MONITORING YEAR 1 ANNUAL REPORT
Final

January 2023

CROSS CREEK RANCH SITE
Montgomery County, NC
Yadkin River Basin
HUC 03040104

DMS Project No. 100138
NCDEQ Contract No. 7879-01
DMS RFP No. 16-007879 / Issued: May 6, 2019
USACE Action ID No. 2020-00051
DWR Project No. 2020-0016
Data Collection Dates: February 2022 – November 2022

PREPARED FOR:

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

January 30, 2023

Mr. Kelly Phillips
Project Manager
NCDEQ – Division of Mitigation Services

Subject: Cross Creek Ranch Site – Monitoring Year 1 Draft Report
Montgomery County, NC
Yadkin River Basin – CU# 03040104
DMS Project ID No. 100138
Contract # 7879-01

Dear Mr. Phillips:

On January 20, 2023, Wildlands Engineering received comments from the Division of Mitigation Services (DMS) regarding the Monitoring Year 1 Draft Report for the Cross Creek Ranch Site. The following letter documents DMS feedback and Wildlands' corresponding responses and additions to the Monitoring Year 1 Annual Report.

Review Comments:

- Report Cover: Thank you for including the data collection dates.

- 1.1 Project Quantities and Credits – Table 1: The footnote indicates the total riparian wetland credits have been updated to account for an error in the Mitigation Plan. Please add that the corrections have been updated and are properly itemized in the ledger.

  Response: The footnote now reflects that the corrections have been updated and are properly itemized in the ledger.

- Section 1.2 – Monitoring Year 2 Data Assessment: The Table 2 goal of protecting the site from harmful uses includes visual inspection of the perimeter as the measurement criteria. Please summarize the monitoring activities and results associated with this goal and indicate if the entire easement boundary was observed during MY1 and marked in accordance with the marking specifications.

  Response: While the majority of the easement boundary was observed during MY1, it was not seen in its entirety. Easement marking specifications remain consistent with those portrayed in Figures 1a-c within boundaries observed during MY1. The boundary will be walked in its entirety during MY2, and the MY1 Monitoring Report has been updated to reflect this statement.

- 2.1 Vegetative Assessment: The first paragraph references stems per acre but it is unclear if these are planted stems. Please add "planted" stems where appropriate.

  Response: The word "planted" was omitted from the second sentence in the first paragraph of section 2.1 to account for the fact that while we can definitively know and state the number of planted stems per acre in each fixed vegetation plot, we cannot do so for random vegetation plots. More specifically, because random vegetation plot locations change each year, there is no way to definitively know, or display in Table 6 (refer to Appendix B), whether random vegetation plot stem

counts portrayed in the "Species Included in Approved Mitigation Plan" columns are planted, or volunteers.

- 2.1 Vegetative Assessment: Please indicate in the second paragraph that volunteer species would be inventoried according to the same metrics applied to planted stems.

  Response: The second paragraph has been updated to reflect that all volunteer species, including recently purposed species within Section 2.1 of the MY1 Monitoring Report, have been, and will be, inventoried according to the same metrics applied to planted stems.

- 2.2 Vegetation Areas of Concern: Please indicate how the privet responded to the initial treatment and compare the current stem density, height and coverage area to pre-treatment conditions.

  Response: The effectiveness of the initial treatment and recent treatments are currently being monitored. It is worth noting there was less than a year in between the submittal of the MY0 Monitoring Report and the submittal of the MY1 Monitoring Report, so comparing the treated privet coverage area of MY1 to the privet coverage area observed in MY0 is not indicative of how vegetation areas of concern are responding to treatments. Addressing large vegetation areas of concern will take multiple treatments implemented during multiple growing seasons. These areas will need at least a full year of monitoring to observe the effectiveness of treatments. Stem density of Chinese privet along Clarks Creek has greatly decreased since the initial mechanical treatment in March of 2022. Due to the nature of treating dense tracts of privet, mechanical removals and chemical treatments may continually need follow-up treatments. This will likely be a multi-year endeavor. Wildlands will map and revise polygons within the Site's Vegetation Area of Concern (refer to Figure 1a-c) during MY2 to plan the next round of treatments accordingly. Changes to the size of polygons with the Vegetation Area of Concern and treatments administered during MY2 will be reflected in the MY2 Monitoring Report.

- 2.6 Wetland Assessment: Verify the growing season end date is consistent with the approved mitigation plan. Leaf drop observations etc.

  Response: Based on Wildlands' observations, leaf senescence occurred in approximately mid-October. This contradicts the growing season end date of November 20th defined in the Mitigation Plan. Wildlands will gather more information on growing season end dates in future monitoring years. Until then, the growing season end date of November 20th will be used.

- 2.6 Wetland Assessment: Gages 2, 7, and 9 did not meet their respective hydroperiods. DMS conducted a field inspection on December 9, 2022, which raised the question, are these three wells representative and useful for interpretating wetland classification? Add discussion that identifies the relative gage locations and elevations within the local wetland topography. Are the gages installed on isolated ridges with localized wetland boundaries? Have the gages been field calibrated in their respective installations to accurately correlate their pressure readings with a measured depth to water from ground surface?

  Response: In an effort to best represent the conditions of each wetland re-establishment and rehabilitation zone, gauges 2, 7, and 9 are placed within the middle of their respective wetland boundaries. All gauges are calibrated correctly to accurately correlate their pressure readings with a measured depth to water from ground surface. After construction of the stream channel, it is anticipated that the groundwater table will take some time to recharge. Additional seasons of water table observation are required to better understand hydrology at the Site and thoroughly evaluate the success of wetland re-establishment areas. While Wildlands believes groundwater

wells 2, 7, and 9 to be placed in a way that best interprets wetland classifications, Wildlands will further investigate locations of gauges 2, 7, and 9 in MY2. Wildlands will continue to monitor the success of wetlands wells failing to make their hydroperiods and will add wells accordingly if needed in the future.

- 2.6 Wetland Assessment: Please include discussion of the rainfall data and expected percentile ranking relative to wet/dry years.

  Response: A discussion of the rainfall data has been added to section 2.6 Wetland Assessment.

- 2.7 Monitoring Year 1 Summary: This section indicates the site is meeting the goals of nutrient and sediment reduction. Although this is a likely outcome of the implemented mitigation measures, these goals do not have specified direct measures for success. This goal needs to be re-stated to conform with the goals section. Work at the site has resulted in cattle exclusion, riparian buffer establishment and improved wetland function. These actions are likely to contribute to uplift but this needs to be either summarized in accordance with the goals or quantified.

  Response: Noted. The Monitoring Year 1 Report has been updated to address this comment.

- Appendix A - Stream Photographs: - Photo Point 31 and 32 are duplicates. Please update the photo.

  Response: Photo Point 31 has been updated within the stream photograph log.

- Appendix B – Vegetation Plot Data: Desirable volunteer species not listed in the approved plan were only counted in the three failed plots and one other plot. Please include the volunteer stems in all plots for each monitoring report if there could be potential need for them for calculating stem density in the future.

  Response: Desirable volunteer species not listed in the approved plan will be included in future monitoring reports. Desirable volunteer species were intentionally left out of fixed vegetation plot stem counts in Table 6 (refer to Appendix B) because, per IRT requirements, supplemental plantings and volunteer plants must be present for at least two growing seasons before counting toward success criteria. Within Table 6, stem counts of desirable volunteer species not listed in the approved plan were included in random vegetation plots because it is difficult to ascertain if the stems have been present before construction, or for two growing seasons. Both purposed and approved species inventoried within all random vegetation plots met height requirements of at least 30cm.

Site Inspection Comments:

- DMS conducted a site inspection on December 9, 2022. The conservation easement boundary was found to be adequately marked and protected, no encroachments were observed and site conditions were consistent with the baseline report.

  Response: Noted.

- Improved visibility of the ground surface due to the dormant season leaf drop suggested some of the wetland wells failing to make their hydroperiods may be positioned on localized high ground or could be in need of calibration.

