		N/A		23.0	35.0	24.0	36.0	N/A		N/A		23.0	35.0	24.0	36.0		
Rc/Bankfull Width		N/A		N/A		4.5	7.1	3.3	7.6	N/A		N/A		2.0	3.0	2.0	3.0	N/A		N/A		2.0	3.0	2.0	3.0		
Meander Length (ft)		N/A		N/A		58.0	201.0	58.0	201.0	N/A		N/A		58.0	161.0	60.0	168.0	N/A		N/A		58.0	161.0	60.0	168.0		
Meander Width Ratio		N/A		N/A		1.5	10.9	1.1	11.5	N/A		N/A		2.0	8.0	2.0	8.0	N/A		N/A		2.0	8.0	2.0	8.0		
Substrate, Bed and Transport Parameters																											
Ri%/Ru%/P%/G%/S%	N/A	---		---		---		---		---		---		---		---		---		---		---		---			
SC%/Sa%/G%/C%/B%/Be%		---		---		---		---		---		---		---		---		---		---		---		---			
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /dip/disp		0.4/0.7/1.3/23.6/42.0/90.0		0.3/0.5/0.9/33.7/45.0/90.0		---		---		---		---		---		0.2/0.8/7.7/102.0/156.8/256.0		SC/0.2/2.0/86.5/128.0/512.0		SC/0.3/1.7/76.7/128.0/256.0		SC/SC/0.7/75.9/128.0/256.0					
Reach Shear Stress (Competency) lb/ft ²		---		---		---		---		---		---		---		---		---		---		---		---			
Max part size (mm) mobilized at bankfull		---		---		---		---		---		---		---		---		---		---		---		---			
Stream Power (Capacity) W/m ²		---		---		---		---		---		---		---		---		---		---		---		---			
Additional Reach Parameters																											
Drainage Area (SM)	N/A	0.05		0.11		0.29		0.40		0.05		0.11		0.29		0.40		0.05		0.11		0.29		0.40			
Watershed Impervious Cover Estimate (%)		1%		1%		1%		1%		1%		1%		1%		1%		1%		1%		1%		1%			
Rosgen Classification		B4		B4		C4c		G4c		B4		B4		C4		C4		B4		B4		C4		C4			
Bankfull Velocity (fps)		5.5	5.8	5.5	5.8	3.4	3.8	3.9	4.0	4.1	4.5	3.50	3.9	---		---		---		---		---		---			
Bankfull Discharge (cfs)		---		23.0		31.0	54.6	40.1		12	20	32	40	---		---		---		---		---		---			
Q-NFF regression (2-yr)		---		---		---		---		---		---		---		---		---		---		---		---		---	
Q-USGS extrapolation (1.2-yr)		---		---		---		---		---		---		---		---		---		---		---		---		---	
Max Q-Mannings		---		---		---		---		---		---		---		---		---		---		---		---		---	
Valley Slope (ft/ft)		0.0370		0.0370		0.0130		0.0130		0.0370		0.0370		0.0130		0.0130		0.0370		0.0370		0.0130		0.0130			
Channel Thalweg Length (ft)		1,901		1,901		2,825		2,825		770	969	1,172	1,666	770	957	1,172	1,666	770	957	1,172	1,666	770	957	1,172	1,666		
Sinuosity	1.14		1.14		1.13		1.13		1.03	1.03	1.11	1.11	1.02	0.96	1.23	1.15	1.02	0.96	1.23	1.15	1.02	0.96	1.23	1.15			
Bankfull/Channel Slope (ft/ft)	0.0340		0.0340		0.0080		0.0080		0.0362	0.0362	0.0093	0.0093	0.0370	0.0375	0.0088	0.0085	0.0370	0.0375	0.0088	0.0085	0.0370	0.0375	0.0088	0.0085			

1. Pattern data is not applicable for A-type and B-type channels

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

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 10. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Dimension and Substrate	UT1 R1A Cross-Section 1 (Riffle)								UT1 R1A Cross-Section 2 (Pool)								UT1 R1B Cross-Section 3 (Pool)								UT1 R1B Cross-Section 4 (Riffle)							
	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation ¹	976.6	976.6	976.6	976.6					976.2	976.3	976.3	976.2					945.7	945.5	945.5	945.5					945.3	945.6	945.6	945.6				
Low Bank Elevation	976.6	976.6	976.6	976.6					976.2	976.3	976.3	976.2					945.7	945.5	945.5	945.5					945.3	945.2	945.3	945.6				
Bankfull Width (ft)	6.6	6.6	5.6	6.7					7.0	8.0	7.8	7.5					8.3	7.1	7.7	6.7					7.9	6.4	6.3	9.2				
Floodprone Width (ft) ²	23.3	21.5	22.2	19.9					-	-	-	-					-	-	-	-					25.2	18.8	21.3	25.5				
Bankfull Mean Depth (ft)	0.4	0.4	0.5	0.4					1.2	1.1	1.0	0.9					1.4	1.2	1.0	0.9					0.7	0.4	0.5	0.6				
Bankfull Max Depth (ft)	0.9	0.9	0.9	0.8					1.9	2.0	1.9	1.5					2.1	1.9	1.7	1.7					0.9	0.8	0.8	1.1				
Bankfull Cross-Sectional Area (ft ²)	2.7	2.8	2.7	2.5					8.2	8.5	8.1	6.8					11.7	8.4	7.7	6.2					5.5	2.8	3.0	5.4				
Bankfull Width/Depth Ratio	16.3	15.6	11.9	17.5					6.0	7.6	7.5	8.4					5.9	6.1	7.7	7.3					11.4	14.6	13.5	15.6				
Bankfull Entrenchment Ratio ³	3.5	3.2	3.9	3.0					-	-	-	-					-	-	-	-					3.2	2.9	3.4	2.8				
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0					-	-	-	-					-	-	-	-					1.0	0.7	0.7	1.0				
Dimension and Substrate	UT1 R4A Cross-Section 5 (Pool)								UT1 R4A Cross-Section 6 (Riffle)								UT1 R4A Cross-Section 7 (Pool)								UT1 R4A Cross-Section 8 (Riffle)							
	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation ¹	891.5	891.6	891.7	891.7					891.8	892.0	892.0	892.0					885.5	885.6	885.4	885.4					885.1	885.4	885.4	885.4				
Low Bank Elevation	891.5	891.6	891.7	891.7					891.8	891.9	891.9	891.9					885.5	885.6	885.4	885.4					885.1	885.4	885.4	885.4				
Bankfull Width (ft)	8.9	7.8	8.1	8.6					12.9	13.5	13.0	13.2					16.2	16.2	13.5	12.1					11.6	12.7	14.1	12.9				
Floodprone Width (ft) ²	-	-	-	-					68.0	66.5	66.3	66.4					-	-	-	-					64.2	62.6	62.6	62.6				
Bankfull Mean Depth (ft)	1.4	1.1	1.1	1.1					0.8	0.6	0.7	0.7					1.0	0.9	0.8	0.9					1.0	0.9	0.9	1.0				
Bankfull Max Depth (ft)	2.1	2.0	2.0	1.9					1.3	1.2	1.4	1.4					2.3	2.3	2.2	2.1					1.4	1.5	1.6	1.6				
Bankfull Cross-Sectional Area (ft ²)	12.9	8.6	8.9	9.5					10.6	8.4	9.4	9.4					15.7	14.2	10.8	11.1					12.0	11.6	12.3	12.4				
Bankfull Width/Depth Ratio	6.2	7.1	7.4	7.9					15.8	21.5	18.1	18.7					16.7	18.5	16.8	13.1					11.3	13.9	16.3	13.5				
Bankfull Entrenchment Ratio ³	-	-	-	-					5.3	4.9	5.1	5.0					-	-	-	-					5.5	4.9	4.4	4.8				
Bankfull Bank Height Ratio	-	-	-	-					1.0	0.9	0.9	0.9					-	-	-	-					1.0	1.0	1.0	1.0				
Dimension and Substrate	UT1 R4B Cross Section 9 (Riffle)								UT1 R4B Cross Section 10 (Pool)								UT1 R4B Cross-Section 11 (Pool)								UT1 R4B Cross-Section 12 (Riffle)							
	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation ¹	879.8	880.2	880.1	880.1					879.5	879.7	879.9	880.0					875.5	875.4	875.4	875.4					875.1	875.4	875.3	875.3				
Low Bank Elevation	879.8	880.0	880.1	880.1					879.5	879.7	879.9	880.0					875.5	875.4	875.4	875.4					875.1	875.3	875.2	875.3				
Bankfull Width (ft)	12.5	12.8	14.9	14.4					13.3	15.0	18.3	18.9					13.2	10.9	11.4	10.6					12.5	12.3	12.8	12.5				
Floodprone Width (ft) ²	82.5	80.9	80.8	80.9					-	-	-	-					-	-	-	-					74.7	74.6	74.5	74.6				
Bankfull Mean Depth (ft)	1.0	0.7	0.8	0.8					2.5	1.8	1.5	1.5					1.6	1.6	1.5	1.7					1.0	0.8	0.9	0.9				
Bankfull Max Depth (ft)	1.3	1.3	1.4	1.5					3.7	3.5	3.7	3.6					3.0	2.7	2.8	2.9					1.6	1.5	1.5	1.6				
Bankfull Cross-Sectional Area (ft ²)	11.9	9.0	11.3	11.9					32.7	26.5	28.1	28.1					21.0	17.7	17.6	17.9					12.5	10.2	11.2	11.7				
Bankfull Width/Depth Ratio	13.1	18.2	19.6	17.3					5.4	8.5	12.0	12.7					8.3	6.8	7.4	6.2					12.5	14.8	14.6	13.3				
Bankfull Entrenchment Ratio ³	6.6	6.3	5.4	5.6					-	-	-	-					-	-	-	-					6.0	6.1	5.8	6.0				
Bankfull Bank Height Ratio	1.0	0.9	1.0	1.0					-	-	-	-					-	-	-	-					1.0	0.9	0.9	1.0				
Dimension and Substrate	UT1 R4B Cross Section 13 (Pool)								UT1 R4B Cross Section 14 (Riffle)																							
	Base ⁴	MY1 ⁴	MY2 ⁴	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7																
Bankfull Elevation ¹	873.5	873.7	873.7	873.7					873.2	873.6	873.4	873.4																				
Low Bank Elevation	873.5	873.7	873.7	873.7					873.2	873.5	873.2	873.4																				
Bankfull Width (ft)	17.5	16.8	19.7	18.0					11.4	12.6	11.2	13.2																				
Floodprone Width (ft) ²	-	-	-	-					75.2	74.0	73.7	73.9																				
Bankfull Mean Depth (ft)	1.3	1.1	1.1	1.1					1.1	0.9	0.9	0.9																				
Bankfull Max Depth (ft)	2.9	2.7	3.1	3.1					1.5	1.6	1.6	1.7																				
Bankfull Cross-Sectional Area (ft ²)	23.4	18.5	22.3	20.0					12.6	11.3	10.0	12.2																				
Bankfull Width/Depth Ratio	13.1	15.2	17.3	16.2					10.3	13.9	12.4	14.2																				
Bankfull Entrenchment Ratio ³	-	-	-	-					6.6	5.9	6.6	5.6																				
Bankfull Bank Height Ratio	-	-	-	-					1.0	1.0	0.9	1.0																				

¹MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

²Floodprone width is calculated from the width of cross-section but valley width may extend further.

³ER for the baseline/monitoring parameters is based on the width of the cross-section, in lieu of assuming the width across the floodplain.

⁴An error was made when processing cross-section 13's data on all parameters for Baseline, all parameters except mean and max depth for MY1, and all parameters except max depth for MY2. The correction was made in MY3, and the data listed has been revised to reflect that correction.