  Response: Noted. See response to comment on 2.6 Wetland Assessment.

Digital Deliverable Comments:

- Photo Point 31 and 32 are duplicates. Please update the photos.

  Response: *Photo Point 31 has been updated within the stream photograph log and a digital copy has been submitted.*

Thank you for your review and providing comments on this submittal. If you have any further questions, please contact me at (919) 851-9986, or by email (jlorch@wildlandseng.com).

Sincerely,

Jason Lorch, *Monitoring Coordinator*

PREPARED BY:

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CROSS CREEK RANCH SITE

Monitoring Year 1 Annual Report

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Section 1: PROJECT OVERVIEW

The Cross Creek Ranch Site (Site) is located in Montgomery County, approximately 1.5 miles northwest of Mount Gilead and 4.5 miles east of Norwood. Table 3 presents information related to the project attributes.

1.1 Project Quantities and Credits

The Site is located on two parcels under one landowner and a conservation easement was recorded on 63.9 acres. Table 1 below shows stream credits by reach and the total amount of stream credits expected at closeout.

Table 1: Project Quantities and Credits

PROJECT MITIGATION QUANTITIES							
Project Segment	**Mitigation Plan Footage**	**As-Built Footage**	**Mitigation Category**	**Restoration Level**	**Mitigation Ratio (X:1)**	**Credits**	**Comments**
STREAMS							
Clarks Creek	3,479	3,479	Warm	EII	4.0	869.750	Fencing Out Livestock, Minor Bank Grading, Invasive Removal
Big Branch	64	15	Warm	R	N/A	0.000	DOT ROW
Big Branch	2,133	2,196	Warm	R	1.0	2,133.000	Full Channel Restoration, Fencing Out Livestock
UT1 R1	2,821	2,866	Warm	R	1.0	2,821.000	Full Channel Restoration, Fencing Out Livestock
UT1 R2	164	167	Warm	R	1.0	164.000	Full Channel Restoration, Fencing Out Livestock
UT1 R2	100	100	Warm	R	N/A	0.000	Culvert Crossing
UT1 R2	423	439	Warm	R	1.0	423.000	Full Channel Restoration, Fencing Out Livestock
UT1B	373	377	Warm	R	1.0	373.000	Full Channel Restoration, Fencing Out Livestock
UT1B	62	62	Warm	R	N/A	0.000	Culvert Crossing
UT1B	868	877	Warm	R	1.0	868.000	Full Channel Restoration, Fencing Out Livestock
UT3	33	47	Warm	R	N/A	0.000	Non-Jurisdictional
UT3 R1	748	754	Warm	R	1.0	748.000	Full Channel Restoration, Fencing Out Livestock
UT3 R2	2,432	2,437	Warm	EII	3.0	810.667	Fencing Out Livestock, Minor Bank Grading
UT3 R3	331	331	Warm	P	10.0	33.100	Conservation Easement
					Totals:	**9,243.517**	

WETLANDS							
Wetland 1	0.442	0.442	Riparian	R	1.0	0.442[2]	
Wetland 2[1]	2.163	2.163	Riparian	R	1.0	2.163	
Wetland 3	1.781	1.781	Riparian	R	1.0	1.781	
Wetland A	0.075	0.075	Riparian	RH	1.5	0.050	
Wetland B	0.116	0.116	Riparian	RH	1.5	0.077	
Wetland D	0.033	0.033	Riparian	RH	1.5	0.022	
Wetland E	0.102	0.102	Riparian	RH	1.5	0.068	
Wetland F	0.103	0.103	Riparian	RH	1.5	0.069	
Wetland G	0.051	0.051	Riparian	RH	1.5	0.034	
Wetland H	0.158	0.158	Riparian	RH	1.5	0.105	
Wetland Q	0.063	0.063	Riparian	RH	1.5	0.042	
					Total:	**4.853**	

1 Wetland 2 boundary includes conversion of the existing farm pond to wetland.
2 Wetland 1 credits have been updated to account for an error in the Mitigation Plan. All corrections are reflected within Table 1 and are properly itemized in the credit ledger.
* Crossing lengths have been removed from restoration footage.

Restoration Level	Stream	Riparian Wetland
	Warm	Riverine
Restoration[2]	7,530.000	
Enhancement II	1,680.417	
Preservation	33.100	
Re-Establishment		4.386
Rehabilitation		0.467
Total Stream Credit	**9,243.517**	
Total Wetland Credit		**4.853[1]**

1 Total Riparian Wetland Credits have been updated to account for an error in the Mitigation Plan.

1.2 Project Goals and Objectives

The project is intended to provide numerous ecological benefits. Table 2 below describes expected outcomes to water quality and ecological processes and provides project goals and objectives.

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.	Reconstruct stream channels slated for restoration with stable dimensions and appropriate depth relative to the existing floodplain. Add bank revetments and instream structures to protect restored/ enhanced streams.	Reduce erosion and sediment inputs; maintain appropriate bed forms and sediment size distribution.	ER stays over 2.2 and BHR below 1.2 with visual assessments showing progression towards stability.	Cross-section monitoring and visual inspections.	No deviations from design.
Exclude livestock from stream channels.	Install fencing to exclude livestock from stream channels, riparian areas, proposed wetland areas, and/or removed livestock from adjacent fields.	Reduce and control sediment inputs; reduce and manage nutrient inputs.	Fence conservation easement to exclude livestock. Install fenced and gated culvert crossings as needed.	Visually inspect the Site to ensure no cattle encroachment is occurring.	Cattle are excluded from project streams.
Improve instream and wetland habitat.	Install habitat features such as cover logs, log sills, and bush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth. Remove farm pond and re-establish forested riparian wetland habitat.	Support biological communities and processes. Provide aquatic habitats for diverse populations of aquatic organisms.	There is no required performance standard for this metric.	N/A	N/A
Reconnect channels with floodplains and riparian wetlands.	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to existing floodplain.	Reduce shear stress on channel; hydrate adjacent wetland areas; filter pollutants out of overbank flows; provide surface storage of water on floodplain; increase groundwater recharge while reducing outflow of stormwater.	Four bankfull events in separate years within monitoring period. 30 consecutive days of flow for intermittent channel.	Crest gauges and/or pressure transducers recording flow elevations.	Big Branch obtained bankfull events in MY1. UT3 R1 obtained 64 days of consecutive flow during MY1.

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Restore wetland function and hydrology.	Restore wetlands through re-establishment of hydrology. Remove the drainage effects of agricultural ditching and maintenance.	Improve terrestrial habitat; and contribute to protection of or improvement of a Water Supply and Nutrient-Sensitive Water.	Free groundwater surface within 12 inches of the ground surface for a minimum of 12% (re-establishment) or 11% (rehabilitation) of the growing season for Montgomery County.	Groundwater gauges will be placed in wetland re-establishment and rehabilitation areas and monitored annually.	6 out of 9 groundwater gauges indicated successful criterion attainment during MY1.
Reduce sediment and nutrient input from adjacent agricultural fields.	Restore riparian stream corridor and pocket wetland areas to slow and filter runoff from adjacent agricultural fields.	Reduction of sediment and nutrients to 303(d) receiving waters.	There is no required performance standard for this metric.	N/A	N/A
Restore and enhance native floodplain and wetland vegetation.	Convert active cattle pasture and previously maintained agricultural areas to forested riparian buffers along all Site streams and wetlands. Treat invasive vegetation along stream corridors. Protect and enhance existing forested riparian buffers.	Provide a canopy to shade streams and reduce thermal loadings; stabilize stream banks and floodplain; support water quality and habitat goals.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre and average height of 7ft at MY5, and 210 stems per acre and average height of 10 ft at MY7. *Shrub and subcanopy species will be omitted from average height calculations.	One hundred square meter vegetation plots are placed on 2% of the planted area of the Site and monitored annually.	26 out of 29 vegetation plots have a planted stem density greater than 320 stems per acre. Vegetation plots 25 and 28 have a stem density of 202 planted stems per acre. Vegetation plot 27 has a stem density of 121 planted stems per acre.
Permanently protect the project Site from harmful uses.	Establish conservation easements on the Site.	Ensure that development and agricultural uses that would damage the Site or reduce the benefits of the project are prevented.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	No easement encroachments. Several portions of the Site boundary were visually inspected. A full boundary inspection will be completed in MY2.