Table 11a. Monitoring Data - Stream Reach Data Summary

Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 3 - 2022

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle²																
Bankfull Width (ft)	6.6		6.6		5.6		6.7									
Floodprone Width (ft)	23		22		22		20									
Bankfull Mean Depth (ft)	0.4		0.4		0.5		0.4									
Bankfull Max Depth (ft)	0.9		0.9		0.9		0.8									
Bankfull Cross-sectional Area (ft ²)	2.7		2.8		2.7		2.5									
Width/Depth Ratio	16.3		15.6		11.9		17.5									
Entrenchment Ratio	3.5		3.2		3.9		3.0									
Bank Height Ratio	1.0		1.0		1.0		1.0									
D ₅₀ (mm)	49.6															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.006	0.052														
Pool Length (ft)																
Pool Max Depth (ft)	0.9	2.1														
Pool Spacing (ft)	7.8	49.9														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	N/A ¹															
Radius of Curvature (ft)	N/A ¹															
Rc/Bankfull Width (ft/ft)	N/A ¹															
Meander Length (ft)	N/A ¹															
Meander Width Ratio	N/A ¹															
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	0.2/0.8/7.7/102.0/156.8/256.0		0.2/0.9/19.6/77.0/119.7/256.0		1.5/10.3/16.8/103.6/151.8/180.0		---		---		---		---		---	
Reach Shear Stress (Competency) lb/ft ²	---															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m ²	---															
Additional Reach Parameters																
Drainage Area (SM)	0.05															
Watershed Impervious Cover Estimate (%)	1%															
Rosgen Classification	B4															
Bankfull Velocity (fps)	---															
Bankfull Discharge (cfs)	---															
Valley Slope (ft/ft)	0.0370															
Channel Thalweg Length (ft)	770															
Sinuosity	1.02															
Bankfull/Channel Slope (ft/ft)	0.0370															

¹Pattern data is not applicable for A-type and B-type channels

²MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 11b. Monitoring Data - Stream Reach Data Summary

Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 3 - 2022

UT1 R1B

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle¹																
Bankfull Width (ft)	7.9		6.4		6.3		9.2									
Floodprone Width (ft)	25		19		21		26									
Bankfull Mean Depth (ft)	0.7		0.4		0.5		0.6									
Bankfull Max Depth (ft)	0.9		0.8		0.8		1.1									
Bankfull Cross-sectional Area (ft ²)	5.5		2.8		3.0		5.4									
Width/Depth Ratio	11.4		14.6		13.5		15.6									
Entrenchment Ratio	3.2		2.9		3.4		2.8									
Bank Height Ratio	1.0		0.7		0.7		1.0									
D ₅₀ (mm)	65.3															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.002	0.063														
Pool Length (ft)																
Pool Max Depth (ft)	1.2	2.4														
Pool Spacing (ft)	7.8	49.7														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	N/A															
Radius of Curvature (ft)	N/A															
Rc/Bankfull Width (ft/ft)	N/A															
Meander Length (ft)	N/A															
Meander Width Ratio	N/A															
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	SC/0.2/2.0/86.5/128.0/512.0		0.5/0.9/18.6/57.2/105.0/128.0		0.1/4.7/13.3/95.4/135.5/180.0		---		---		---		---		---	
Reach Shear Stress (Competency) lb/ft ²																
Max part size (mm) mobilized at bankfull																
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	0.11															
Watershed Impervious Cover Estimate (%)	0															
Rosgen Classification	B4															
Bankfull Velocity (fps)	---															
Bankfull Discharge (cfs)	---															
Valley Slope (ft/ft)	0.0370															
Channel Thalweg Length (ft)	957															
Sinuosity	0.96															
Bankfull/Channel Slope (ft/ft)	0.0375															

¹MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 11c. Monitoring Data - Stream Reach Data Summary

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

UT1 R4A

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle¹																
Bankfull Width (ft)	11.6	12.9	12.7	13.5	13.0	14.1	12.9	13.2								
Floodprone Width (ft)	64	68	63	67	63	66	63	66								
Bankfull Mean Depth (ft)	0.8	1.0	0.6	0.9	0.7	0.9	0.7	1.0								
Bankfull Max Depth (ft)	1.3	1.4	1.2	1.5	1.4	1.6	1.4	1.6								
Bankfull Cross-sectional Area (ft ²)	10.6	12.0	8.4	11.6	9.4	12.3	9.4	12.4								
Width/Depth Ratio	11.3	15.8	13.9	21.5	16.3	18.1	13.5	18.7								
Entrenchment Ratio	5.3	5.5	4.9		4.4	5.1	4.8	5.0								
Bank Height Ratio	1.0		0.9	1.0	0.9	1.0	0.9	1.0								
D ₅₀ (mm)	59.4	71.0														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.001	0.037														
Pool Length (ft)																
Pool Max Depth (ft)	1.9	2.8														
Pool Spacing (ft)	28.0	97.5														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	23.0	92.0														
Radius of Curvature (ft)	23.0	35.0														
Rc/Bankfull Width (ft/ft)	2.0	3.0														
Meander Length (ft)	58.0	161.0														
Meander Width Ratio	2.0	8.0														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	SC/0.3/1.7/76.7/128.0/256.0		SC/0.3/1.0/93.2/146.7/256.0		0.1/8.0/13.3/100.0/155.5/256.0		---		---		---		---		---	
Reach Shear Stress (Competency) lb/ft ²	---															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	0.29															
Watershed Impervious Cover Estimate (%)	1%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	---															
Bankfull Discharge (cfs)	---															
Valley Slope (ft/ft)	0.0130															
Channel Thalweg Length (ft)	1,172															
Sinuosity	1.23															
Bankfull/Channel Slope (ft/ft)	0.0088															

¹MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 11d. Monitoring Data - Stream Reach Data Summary

Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 3 - 2022

UT1 R4B

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle¹																
Bankfull Width (ft)	11.4	12.5	12.3	12.8	11.2	14.9	12.5	14.4								
Floodprone Width (ft)	75	83	74	81	74	81	74	81								
Bankfull Mean Depth (ft)	1.0	1.1	0.7	0.9	0.8	0.9	0.8	0.9								
Bankfull Max Depth (ft)	1.3	1.6	1.3	1.6	1.4	1.6	1.5	1.7								
Bankfull Cross-sectional Area (ft ²)	11.9	12.6	9.0	11.3	10.0	11.3	11.7	12.2								
Width/Depth Ratio	10.3	13.1	13.9	18.2	12.4	19.6	13.3	17.3								
Entrenchment Ratio	6.0	6.6	5.9	6.3	5.4	6.6	5.6	6.0								
Bank Height Ratio	1.0		0.9	1.0	0.9	1.0	1.0									
D ₅₀ (mm)	55.6	69.1														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.004	0.021														
Pool Length (ft)																
Pool Max Depth (ft)	1.8	3.9														
Pool Spacing (ft)	47.2	115.3														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	24.0	96.0														
Radius of Curvature (ft)	24.0	36.0														
Rc/Bankfull Width (ft/ft)	2.0	3.0														
Meander Length (ft)	60.0	168.0														
Meander Width Ratio	2.0	8.0														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	SC/SC/0.7/75.9/128.0/256.0		SC/0.2/0.9/67.5/87.9/256.0		SC/0.7/5.6/90.0/139.4/256.0		---		---		---		---		---	
Reach Shear Stress (Competency) lb/ft ²	---															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	0.40															
Watershed Impervious Cover Estimate (%)	1%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	---															
Bankfull Discharge (cfs)	---															
Valley Slope (ft/ft)	0.0130															
Channel Thalweg Length (ft)	1,666															
Sinuosity	1.15															
Bankfull/Channel Slope (ft/ft)	0.0085															

¹MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

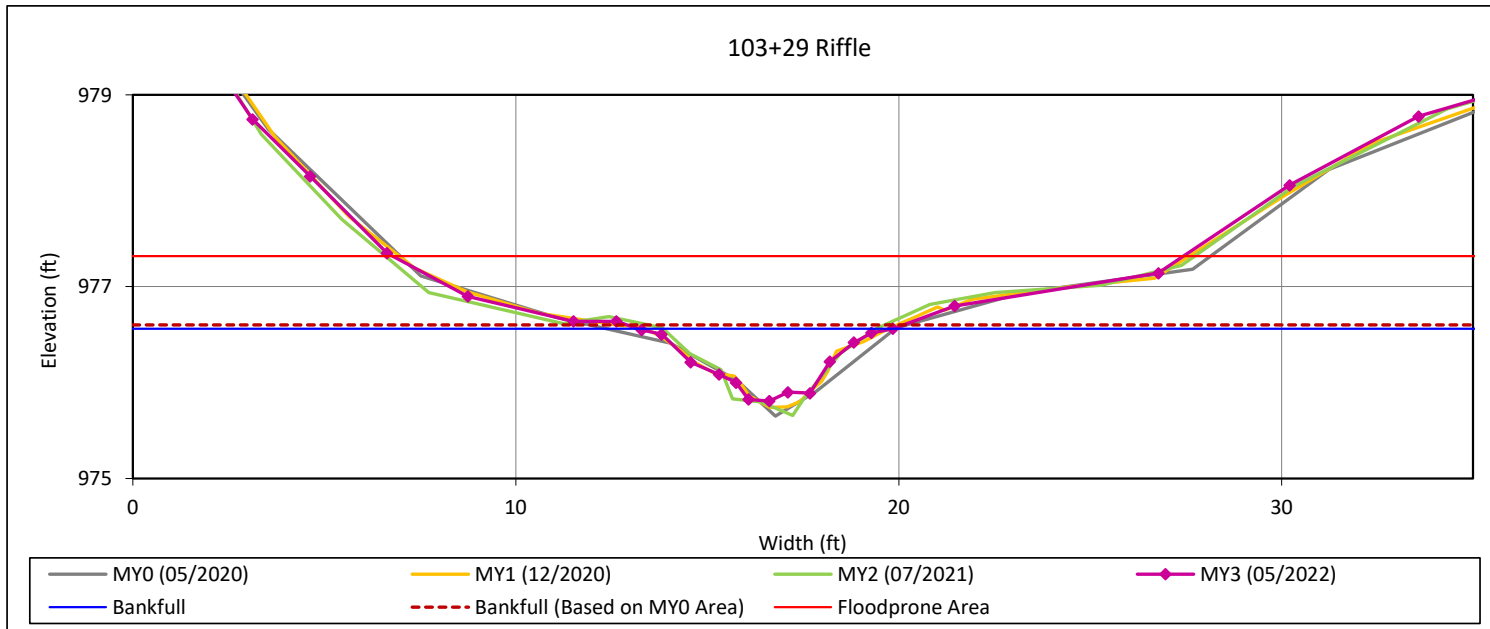
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Cross-Section 1-UT1 Reach 1A



Bankfull Dimensions

2.5	x-section area (ft.sq.)
6.7	width (ft)
0.4	mean depth (ft)
0.8	max depth (ft)
6.9	wetted perimeter (ft)
0.4	hydraulic radius (ft)
17.5	width-depth ratio
19.9	W flood prone area (ft)
3.0	entrenchment ratio
1.0	low bank height ratio

Survey Date: 05/2022

Field Crew: Wildlands Engineering



View Downstream

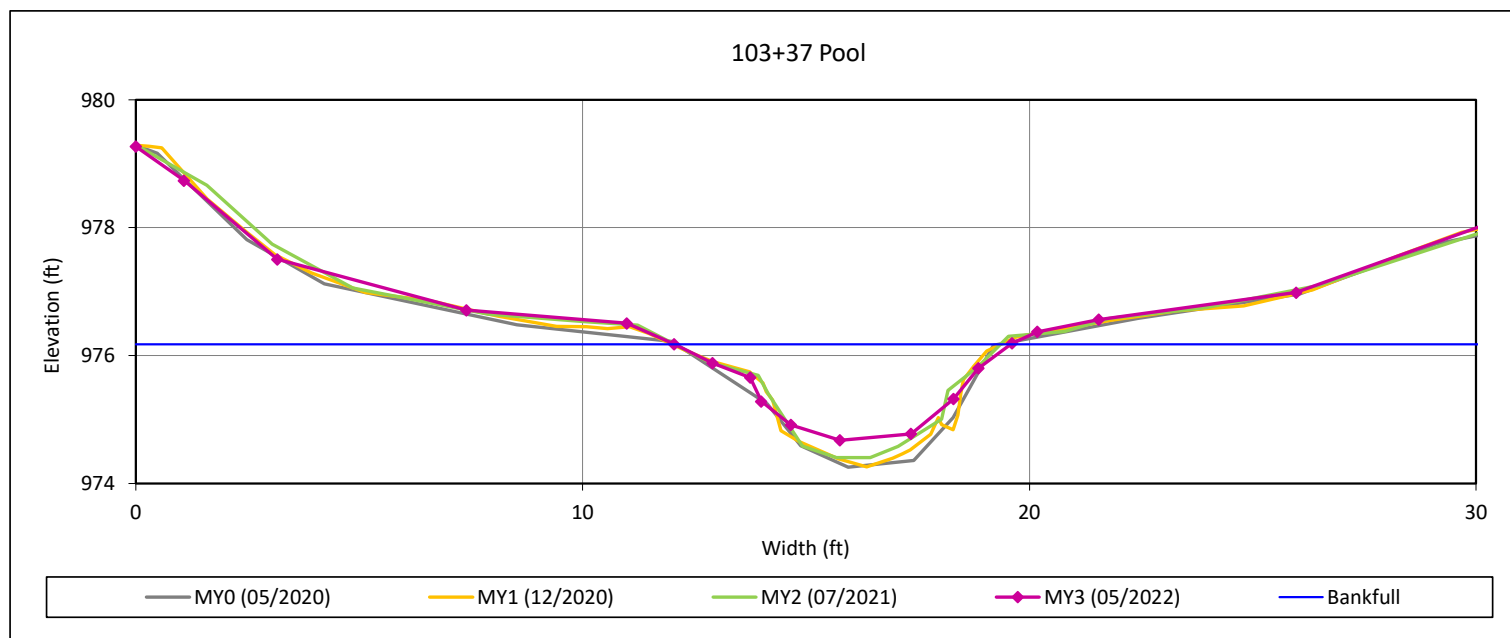
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Cross-Section 2-UT1 Reach 1A