1.3 Project Attributes

The Site was an active cattle farm composed of cattle pastures and previously deforested timber areas. Historical aerials from 1955 to 2018 (Wildlands, 2021) showed that onsite streams existed in their same approximate location for the last 65 years with minor changes to land management. Table 3 below and Table 8 in Appendix C present additional information on pre-restoration conditions.

Table 3: Project Attributes

PROJECT INFORMATION			
Project Name	Cross Creek Ranch Site	County	Montgomery County
Project Area (acres)	63.9	Project Coordinates	35.232211 N, 80.02425 W
PROJECT WATERSHED SUMMARY INFORMATION			
Physiographic Province	Piedmont	River Basin	Pee Dee
USGS HUC 8-digit	03040104	USGS HUC 14-digit	03040104020020
DWR Sub-basin	03-07-10	Land Use Classification	24% agriculture, 74% forested, 5% developed
Project Drainage Area (acres)	16,337	Percentage of Impervious Area	0.7%

RESTORATION TRIBUTARY SUMMARY INFORMATION					
Parameters	**Clarks Creek**	**Big Branch**	**UT1**	**UT1B**	**UT3**
Pre-project length (feet)	3,479	2,044	3,604	1,571	3,611
Post-project (feet)	3,479	2,211	3,535	1,292	3,568
Valley confinement	Unconfined	Unconfined	Moderately Confined	Moderately Confined	Confined
Drainage area (acres)	16,667	1,464	725	348	96
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Perennial	Perennial
DWR Water Quality Classification	C				
Dominant Stream Classification (existing)	N/A	C4/1	E4/1, G3c/1	B4c/1	F1
Dominant Stream Classification (proposed)	N/A	C4/1	C4/1	C4/1	B4
Dominant Evolutionary class (Simon) if applicable	V	II	III/IV	IV	III

REGULATORY CONSIDERATIONS			
Parameters	**Applicable?**	**Resolved?**	**Supporting Documentation**
Water of the United States - Section 404	Yes	Yes	USACE Nationwide Permit No. 27 and DWQ 401 Water Quality Certification No. 4134.
Water of the United States - Section 401	Yes	Yes	
Endangered Species Act	Yes	Yes	Categorical Exclusion in Mitigation Plan (Wildlands, 2021)
Historic Preservation Act	Yes	Yes	
Coastal Zone Management Act (CZMA or CAMA)	N/A	N/A	N/A
Essential Fisheries Habitat	N/A	N/A	N/A

Section 2: MONITORING YEAR 1 DATA ASSESSMENT

Annual monitoring and Site visits were conducted during MY1 to assess the condition of the project. The vegetation and stream success criteria for the Site follow the approved success criteria presented in the Mitigation Plan (Wildlands, 2021). Performance criteria for vegetation, stream, and hydrologic assessment are located in Section 1.2 Table 2: Goals, Performance Criteria, and Functional Improvements. Methodology for annual monitoring is presented in the MY0 Annual Report (Wildlands, 2022).

2.1 Vegetative Assessment

The MY1 vegetative survey was completed in September 2022. Vegetation monitoring resulted in a stem density range of 121 to 648 planted stems per acre. Out of the 29 vegetation plots, 26 exceed the interim requirement of 320 stems per acre required at MY3. Herbaceous vegetation is also abundant across the Site and includes native pollinator species, indicating a healthy riparian habitat. The riparian habitat is helping to reduce nutrient runoff from the cattle fields outside the easement and stabilizing the stream banks. Refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table and Appendix B for Vegetation Plot Data.

Random vegetation plot 25, located along UT1, and random vegetation plots 27 and 28, located along Clarks Creek, do not meet the interim requirement. Within random vegetation plots all stems inventoried and counted in Table 6 (refer to Appendix B) were at least 30 cm in height. Stems under 30 cm were not counted. As seen through visual observations and vegetation plot data, many volunteers are coming in across the Site that were not in the approved Mitigation Plan planting list. Wildlands purposes to include several desirable volunteer species. Wildlands purposes to include boxelder (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), honey locust (*Gleditsia triacanthos*), and white oak (*Quercus alba*) as desirable species that should be counted toward the vegetation success criteria. All purposed volunteer species were inventoried according to the same metrics applied to planted stems, and will continue to be inventoried in such a way.

There were a significant number of mature hardwood trees that were left untouched from construction. A visual site assessment in October 2022 indicated that mature hardwood trees in construction areas have survived. Planted trees and volunteer species are growing throughout the Site and starting to fill in an understory that will eventually become a mature hardwood forest.

2.2 Vegetation Areas of Concern

The primary cause for live stake mortality represented by random vegetation plots 27 and 28 along Clarks Creek is likely competition with fescue. These areas will be evaluated and treated in 2023 with ring-sprays to limit fescue competition.

A visual assessment conducted on October 26, 2022, revealed that Chinese privet is present along portions of UT3 and UT1 (Figure 1a-b). A foliar chemical treatment will be applied to UT3 and UT1 during monitoring year 2 (MY2).

Dense Chinese privet *(Ligustrum sinense)* along Clarks Creek (Figure 1a-b) was removed mechanically in March 2022 on 19.57 acres. Initial removal was successful, with privet stem density greatly decreasing along Clarks Creek. Due to the nature of treating dense tracts of Chinese privet, addressing vegetation areas of concern will likely be a multi-year endeavor. Wildlands recognizes that multiple treatments are typically needed for effective invasive plant control. Previously treated areas will be re-treated with a foliar chemical treatment as necessary, and continue to be monitored in MY2. Refer to Appendix A for

the Vegetation Condition Assessment Table and Figures 1a-c for a mapped representation of previously removed Chinese privet on the Site, as well as areas to be treated in MY2.

2.3 Stream Assessment

Morphological surveys for MY1 were conducted in October 2022. All streams within the Site are stable and functioning as designed. All 16 cross-sections at the Site show little to no change in the bankfull area and width-to-depth ratio, and bank height ratios are less than 1.2. Pebble count data is no longer required per the September 29, 2021 Technical Work Group Meeting and is not included in this report. The IRT reserves the right to request pebble count data/particle distributions if deemed necessary during the monitoring period. Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table and Stream Photographs and Appendix C for Stream Geomorphology Data.

2.4 Stream Areas of Concern

No stream areas of concern were identified during MY1.

2.5 Hydrology Assessment

Big Branch exhibited six bankfull events in MY1 as of October 21, 2022, and is on track to meet performance standards of four bankfull events in separate years during the 7-year monitoring period. UT3 R1, UT1 R1, and UT1B have had no bankfull events as of October 21, 2022. Additional seasons of observation are required to better understand hydrology at the site and thoroughly evaluate the success of project reaches.

In addition, the presence of baseflow must be documented on intermittent reaches (UT3 R1) for a minimum of 30 consecutive days during a normal precipitation year. The gauge on UT3 R1 exceeded criteria with 64 consecutive days of flow during MY1.

2.6 Wetland Assessment

The performance criterion for groundwater gauges (GW) 5 and 6 is a free groundwater surface within 12 inches of the soil surface for 11% of the growing season (28 days). The performance criterion for GWs 1-4 and GWs 7-9 is a free groundwater surface within 12 inches of the soil surface for 12% of the growing season (30 days). Growing season dates approved in the Mitigation Plan are March 17 through November 20, with allowance for modification based on soil temperature data and bud burst. During MY1, bud burst of red buckeye (*Aesculus pavia*) was observed on February 23, 2022 and soil temperature was above 41 degrees Fahrenheit for the entire data observation period. Therefore, growing season dates used for MY1 wetland hydrology evaluation are March 1, 2022 through November 20, 2022. The soil temperature probe recorded data properly from February 11, 2022, until March 13, 2022, after which it began to malfunction. Because of the probe malfunction, data from a soil temperature probe deployed at a nearby mitigation site (approximately 28 miles southwest of the Site) will be referred to from March 13, 2022, to October 21, 2022. Refer to Appendix D for the Soil Temperature Probe Plot. The soil temperature probe was replaced on October 21, 2022.