Bankfull Dimensions

6.8	x-section area (ft.sq.)
7.5	width (ft)
0.9	mean depth (ft)
1.5	max depth (ft)
8.4	wetted perimeter (ft)
0.8	hydraulic radius (ft)
8.4	width-depth ratio

Survey Date: 05/2022

Field Crew: Wildlands Engineering



View Downstream

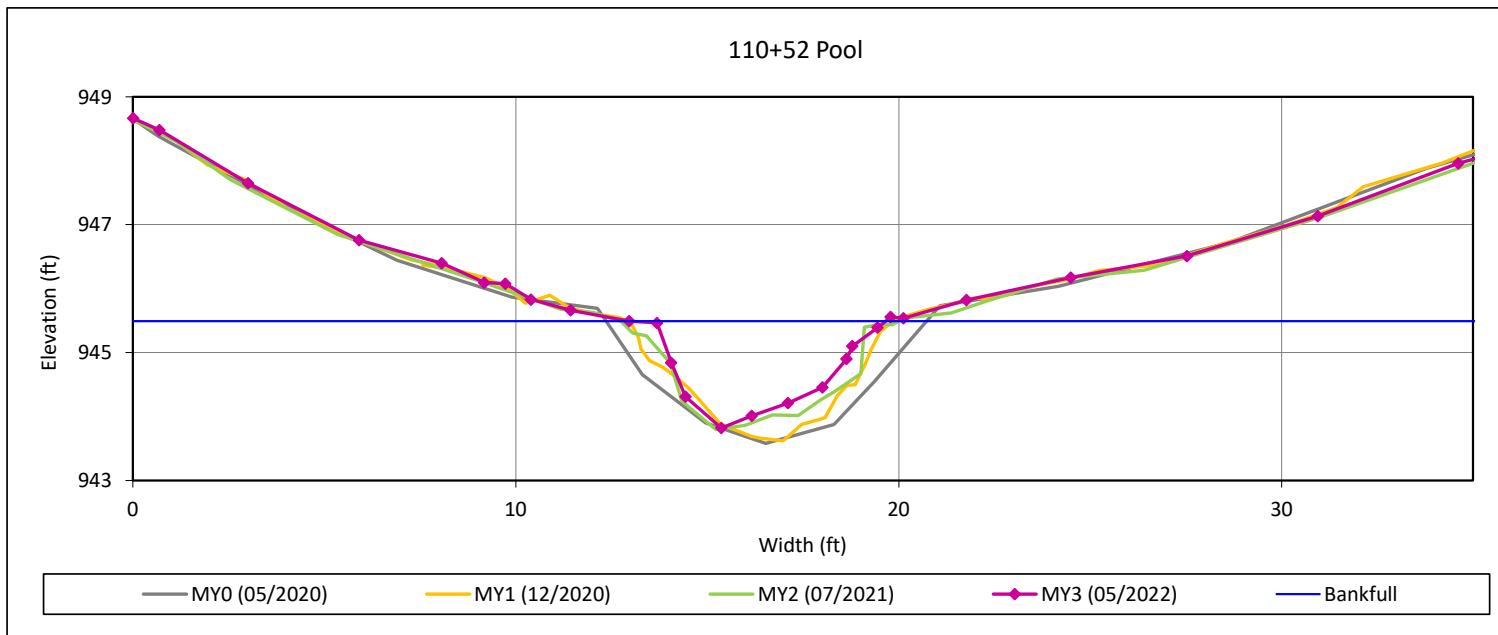
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Cross-Section 3-UT1 Reach 1B



Bankfull Dimensions

6.2	x-section area (ft.sq.)
6.7	width (ft)
0.9	mean depth (ft)
1.7	max depth (ft)
7.8	wetted perimeter (ft)
0.8	hydraulic radius (ft)
7.3	width-depth ratio

Survey Date: 05/2022

Field Crew: Wildlands Engineering



View Downstream

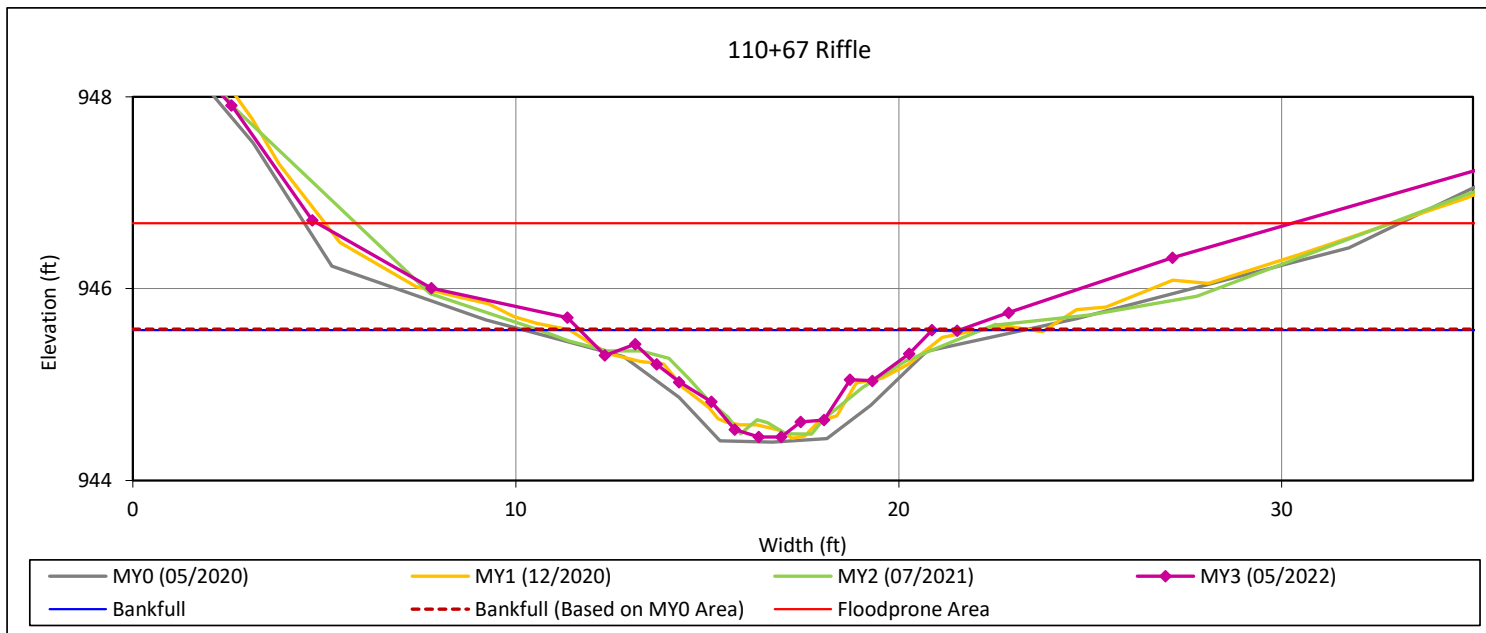
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Cross-Section 4-UT1 Reach 1B



Bankfull Dimensions

5.4	x-section area (ft.sq.)
9.2	width (ft)
0.6	mean depth (ft)
1.1	max depth (ft)
9.7	wetted perimeter (ft)
0.6	hydraulic radius (ft)
15.6	width-depth ratio
25.5	W flood prone area (ft)
2.8	entrenchment ratio
1.0	low bank height ratio

Survey Date: 05/2022

Field Crew: Wildlands Engineering



View Downstream

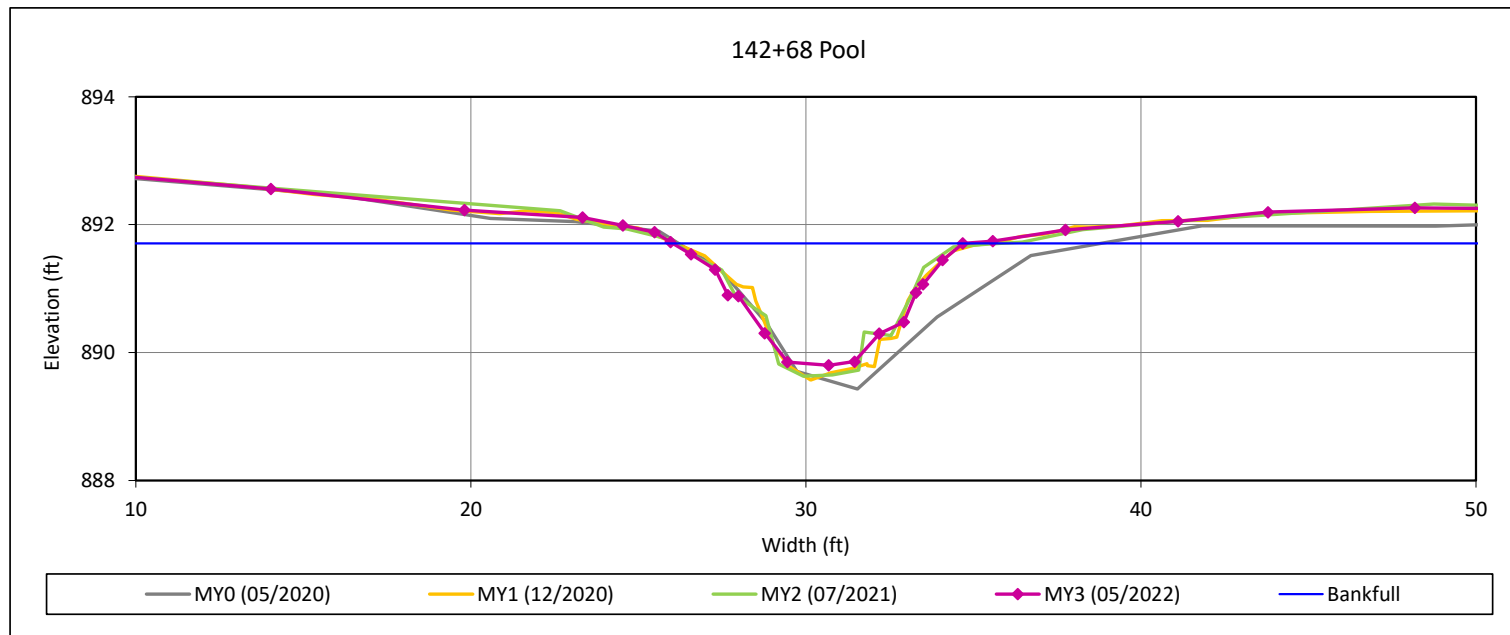
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Cross-Section 5-UT1 Reach 4A



Bankfull Dimensions

9.5	x-section area (ft.sq.)
8.6	width (ft)
1.1	mean depth (ft)
1.9	max depth (ft)
9.8	wetted perimeter (ft)
1.0	hydraulic radius (ft)
7.9	width-depth ratio

Survey Date: 05/2022

Field Crew: Wildlands Engineering



View Downstream

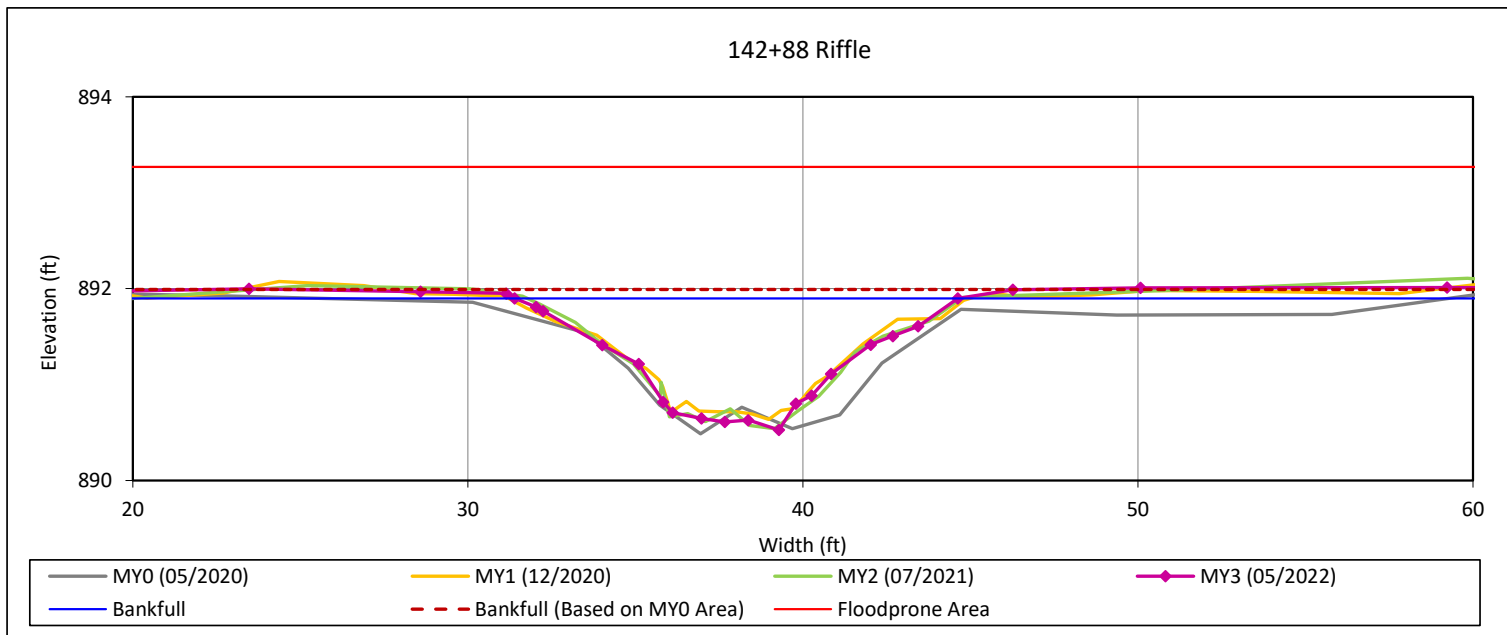
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Cross-Section 6-UT1 Reach 4A



Bankfull Dimensions

9.4	x-section area (ft.sq.)
13.2	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
13.6	wetted perimeter (ft)
0.7	hydraulic radius (ft)
18.7	width-depth ratio
66.4	W flood prone area (ft)
5.0	entrenchment ratio
0.9	low bank height ratio

Survey Date: 05/2022

Field Crew: Wildlands Engineering



View Downstream

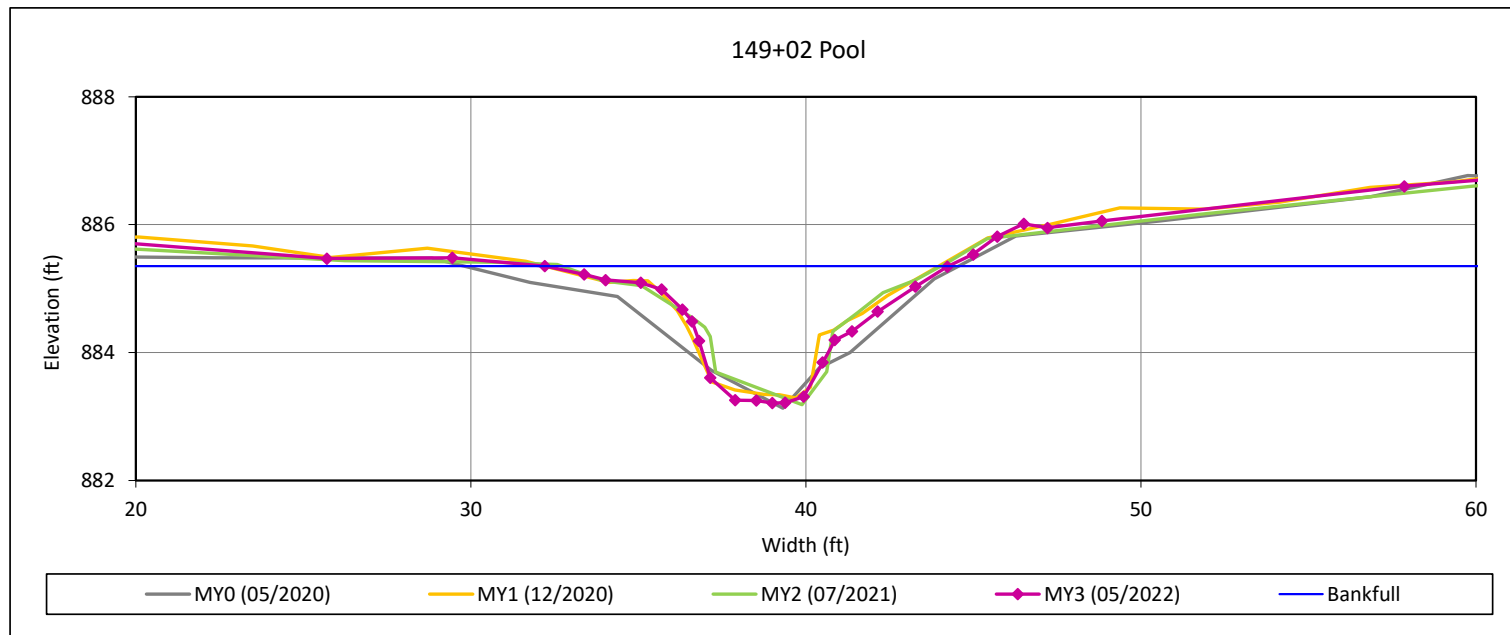
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Cross-Section 7-UT1 Reach 4A



Bankfull Dimensions

11.1	x-section area (ft.sq.)
12.1	width (ft)
0.9	mean depth (ft)
2.1	max depth (ft)
13.3	wetted perimeter (ft)
0.8	hydraulic radius (ft)
13.1	width-depth ratio

Survey Date: 05/2022

Field Crew: Wildlands Engineering



View Downstream

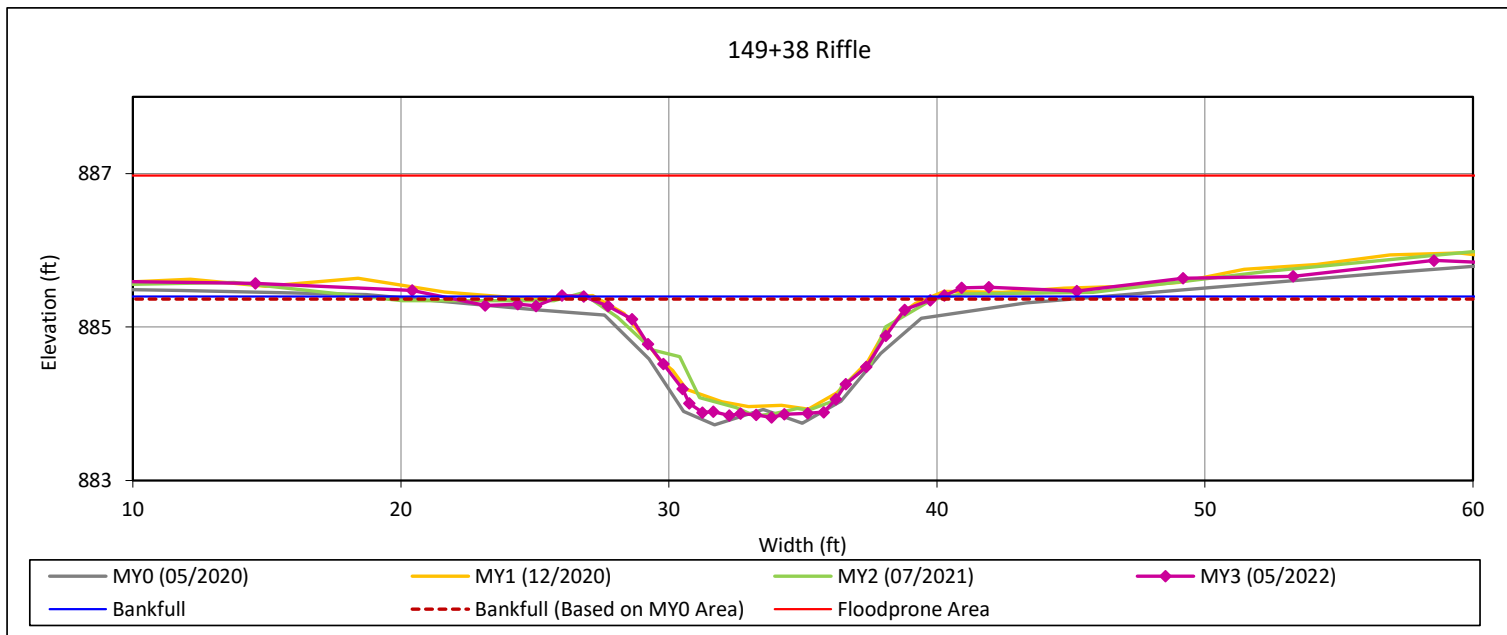
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Cross-Section 8-UT1 Reach 4A



Bankfull Dimensions

12.4	x-section area (ft.sq.)
12.9	width (ft)
1.0	mean depth (ft)
1.6	max depth (ft)
13.5	wetted perimeter (ft)
0.9	hydraulic radius (ft)
13.5	width-depth ratio
62.6	W flood prone area (ft)
4.8	entrenchment ratio
1.0	low bank height ratio

Survey Date: 05/2022

Field Crew: Wildlands Engineering



View Downstream

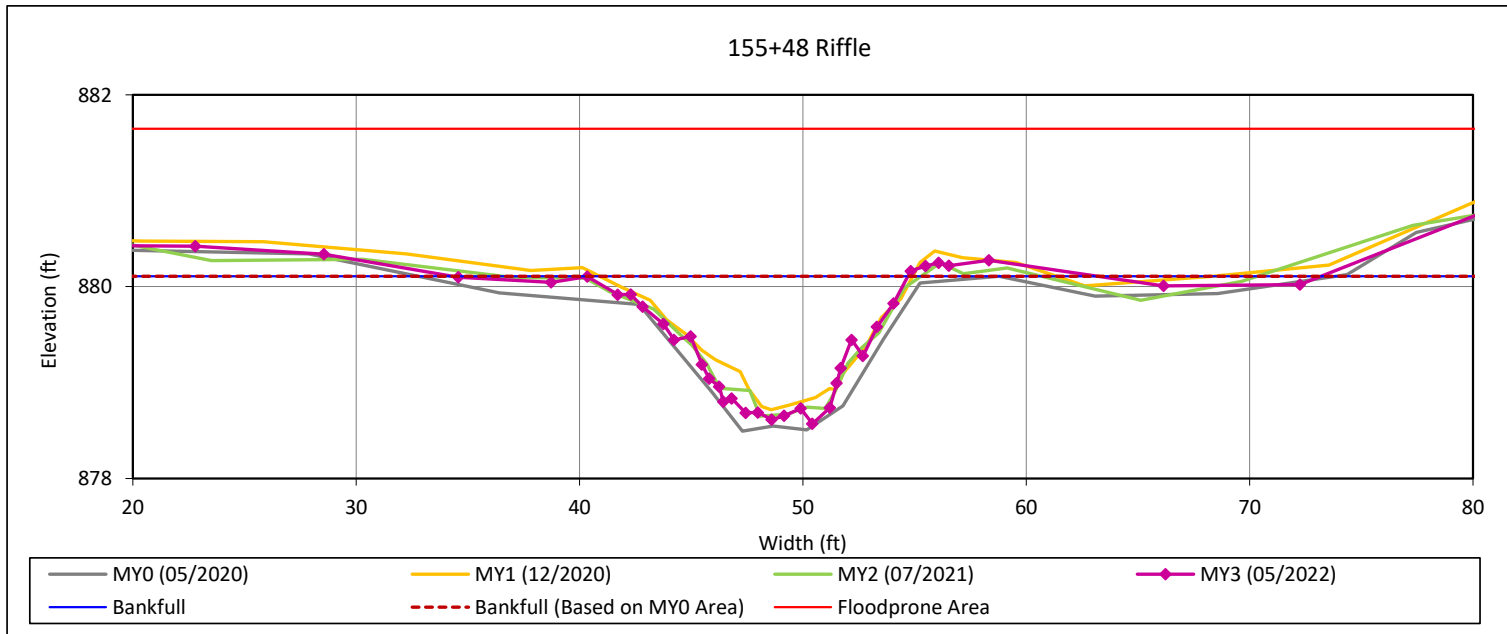
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Cross-Section 9-UT1 Reach 4B