Six of the nine GWs at the Site attained the success criterion for MY1 (Table 13). Refer to Appendix D for hydrologic data. GW 5 and 6 within wetland rehabilitation zones exceed hydroperiod criterion. GWs 1, 3, 4, and 8 within wetland re-establishment zones exceed hydroperiod criterion. GWs 2, 7, and 9 have not yet met hydroperiod criterion for wetland re-establishment zones in MY1. GW 9 experienced a malfunction in which data was not recorded from May 9, 2022 to August 12, 2022. After construction of the stream channel, it is anticipated that the groundwater table will take some time to recharge. Additional seasons of water table observation are required to better understand hydrology at the Site and thoroughly evaluate the success of wetland re-establishment areas.

Furthermore, groundwater hydrology across the Site was affected by dry conditions during the winter, summer, and fall of 2022. According to the National Integrated Drought Information System, Montgomery County experienced severe (D2) to abnormally dry conditions during the entire month of December 2021. This was followed by moderate drought (D1) conditions to abnormally dry conditions throughout January 2022, and abnormally dry conditions (D0) from February until mid-March 2022 (NOAA, 2023). Abnormally dry conditions re-occurred from the beginning of June through the beginning of October, with a D1 drought beginning by the end of October and extending to the beginning of December 2022 for approximately 80% to 100% of Montgomery county's geographic area (NOAA, 2023). Additionally, the annual precipitation total is close to the 30th percentile value obtained from the Agricultural Applied Climate Information System DUNN 4 NW, NC WETS table (ACIS, 2022).

2.7 Monitoring Year 1 Summary

Out of the 29 vegetation plots, 26 exceed the MY3 interim requirement of 320 stems per acre. When including desirable volunteers, all 29 vegetation plots are on track to meet success criteria. Chinese privet is present throughout approximately 27 acres of the project area, primarily along Clarks Creek and UT3, and will be treated in MY2. All streams within the Site are stable. Six bankfull events were documented on Big Branch. UT3 R1, UT1 R1, and UT1B have yet to obtain a bankfull event during MY1, but all streams are anticipated to meet bankfull criteria during MY2 with a full year of data available. UT3 R1 has exhibited 64 consecutive days of stream flow, fulfilling MY1 success requirements. Overall, the Site is meeting the goals outlined in Table 2, which were established within the Mitigation Plan, and is on track to meet final success criteria.

Summary information and data related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

Section 3: REFERENCES

ACIS. 2022. Agricultural Applied Climate Information System (AgACIS). WETS Station: DUNN 4 NW, NC. Accessed at: https://agacis.rcc-acis.org/?fips=37085

Doll, B.A., Grabow, G.L., Hall, K.A., Halley, J., Harman, W.A., Jennings, G.D., and Wise, D.E. 2003. Stream Restoration A Natural Channel Design Handbook.

Harrelson, C.C., Rawlins, C.L., Potyondy, J.P. 1994. *Stream Channel Reference Sites: An Illustrated Guide to Field Technique.* Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

NOAA. 2023. National Integrated Drought Information System. Drought Conditions for Montgomery County. Accessed at: https://www.drought.gov/states/north-carolina/county/Montgomery

North Carolina Division of Water Resources (DWR). 2008. Yadkin-Pee Dee River Basin Plan.

North Carolina Ecosystem Enhancement Program (EEP), 2009. Upper Yadkin River Basin Restoration Priorities.

Rosgen, D. L. 1994. A classification of natural rivers. *Catena* 22:169-199.

Rosgen, D.L. 1996. Applied River Morphology. Pagosa Springs, CO: Wildland Hydrology Books.

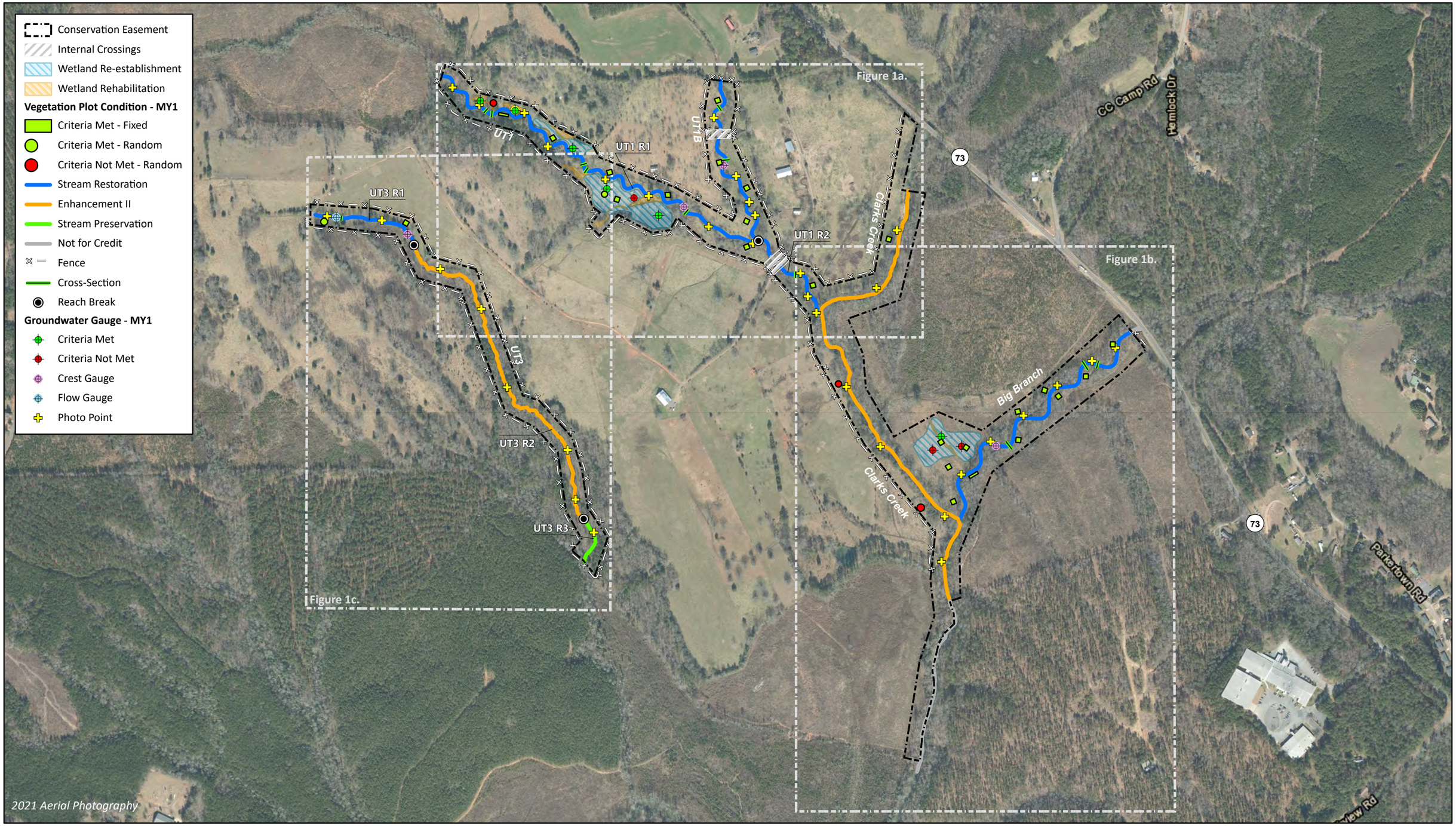
Rosgen, D.L. 1997. A Geomorphological Approach to Restoration of Incised Rivers. Proceedings of the Conference on Management of Landscapes Disturbed by Channel Incision. Center For Computational Hydroscience and Bioengineering, Oxford Campus, University of Mississippi, Pages 12-22.