Bankfull Dimensions

- 11.9 x-section area (ft.sq.)
- 14.4 width (ft)
- 0.8 mean depth (ft)
- 1.5 max depth (ft)
- 15.1 wetted perimeter (ft)
- 0.8 hydraulic radius (ft)
- 17.3 width-depth ratio
- 80.9 W flood prone area (ft)
- 5.6 entrenchment ratio
- 1.0 low bank height ratio

Survey Date: 05/2022

Field Crew: Wildlands Engineering



View Downstream

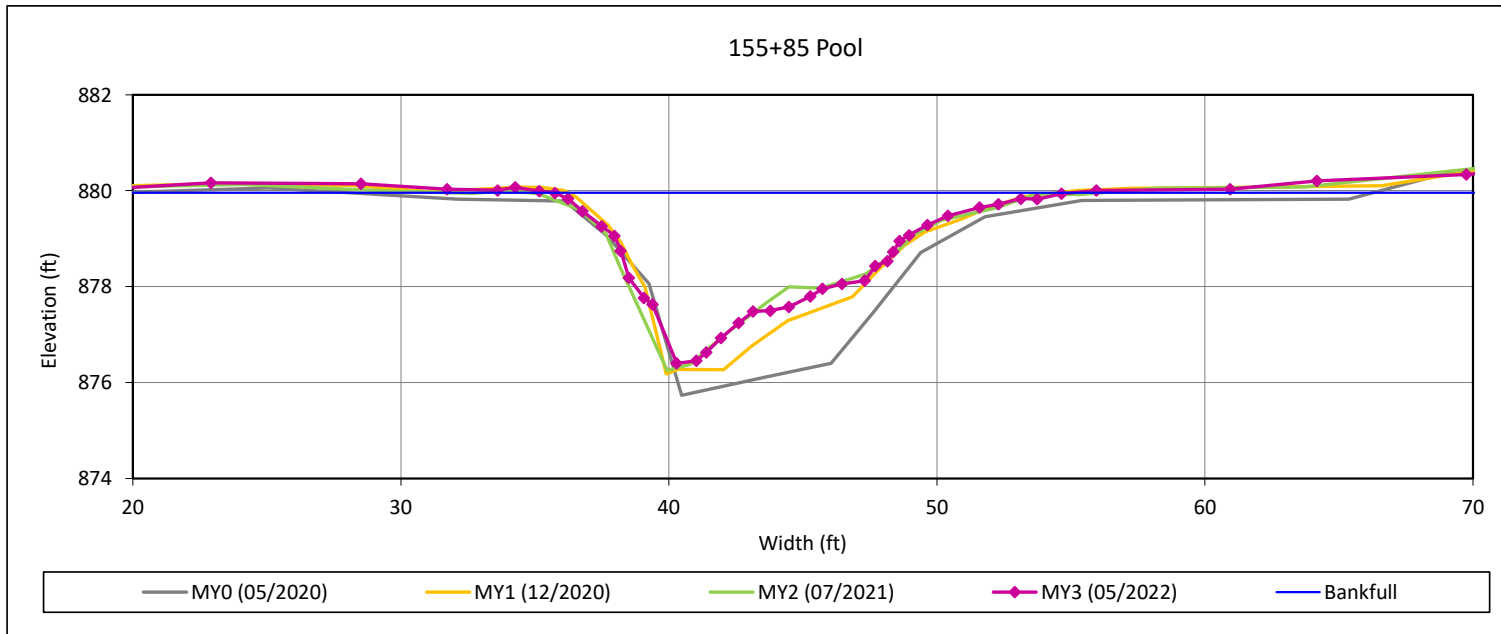
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Cross-Section 10-UT1 Reach 4B



Bankfull Dimensions

28.1	x-section area (ft.sq.)
18.9	width (ft)
1.5	mean depth (ft)
3.6	max depth (ft)
21.1	wetted perimeter (ft)
1.3	hydraulic radius (ft)
12.7	width-depth ratio

Survey Date: 05/2022

Field Crew: Wildlands Engineering



View Downstream

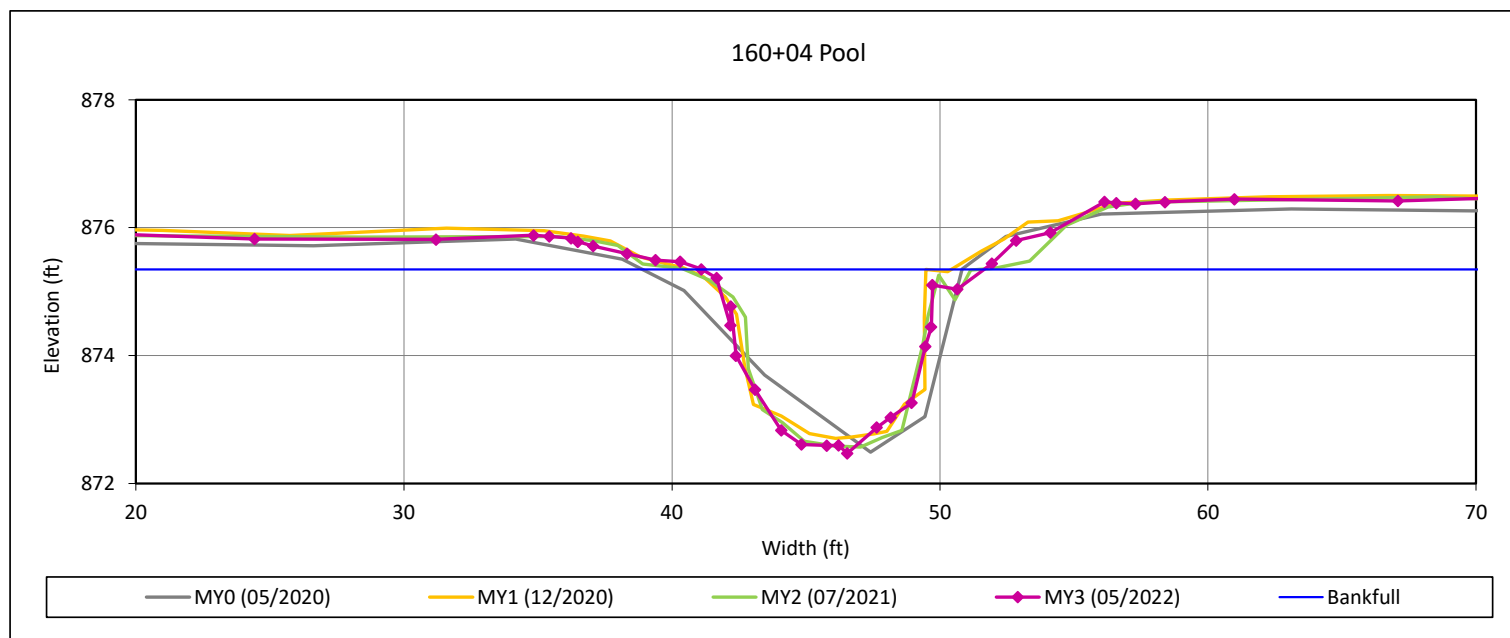
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Cross-Section 11-UT1 Reach 4B



Bankfull Dimensions

17.9	x-section area (ft.sq.)
10.6	width (ft)
1.7	mean depth (ft)
2.9	max depth (ft)
13.7	wetted perimeter (ft)
1.3	hydraulic radius (ft)
6.2	width-depth ratio

Survey Date: 05/2022

Field Crew: Wildlands Engineering



View Downstream

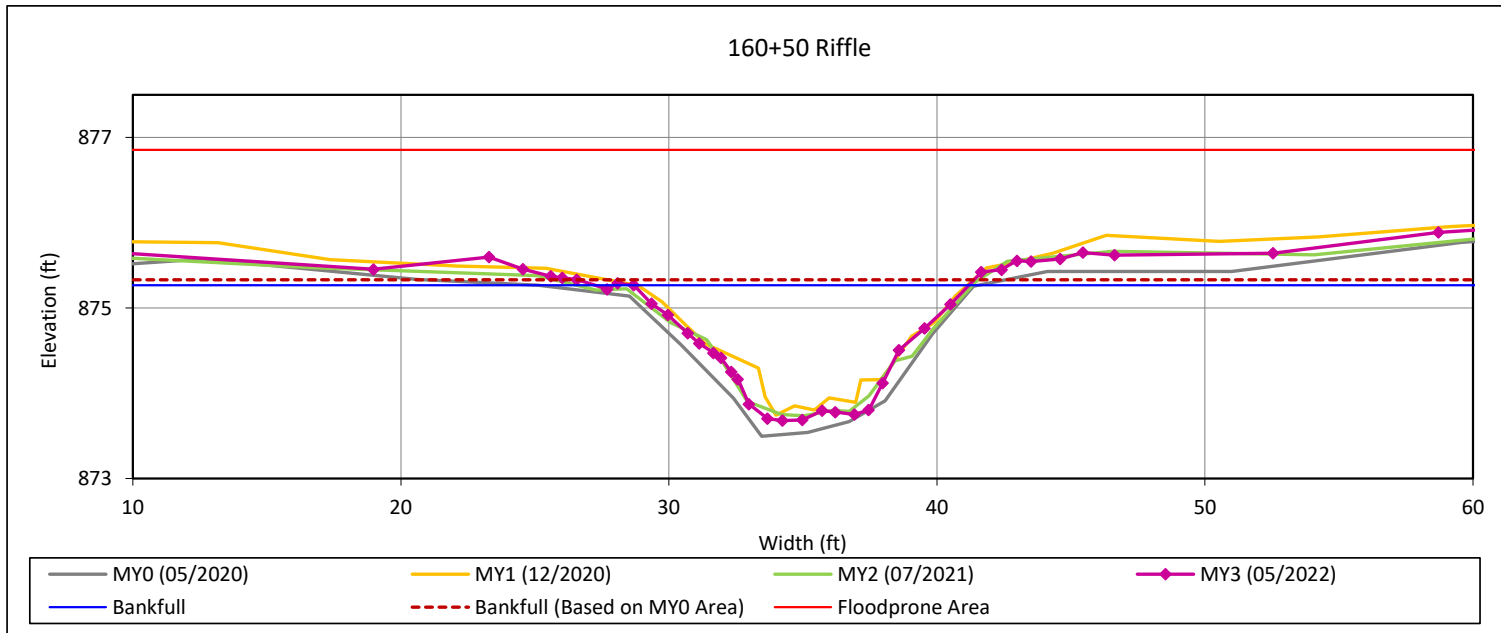
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Cross-Section 12-UT1 Reach 4B



Bankfull Dimensions

11.7	x-section area (ft.sq.)
12.5	width (ft)
0.9	mean depth (ft)
1.6	max depth (ft)
13.1	wetted perimeter (ft)
0.9	hydraulic radius (ft)
13.3	width-depth ratio
74.6	W flood prone area (ft)
6.0	entrenchment ratio
1.0	low bank height ratio