United States Army Corps of Engineers. 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

United States Geological Survey. 1998. North Carolina Geology.

Wildlands Engineering, Inc. 2021. Cross Creek Ranch Mitigation Project Mitigation Plan. DMS, Raleigh, NC.

Wildlands Engineering, Inc. 2022. Cross Creek Ranch Site Monitoring Year 0 (MY0) Annual Report. DMS, Raleigh, NC



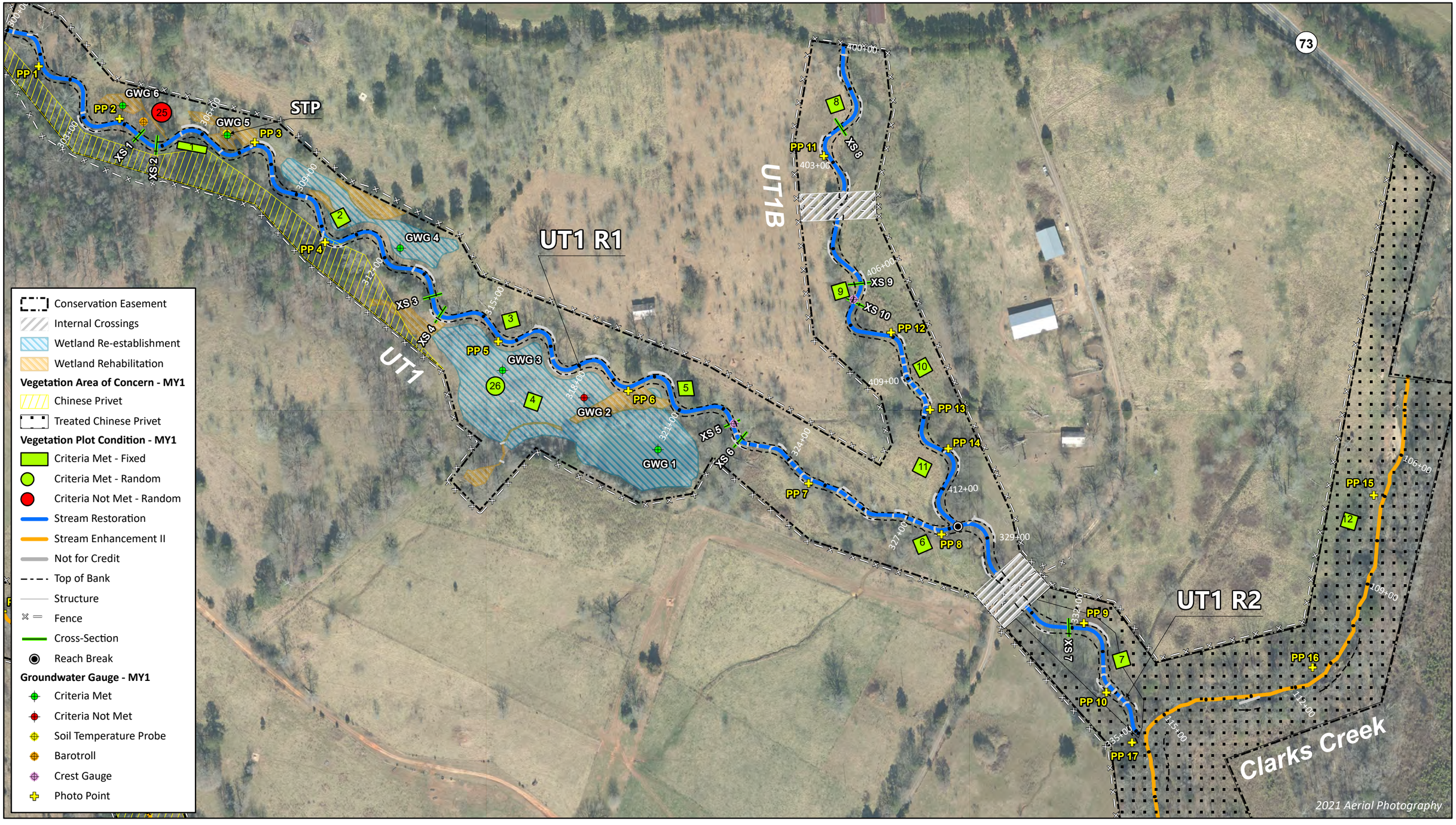
WILDLANDS ENGINEERING

0 600 1,200 Feet

N

Figure 1. Current Condition Plan View
Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

Montgomery County, NC



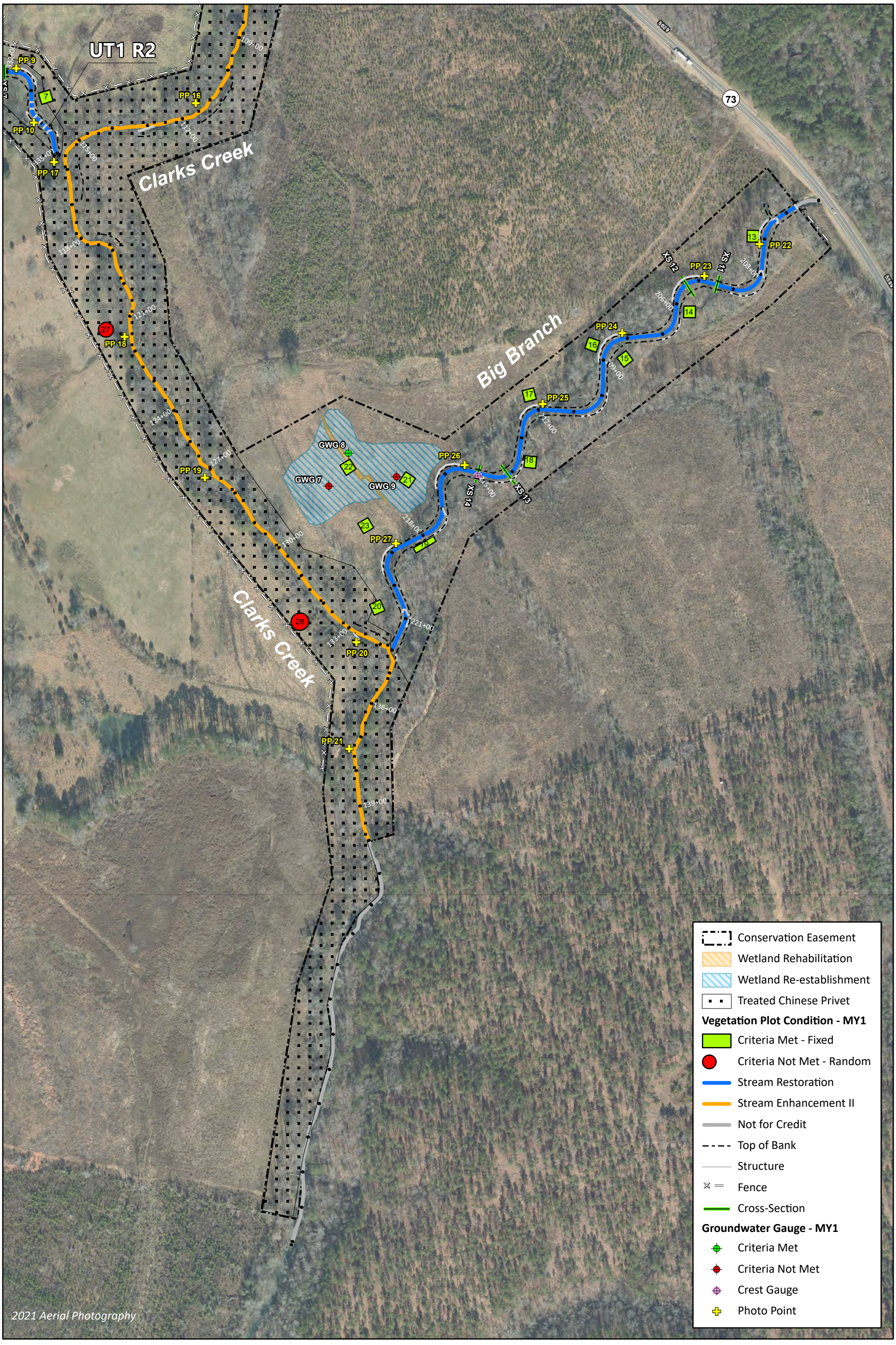
WILDLANDS ENGINEERING

0 200 400 Feet

N

Figure 1a. Current Condition Plan View
Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