Survey Date: 05/2022

Field Crew: Wildlands Engineering



View Downstream

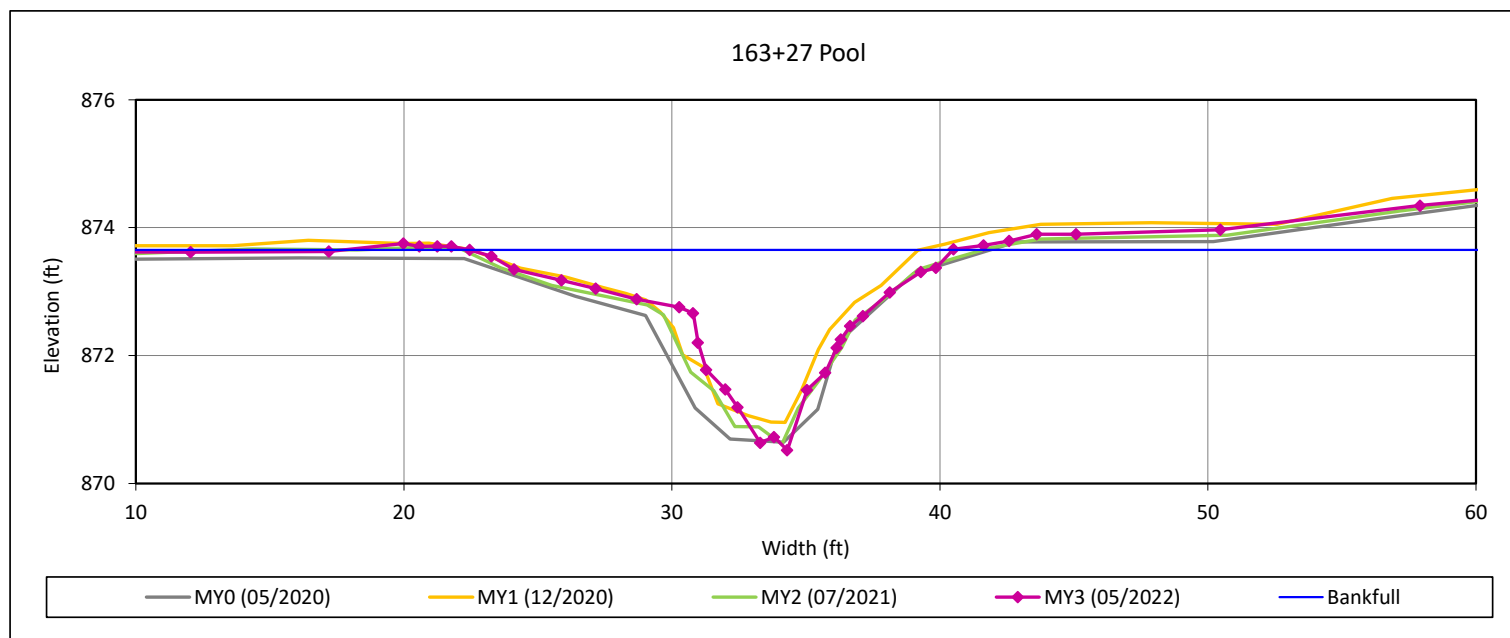
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Cross-Section 13-UT1 Reach 4B



Bankfull Dimensions

20.0	x-section area (ft.sq.)
18.0	width (ft)
1.1	mean depth (ft)
3.1	max depth (ft)
19.9	wetted perimeter (ft)
1.0	hydraulic radius (ft)
16.2	width-depth ratio

Survey Date: 05/2022

Field Crew: Wildlands Engineering



View Downstream

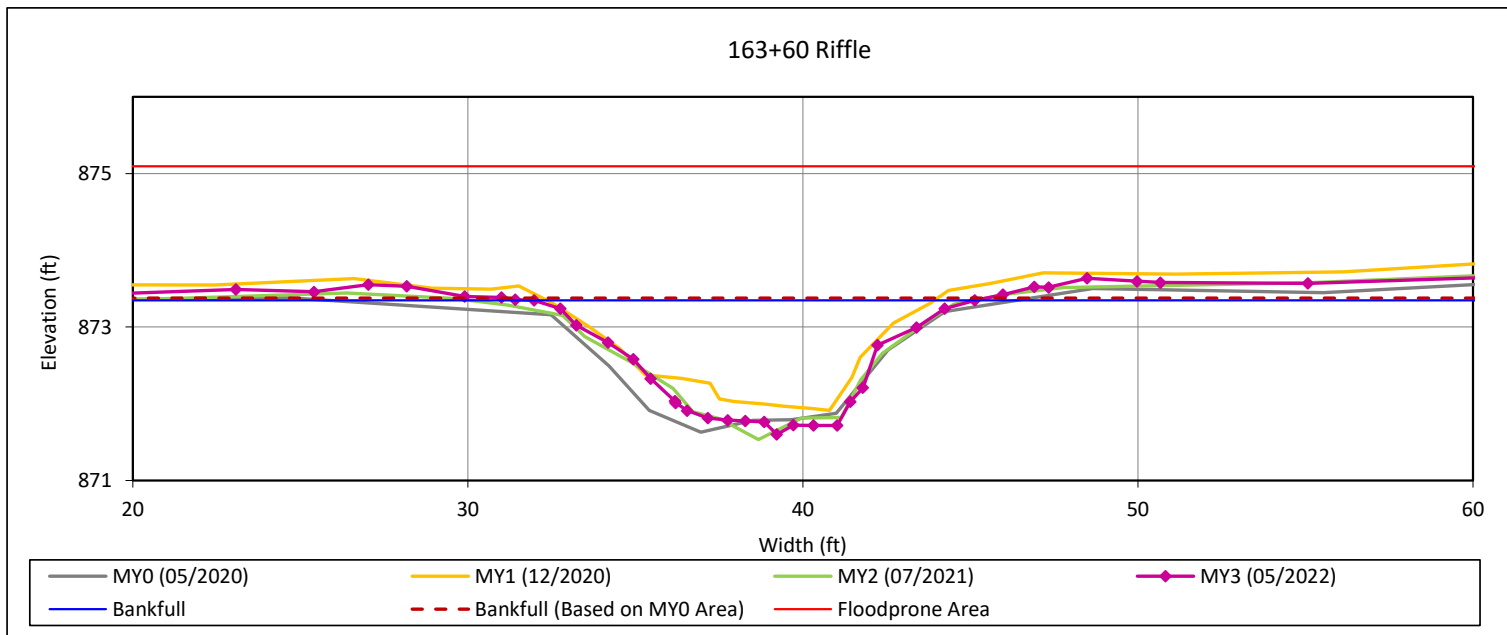
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Cross-Section 14-UT1 Reach 4B



Bankfull Dimensions

12.2	x-section area (ft.sq.)
13.2	width (ft)
0.9	mean depth (ft)
1.7	max depth (ft)
13.9	wetted perimeter (ft)
0.9	hydraulic radius (ft)
14.2	width-depth ratio
73.9	W flood prone area (ft)
5.6	entrenchment ratio
1.0	low bank height ratio

Survey Date: 05/2022

Field Crew: Wildlands Engineering



View Downstream

APPENDIX D. Hydrology Data

Table 12. Verification of Bankfull Events

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

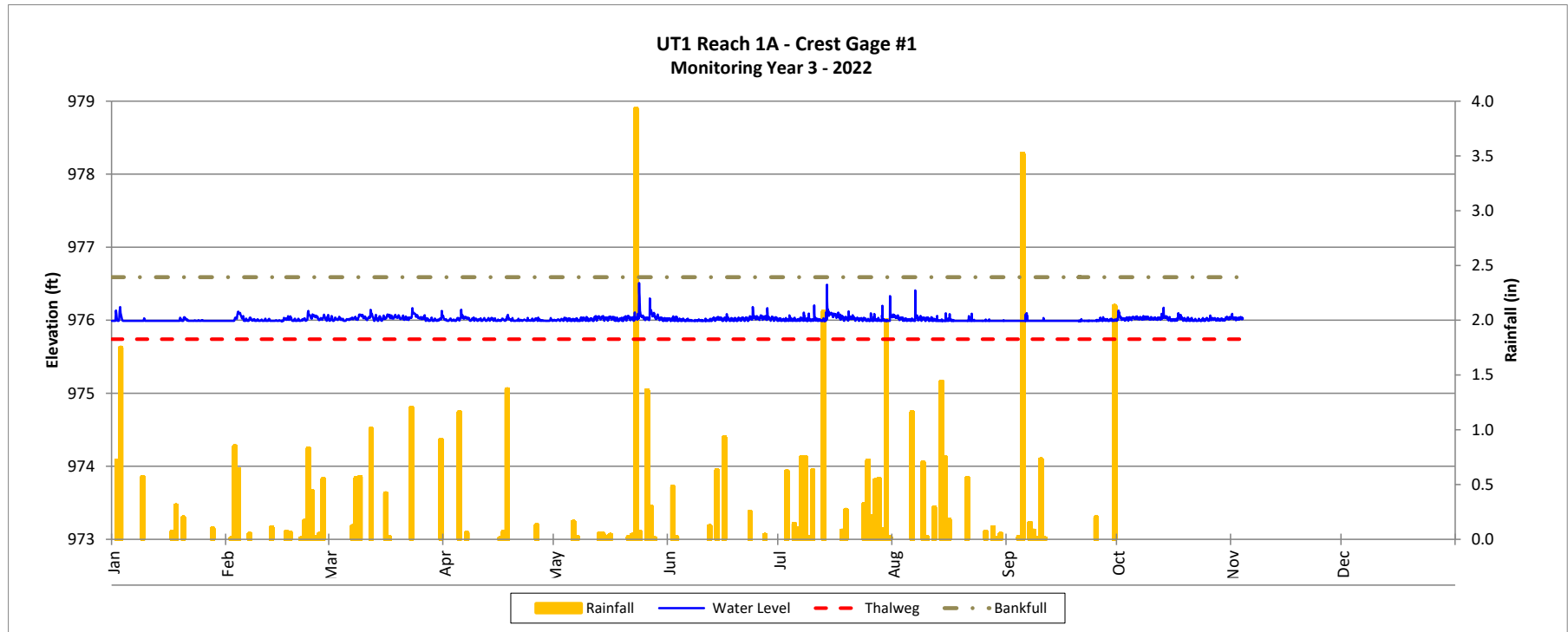
Reach	Gage Name	MY	Date of Occurrence	Date of Data Collection	Method
UT1 - 1A	CG1	MY1	11/12/2020	11/12/2020	Crest Gage
	CG1	MY2	---	---	Crest Gage
	CG1	MY3	---	---	Crest Gage
UT1 - 4A	CG2	MY3	5/23/2022	5/23/2022	Crest Gage