Montgomery County, NC



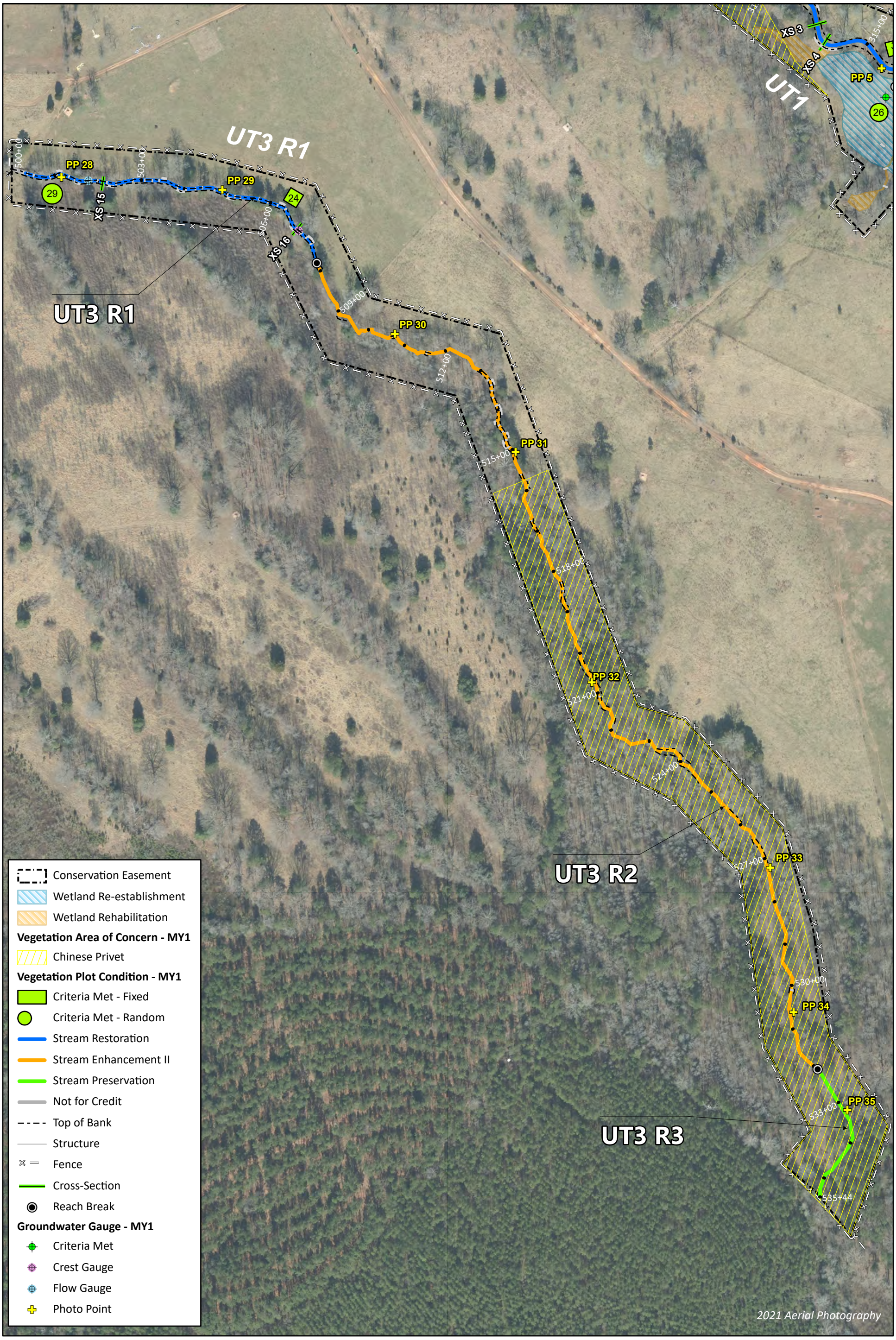
WILDLANDS ENGINEERING

0 250 500 Feet

N

Figure 1b. Current Condition Plan View
Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

Montgomery County, NC



WILDLANDS ENGINEERING

0 200 400 Feet

N

Figure 1c. Current Condition Plan View
Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

Montgomery County, NC

APPENDIX A. VISUAL ASSESSMENT DATA

Table 4. Visual Stream Morphology Stability Assessment Table

Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

UT1 R1

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	2,866
					Assessed Bank Length	5,732
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	9	9		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	17	17		100%

Visual assessment was completed October 26, 2022.

UT1 R2

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	606
					Assessed Bank Length	1,212
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	3	3		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	6	6		100%

Visual assessment was completed October 26, 2022.

Table 4. Visual Stream Morphology Stability Assessment Table

Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

UT1B

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	1,254
					Assessed Bank Length	2,508
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	7	7		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	11	11		100%

Visual assessment was completed October 26, 2022.

Clark's Creek

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	3,479
					Assessed Bank Length	6,958
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	0	0		N/A
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	1	1		100%

Visual assessment was completed October 26, 2022.

Table 4. Visual Stream Morphology Stability Assessment Table

Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

Big Branch

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	2,196
					Assessed Bank Length	4,392
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	5	5		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	12	12		100%

Visual assessment was completed October 26, 2022.

UT3 R1

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	754
					Assessed Bank Length	1,508
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	13	13		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	8	8		100%

Visual assessment was completed October 26, 2022.

Table 4. Visual Stream Morphology Stability Assessment Table

Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

UT3 R2

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
				Assessed Stream Length		2,437
				Assessed Bank Length		4,874
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	3	3		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	5	5		100%

Visual assessment was completed October 26, 2022.

UT3 R3

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
				Assessed Stream Length		331
				Assessed Bank Length		662
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	0	0		N/A
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	0	0		N/A

Visual assessment was completed October 26, 2022.

Table 5. Vegetation Condition Assessment Table
Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

Planted Acreage **43.50**

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10	0.00	0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10	0.00	0%
		Total	**0.00**	**0%**
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10	0.00	0%
		Cumulative Total	**0.00**	**0%**

Visual assessment was completed October 26, 2022.

Easement Acreage **63.90**

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Invasive species included in summation above should be identified in report summary.	0.10	27.11	42%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	none	0 Encroachments Noted / 0 ac	

Visual assessment was completed October 26, 2022.

STREAM PHOTOGRAPHS

	
PHOTO POINT 1 UT1 R1 – upstream *(10/17/2022)*	**PHOTO POINT 1 UT1 R1 – downstream *(10/17/2022)***
	
PHOTO POINT 2 UT1 R1 – upstream *(10/17/2022)*	**PHOTO POINT 2 UT1 R1 – downstream *(10/17/2022)***
	
PHOTO POINT 3 UT1 R1 – upstream *(10/17/2022)*	**PHOTO POINT 3 UT1 R1 – downstream *(10/17/2022)***

PHOTO POINT 4 UT1 R1 – upstream *(10/17/2022)*

PHOTO POINT 4 UT1 R1 – downstream *(10/17/2022)*

PHOTO POINT 5 UT1 R1 – upstream *(10/17/2022)*

PHOTO POINT 5 UT1 R1 – downstream *(10/17/2022)*

PHOTO POINT 6 UT1 R1 – upstream *(10/17/2022)*

PHOTO POINT 6 UT1 R1 – downstream *(10/17/2022)*

	
PHOTO POINT 7 UT1 R1 – upstream *(10/17/2022)*	**PHOTO POINT 7 UT1 R1 – downstream *(10/17/2022)***
	
PHOTO POINT 8 UT1 R1 – upstream *(10/17/2022)*	**PHOTO POINT 8 UT1 R1 – downstream *(10/17/2022)***
	
PHOTO POINT 9 UT1 R2 – upstream *(10/17/2022)*	**PHOTO POINT 9 UT1 R2 – downstream *(10/17/2022)***

	
PHOTO POINT 10 UT1 R2 – upstream *(10/17/2022)*	**PHOTO POINT 10 UT1 R2 – downstream *(10/17/2022)***
	
PHOTO POINT 11 UT1B – upstream *(10/17/2022)*	**PHOTO POINT 11 UT1B – downstream *(10/17/2022)***
	
PHOTO POINT 12 UT1B – upstream *(10/17/2022)*	**PHOTO POINT 12 UT1B – downstream *(10/17/2022)***

PHOTO POINT 13 UT1B – upstream *(10/17/2022)*

PHOTO POINT 13 UT1B – downstream *(10/17/2022)*

PHOTO POINT 14 UT1B – upstream *(10/17/2022)*

PHOTO POINT 14 UT1B – downstream *(10/17/2022)*

PHOTO POINT 15 Clarks Creek – upstream *(10/17/2022)*

PHOTO POINT 15 Clarks Creek – downstream *(10/17/2022)*

	
PHOTO POINT 16 Clarks Creek – upstream *(10/17/2022)*	**PHOTO POINT 16 Clarks Creek – downstream *(10/17/2022)***
	
PHOTO POINT 17 Clarks Creek – upstream *(10/17/2022)*	**PHOTO POINT 17 Clarks Creek – downstream *(10/17/2022)***
	
PHOTO POINT 18 Clarks Creek – upstream *(10/17/2022)*	**PHOTO POINT 18 Clarks Creek – downstream *(10/17/2022)***

	
PHOTO POINT 19 Clarks Creek – upstream *(10/17/2022)*	**PHOTO POINT 19 Clarks Creek – downstream *(10/17/2022)***
	
PHOTO POINT 20 Clarks Creek – upstream *(10/17/2022)*	**PHOTO POINT 20 Clarks Creek – downstream *(10/17/2022)***

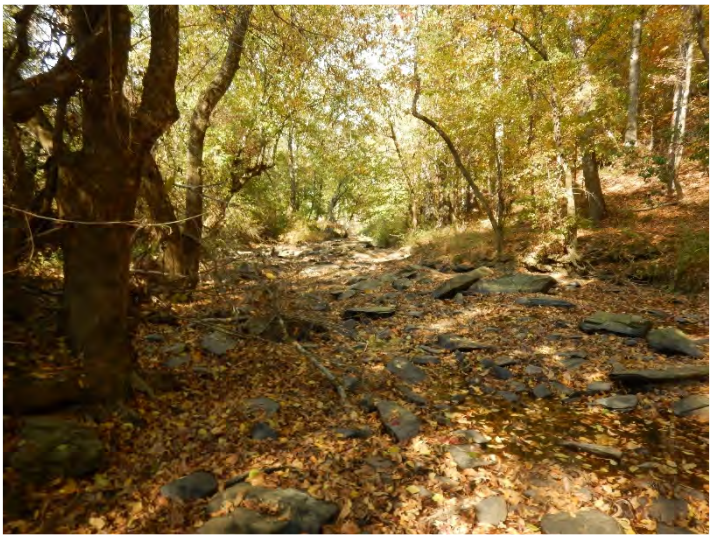
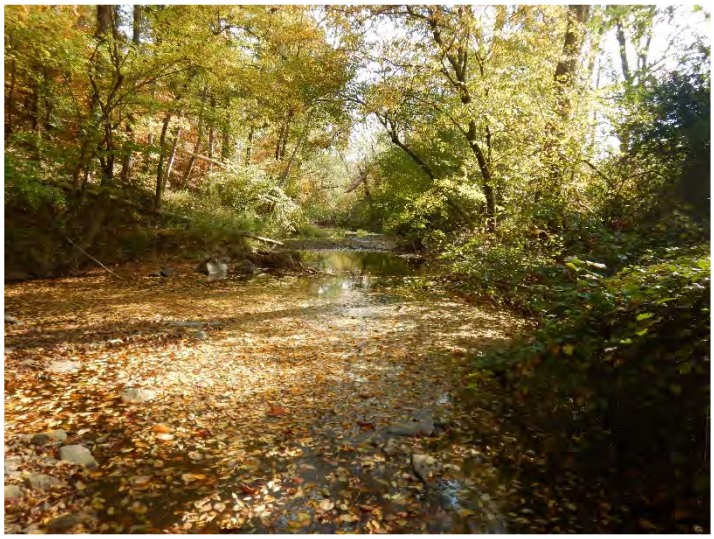

	

PHOTO POINT 21 Clarks Creek – upstream *(10/17/2022)*	**PHOTO POINT 21 Clarks Creek – downstream *(10/17/2022)***

PHOTO POINT 22 Big Branch – upstream *(10/17/2022)*

PHOTO POINT 22 Big Branch – downstream *(10/17/2022)*

PHOTO POINT 23 Big Branch – upstream *(10/17/2022)*

PHOTO POINT 23 Big Branch – downstream *(10/17/2022)*

PHOTO POINT 24 Big Branch – upstream *(10/17/2022)*

PHOTO POINT 24 Big Branch – downstream *(10/17/2022)*

	
PHOTO POINT 25 Big Branch – upstream *(10/17/2022)*	**PHOTO POINT 25 Big Branch – downstream *(10/17/2022)***
	
PHOTO POINT 26 Big Branch – upstream *(10/17/2022)*	**PHOTO POINT 26 Big Branch – downstream *(10/17/2022)***
	
PHOTO POINT 27 Big Branch – upstream *(10/17/2022)*	**PHOTO POINT 27 Big Branch – downstream *(10/17/2022)***

	
PHOTO POINT 28 UT3 R1 – upstream *(10/17/2022)*	**PHOTO POINT 28 UT3 R1 – downstream *(10/17/2022)***
	
PHOTO POINT 29 UT3 R1 – upstream *(10/17/2022)*	**PHOTO POINT 29 UT3 R1 – downstream *(10/17/2022)***
	
PHOTO POINT 30 UT3 R2 – upstream *(10/17/2022)*	**PHOTO POINT 30 UT3 R2 – downstream *(10/17/2022)***

	
PHOTO POINT 31 UT3 R2 – upstream *(10/17/2022)*	**PHOTO POINT 31 UT3 R2 – downstream *(10/17/2022)***
	
PHOTO POINT 32 UT3 R2 – upstream *(10/17/2022)*	**PHOTO POINT 32 UT3 R2 – downstream *(10/17/2022)***
	
PHOTO POINT 33 UT3 R2 – upstream *(10/17/2022)*	**PHOTO POINT 33 UT3 R2 – downstream *(10/17/2022)***

CULVERT CROSSING PHOTOGRAPHS

UT1 R2 - Looking Upstream *(10/17/2022)*

UT1 R2 - Looking Downstream *(10/17/2022)*

UT1 R2 Culvert Crossing – Looking Southwest *(10/26/2022)*

UT1 R2 Culvert Crossing – Looking Northeast *(10/26/2022)*

UT1B - Looking Upstream (*11/21/2022*)

UT1B - Looking Downstream (*11/21/2022*)

	
UT1B Culvert Crossing – Looking West (*10/26/2022*)	**UT1B Culvert Crossing - Looking East (*10/26/2022*)**