Recorded Bankfull Events

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

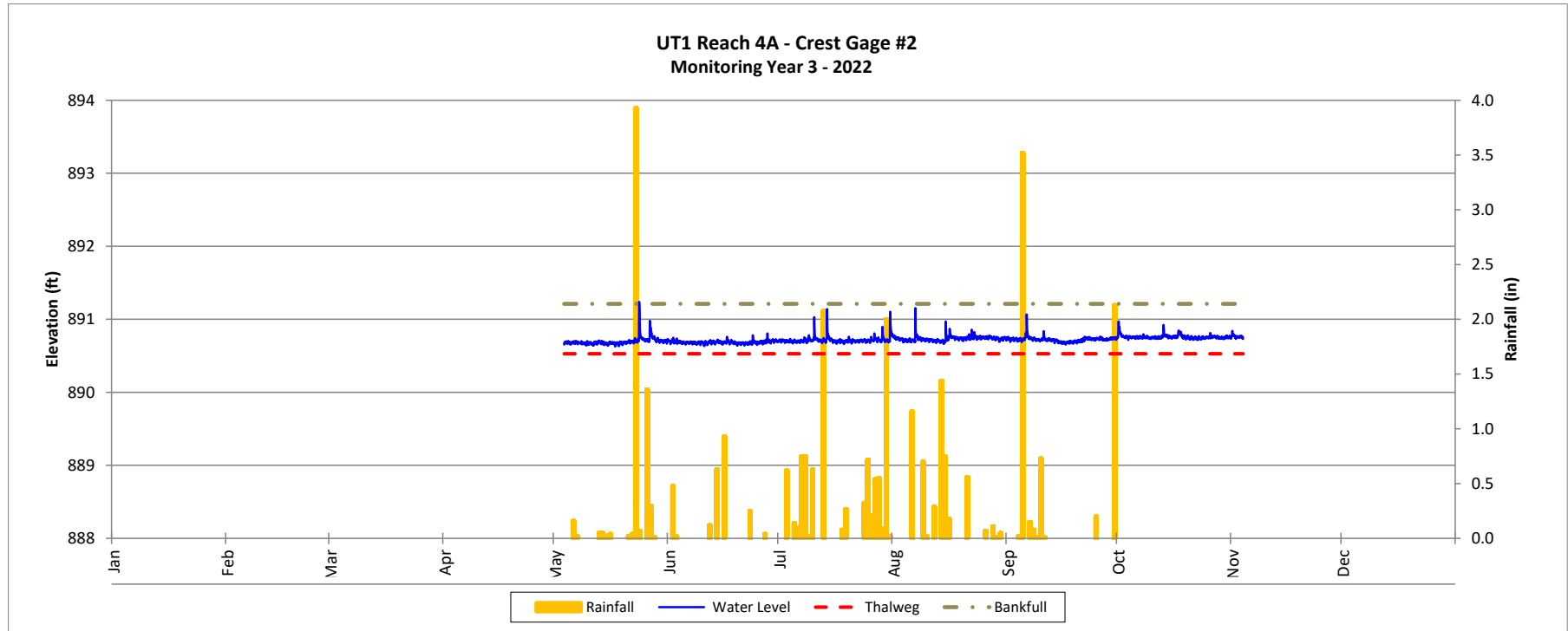


Recorded Bankfull Events

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022



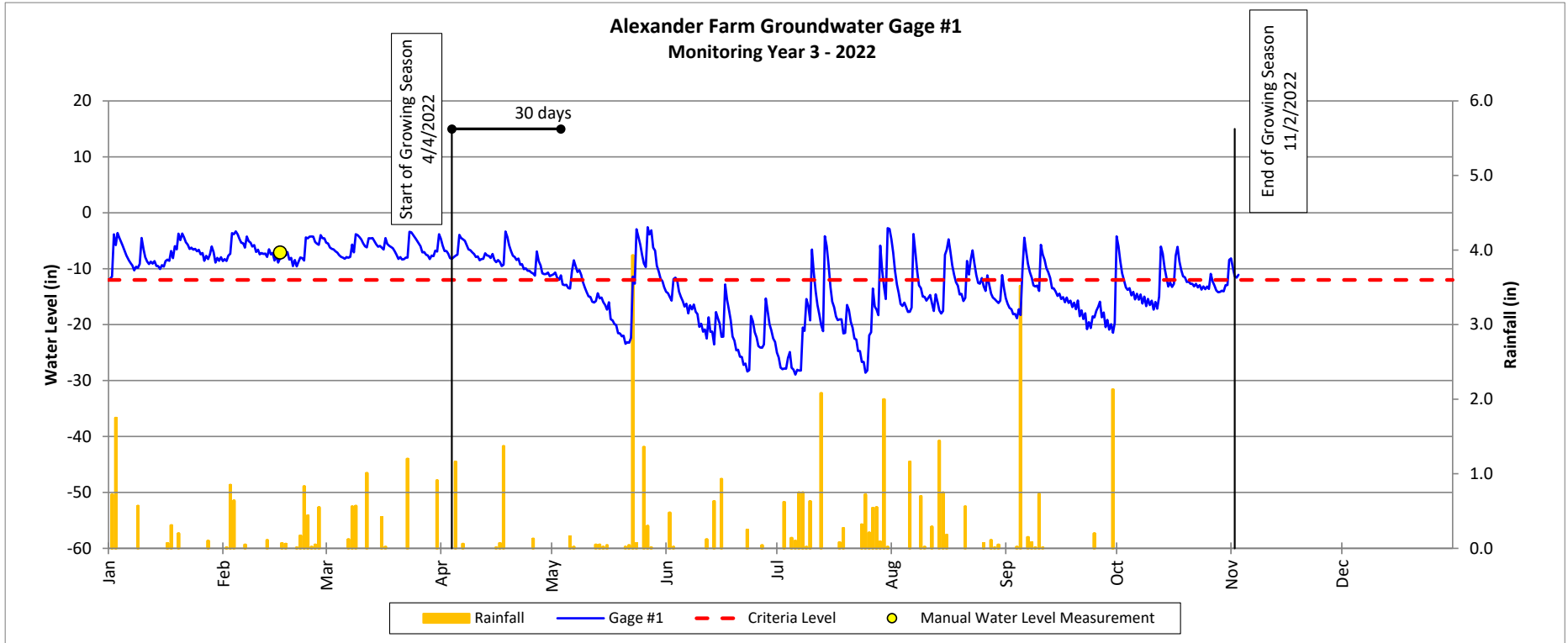
Groundwater Gage Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Wetland E on UT1 R1B



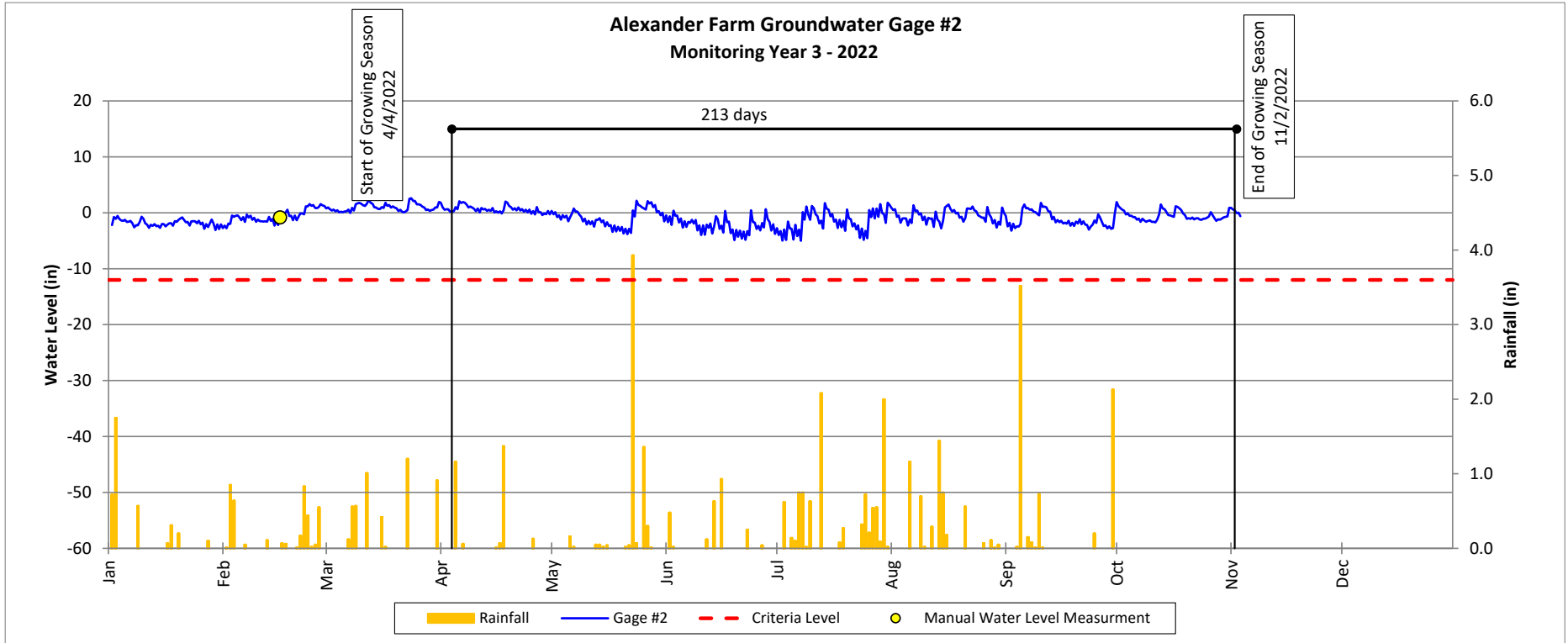
Groundwater Gage Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Wetland N on UT1 R4A

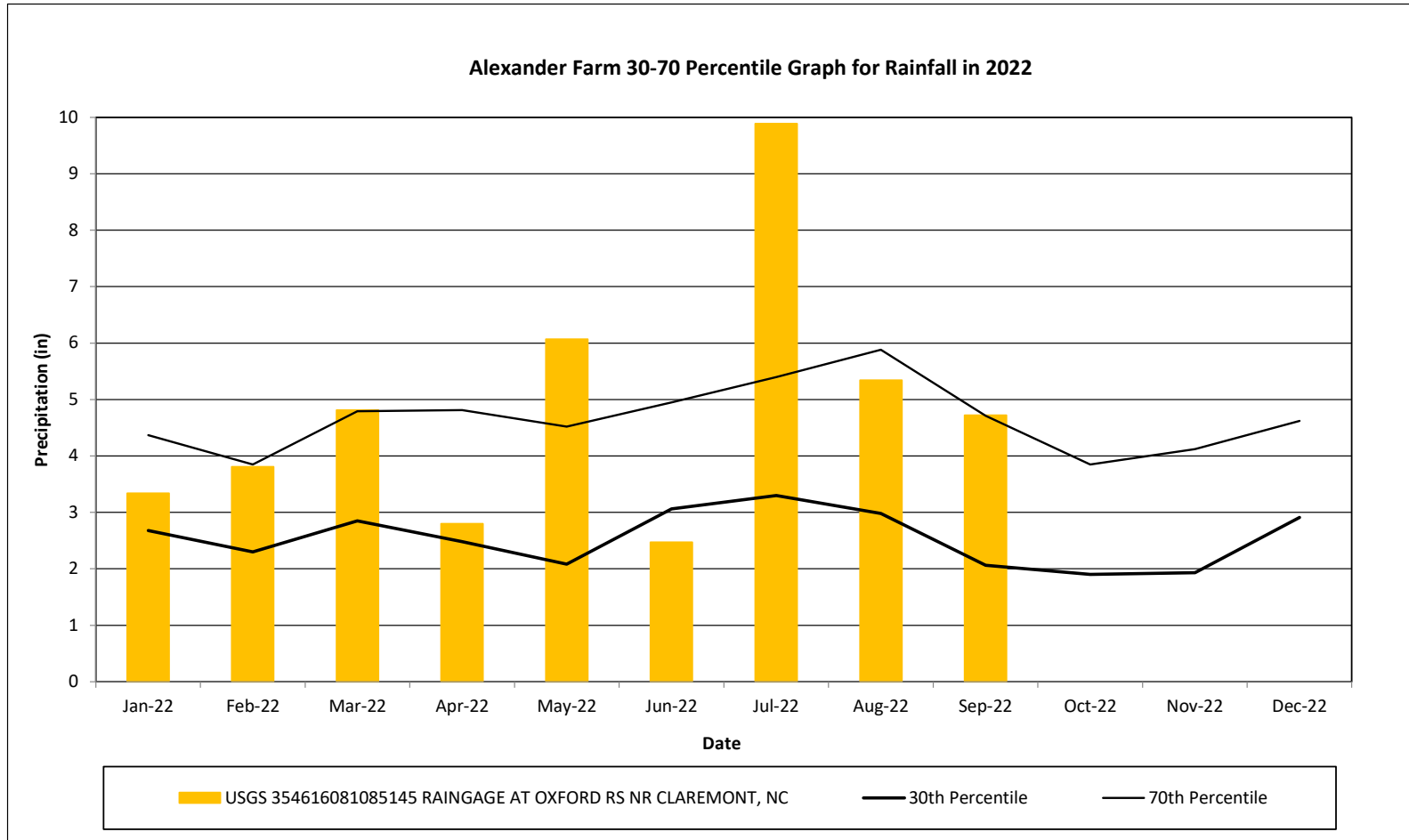


Monthly Rainfall Data

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022



Annual Rainfall collected by USGS 354616081085145 RAINGAGE AT OXFORD RS NR CLAREMONT, NC

30th and 70th percentile rainfall data collected from WETS station Statesville 2 NNE, NC

USGS Correspondence

From: [Fine, Jason M](#)
To: [Brandon Romeo](#)
Subject: RE: [EXTERNAL] USGS 354616081085145 RAINGAGE AT OXFORD RS NR CLAREMONT, NC
Date: Tuesday, November 8, 2022 2:42:15 PM

Brandon,
That raingage has been discontinued because the funding was not renewed. There are no plans to bring the site back online.
Thank you,
Jason

Jason M. Fine | U.S. Geological Survey
National Groundwater Networks Cordinator
Hydrologic Networks Branch
3916 Sunset Ridge Road | Raleigh, NC 27607
office: 919-571-4034 | cell: 919-818-6969 | fax: 919-571-4041
jmfine@usgs.gov
[National Groundwater Monitoring Network](#)
[USGS Climate Response Network](#)

From: Brandon Romeo <bromeo@wildlandseng.com>
Sent: Tuesday, November 8, 2022 2:37 PM
To: Fine, Jason M <jmfine@usgs.gov>
Subject: [EXTERNAL] USGS 354616081085145 RAINGAGE AT OXFORD RS NR CLAREMONT, NC

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Hey Jason,

I just wanted to email you regarding the USGS 354616081085145 RAINGAGE AT OXFORD RS NR CLAREMONT, NC. Will the daily precipitation data for this rain gage continue to be updated on the new website starting in 2023 or is this gage completely offline now? If the latter is true (gage is indefinitely offline) can you point me to a rain gage close to this one that will continue to function and update the daily precipitation data?

Thanks for the help,

Brandon Romeo | Environmental Scientist
O: 704.332.7754 x129
M: 917.747.6086

Wildlands Engineering, Inc.

1430 S. Mint St, Suite 104

Charlotte, NC 28203

**Groundwater Gage Photographs
Monitoring Year 3**



Groundwater Gage 1 - (02/18/2022)



Groundwater Gage 2 - (02/18/2022)

APPENDIX E. Project Timeline and Contact Information

Table 13. Project Activity and Reporting History

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Activity or Report		Data Collection Complete	Completion or Delivery
404 Permit		October 2019	November 2019
Mitigation Plan		March 2018 - October 2019	October 2019
Final Design - Construction Plans		September 2019	September 2019
Construction		December 2019 - April 2020	April 2020
Temporary S&E mix applied to entire project area ¹		April 2020	April 2020
Permanent seed mix applied to reach/segments ¹		April 2020	April 2020
Bare root and live stake plantings for reach/segments		April 2020	April 2020
Baseline Monitoring (Year 0)	Stream Survey	April - May 2020	September 2020
	Vegetation Survey	Collected - April 2020 Verified - June 2020	
Year 1 Monitoring	Invasive treatment	May - August 2020	December 2020
	Stream Survey	December 2020	
	Vegetation Survey	October 2020	
Year 2 Monitoring	Supplemental Plantings	March 2021	December 2021
	Live Stake Install	March 2021	
	Soil Amendments & Seeding	June 2021	
	Invasive treatment	July 2021	
	Stream Survey	July 2021	
Year 3 Monitoring	Vegetation Survey	November 2021	November 2022
	Supplemental Plantings	February 2022	
	Invasive treatment	February 2022	
	Stream Survey	May 2022	
	Invasive treatment	June 2022	
	AOC Repair	June 2022	
Vegetation Survey	August 2022		
Year 4 Monitoring	AOC Repair	November 2022	
	Stream Survey		
Year 5 Monitoring	Vegetation Survey		
	Stream Survey		
Year 6 Monitoring	Vegetation Survey		
	Stream Survey		
Year 7 Monitoring	Vegetation Survey		
	Stream Survey		

¹Seed and mulch is added as each section of construction is completed.

Table 14. Project Contact Table

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 3 - 2022

Designers Aaron Earley, PE, CFM	Wildlands Engineering, Inc. 1430 South Mint Street, Suite 104 Charlotte, NC 28203 704.332.7754
Construction Contractors	Baker Grading & Landscaping, Inc 970 Bat Cave Road Old Fort, NC 28762
Planting Contractor	Bruton Natural Systems, Inc. PO Box 1197 Fremont, NC 27830
Seeding Contractor	Baker Grading & Landscaping, Inc. 970 Bat Cave Road Old Fort, NC 28762
Seed Mix Sources	Baker Grading & Landscaping, Inc.
Nursery Stock Suppliers	
Bare Roots Live Stakes	Bruton Natural Systems, Inc.
Herbaceous Plugs	Wetland Plants Inc.
Monitoring Performers	
Monitoring, POC	Kristi Suggs (704) 332.7754 x.110

APPENDIX F. Additional Documentation



MEETING NOTES

MEETING: MY2 IRT Credit Release Site Walk
ALEXANDER FARM Mitigation Site
Catawba 03050101; Alexander County, NC
DEQ Contract No. 7416
DMS Project No. 100048
Wildlands Project No. 005-02169

DATE: Monday, May 9, 2022

LOCATION: Elk Shoals Church Loop
Stony Point, NC

Attendees

Kim (Browning) Isenhour, USACE	Harry Tsomides, DMS	Aaron Earley, Wildlands
Casey Haywood, USACE	Paul Wiesner, DMS	
Erin Davis, NCDWR	Sam Kirk, Wildlands	
Olivia Munzer, NCWRC	Brandon Romeo, Wildlands	

Meeting Notes

The meeting began at 12:30 pm. Aaron presented an overview of the site conditions and issues noted in the AMP, MY1, and MY2 reports. From there, the group walked upstream to the headwaters of UT1, retraced steps and reviewed UT1, UT1A and the BMP downstream of the road. The meeting concluded at 3:00 PM.

1. Opening Remarks

- Aaron noted that portions of this site had been replanted twice as part of the AMP and that a 200 LF section of dry channel on UT1 Reach 1A was observed last week for the first time.
- Kim asked if we thought fescue in the easement affected bare root survival. Sam replied that the fescue areas within the easement did not line up the low stem counts. The majority of fescue within the easement occurs near the culvert crossing between UT1 Reach 1B and 2. These areas have been ring sprayed and will continue to be monitored and treated.
- Kim asked if this site contained ground water gages in wetlands to monitor functionality. Brandon replied that two gages were installed in delineated wetlands and Aaron clarified that they were not tie to success criteria.

2. Specific Items of Discussion

- **Upstream of road**
 - Kim asked why UT1 Reach 2 was not proposed for restoration given the erosion and incision. Aaron and Paul acknowledged that the reach was borderline, but E2 was chosen since erosion and

incision were sporadic. No additional work was done during construction because most of the reach flowed through a large wetland which was not permitted for impacts under the NWP 27. Wildlands will monitor the at-risk areas with additional phot points.

- Casey asked if the failing veg plot near station 114+00 was replanted. Sam confirmed that it was.
- Kim noticed some bare areas along the right fenceline and suggested that Wildlands keep eyes on them.
- Casey and Erin asked about the presence of algae in the stream and expressed concern about in-stream vegetation. Wildlands replied that algae was most likely due to long, slow pool sections and the lack of shade. Once live stakes grow tall enough to shade the channel, the presence of algae could decrease. Wildlands plans on treating in-stream vegetation in June.
- Kim asked if the design called for wider pool sections that were observed in the field because that was not apparent in the monitoring reports. Wildlands responded that pools were designed to be 30% wider than riffles. Winter photos will be included in subsequent monitoring reports, so the channel dimension is more visible (this will be done site-wide when the channel is not visible).
- Olivia asked if the wetland near station 111+60 RT ever dried up. Sam and Brandon confirmed that they have never seen it dry.
- Kim suggested that a transect be added near station 109+00 to monitor veg since it seemed bare. Wildlands confirmed a transect would be added.
- Casey requested that any repairs on piping structures (both identified in MY2 report and new instances) be discussed in the subsequent monitoring report.
- The IRT asked Wildlands about the path forward for the 200 LF of dry channel on UT1 Reach 1A (station 103+50 – 105+50). Wildlands responded that they will discuss this section internally to develop an approach to determine the cause(s) of absence of baseflow. The approach could include additional flow gages or groundwater wells and taking a closer look at the bounding grade control structures functionality. Kim suggested installing a game camera in the dry section to visually monitor flow conditions. Wildlands agreed.
- Kim suggested installing additional live stakes near the upper extents of UT1 Reach 1A where sedimentation has occurred. Wildlands agreed.
- **Downstream of road**
 - Aaron pointed out that while the preservation reach does have some eroded banks and incision, it has not changed significantly since pre-project conditions. Kim agreed with preservation to avoid impacting the mature wooded buffer.
 - Casey asked if aggradation at the beginning of UT1 Reach 4A coincided with the fallen tree. Wildlands confirmed that was the case and suspected that aggradation would lessen once tree was removed. Aaron noted that the channel width had not changed through the aggradation section.
 - Erin asked if the area near station 142+50 was replanted. Sam confirmed. Kim said that in general, all replanted areas (especially within wetlands) need mobile plots or transects. Brandon confirmed that 5 mobile plots have been added since baseline and transects will be added where needed.



- Kim asked if additional monitoring years were added due to replanting. Aaron replied that per the AMP, Wildlands will conduct an extra year of vegetation monitoring in MY6. If the data doesn't suggest that vegetation performance towards success, and additional year of monitoring may be required in MY8.
- Kim suggested adding a photo point to monitor failed lunker log at UT1 station 151+10 since the bank appears to be stable. Wildlands agreed.
- Kim asked about the condition of the linear wetland at the downstream end of the project. Wildlands explained that it delineated as a wetland and drains pasture runoff. It was not impacted during construction. Kim suggested that a winter photo point be added to the linear wetland feature. Wildlands agreed.

3. Closing Remarks

- Kim remarked that there were several invasives, including cattail and paulownia, that need to be treated. Wildlands confirmed that some invasives have already been treated this year and additional invasives will be treated in the upcoming months.
- Kim and Paul requested that the linear footage and % of total length of the dry section of channel be included in the minutes. The dry section is approximately 200 LF and constitutes approximately 4.7% of the stream credits. The dry section is noted on the attached figure. Wildlands plans on discussing an approach internally.
- The IRT agreed to release the MY2 (2021) credits as proposed.

These meeting minutes were prepared by Aaron Earley and reviewed by Sam Kirk and Brandon Romeo on May 19, 2022, and represent the authors' interpretation of events. Please report and discrepancies or corrections within 5 business days of receipt of these minutes.

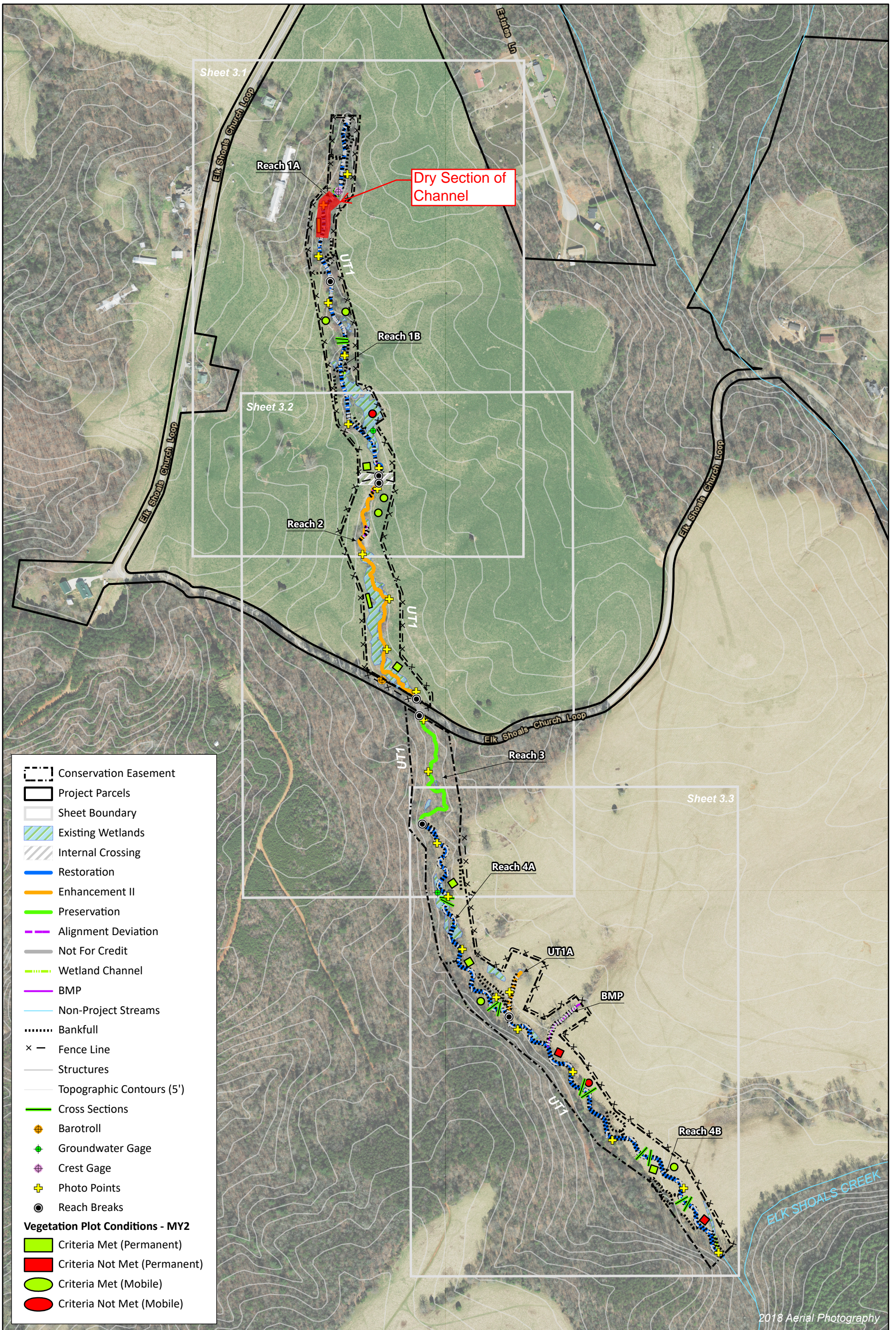


Figure 3.0 Current Condition Plan View (Key)
 Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021
 Alexander County, NC