VEGETATION PLOT PHOTOGRAPHS

FIXED VEG PLOT 1 ***(09/15/2022)***

FIXED VEG PLOT 2 ***(09/15/2022)***

FIXED VEG PLOT 3 ***(09/15/2022)***

FIXED VEG PLOT 4 ***(09/15/2022)***

FIXED VEG PLOT 5 ***(09/15/2022)***

FIXED VEG PLOT 6 ***(09/15/2022)***

FIXED VEG PLOT 7 *(09/15/2022)*

FIXED VEG PLOT 8 *(09/15/2022)*

FIXED VEG PLOT 9 *(09/15/2022)*

FIXED VEG PLOT 10 *(09/15/2022)*

FIXED VEG PLOT 11 *(09/15/2022)*

FIXED VEG PLOT 12 *(09/15/2022)*

FIXED VEG PLOT 13 ***(09/15/2022)***

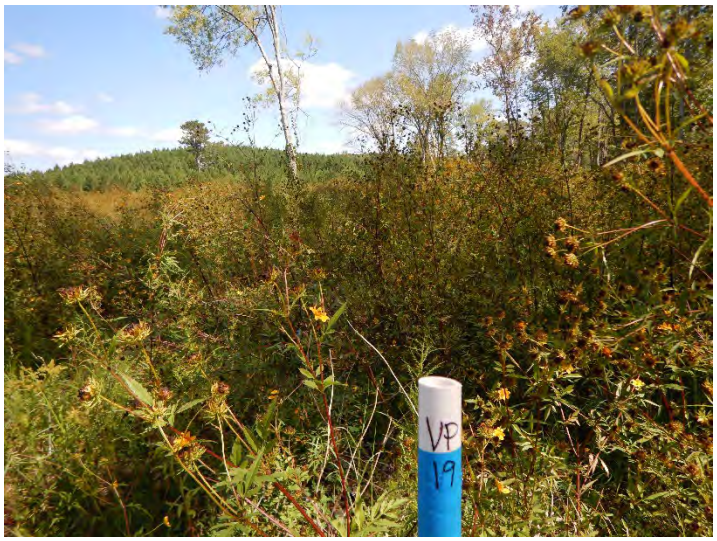
FIXED VEG PLOT 14 ***(09/15/2022)***

FIXED VEG PLOT 15 ***(09/15/2022)***

FIXED VEG PLOT 16 ***(09/15/2022)***

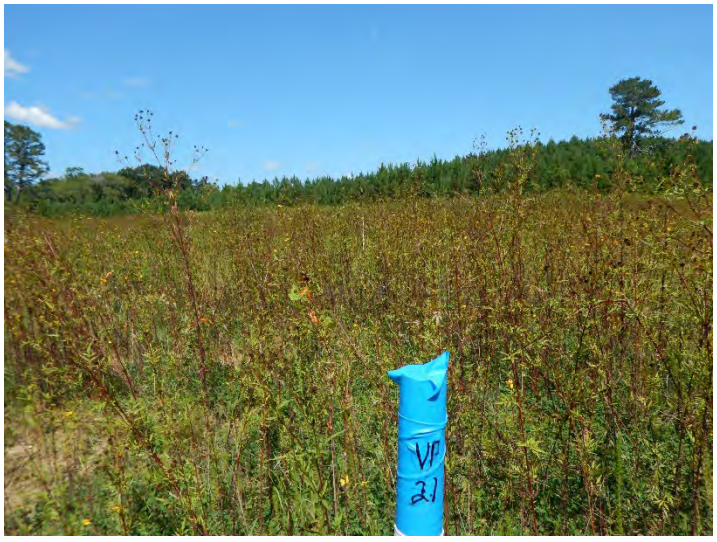
FIXED VEG PLOT 17 ***(09/15/2022)***

FIXED VEG PLOT 18 ***(09/15/2022)***



FIXED VEG PLOT 19 ***(09/15/2022)***

FIXED VEG PLOT 20 ***(09/15/2022)***



FIXED VEG PLOT 21 ***(09/15/2022)***

FIXED VEG PLOT 22 ***(09/15/2022)***

FIXED VEG PLOT 23 ***(09/15/2022)***

FIXED VEG PLOT 24 ***(10/17/2022)***

RANDOM VEG PLOT 25 *(09/15/2022)*

RANDOM VEG PLOT 26 *(09/15/2022)*

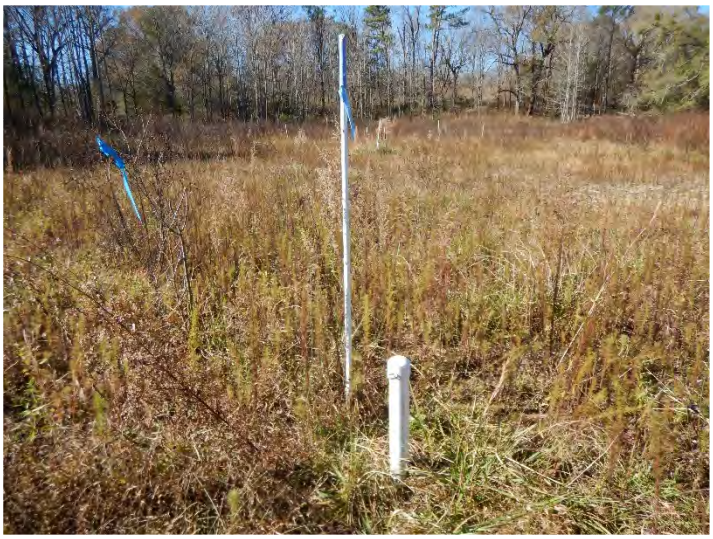
RANDOM VEG PLOT 27 *(09/15/2022)*

RANDOM VEG PLOT 28 *(09/15/2022)*

RANDOM VEG PLOT 29 *(10/17/2022)*

GROUNDWATER WELL PHOTOGRAPHS

GROUNDWATER WELL 1 – *(11/21/2022)*

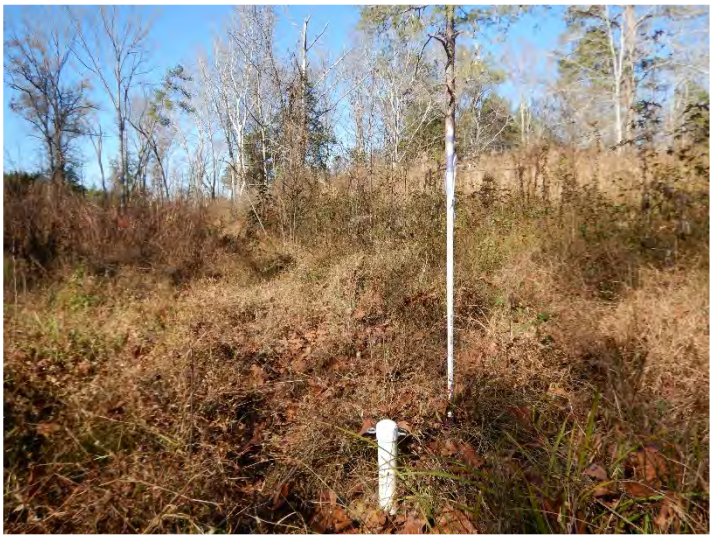


GROUNDWATER WELL 2 – *(11/21/2022)*

GROUNDWATER WELL 3 – *(11/21/2022)*

GROUNDWATER WELL 4 – *(11/21/2022)*

GROUNDWATER WELL 5 – *(11/21/2022)*



GROUNDWATER WELL 6 – *(11/21/2022)*

GROUNDWATER WELL 7 – *(11/21/2022)*

GROUNDWATER WELL 8 – *(11/21/2022)*

GROUNDWATER WELL 9 – *(11/21/2022)*

APPENDIX B. VEGETATION PLOT DATA

Table 6. Vegetation Plot Data
Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

Planted Acreage	43.5
Date of Initial Plant	2022-03-10
Date of Current Survey	2022-09-15
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F		Veg Plot 5 F		Veg Plot 6 F		Veg Plot 7 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Alnus serrulata	tag alder	Tree	OBL							3	3						
	Asimina triloba	pawpaw	Tree	FAC											1	1	1	1
	Betula nigra	river birch	Tree	FACW	3	3	3	3	2	2	1	1	2	2	1	1	2	2
	Celtis laevigata	sugarberry	Tree	FACW	1	1			2	2			2	2			2	2
	Cephalanthus occidentalis	buttonbush	Shrub	OBL							1	1						
	Diospyros virginiana	common persimmon	Tree	FAC	2	2			1	1			2	2	2	2	1	1
	Euonymus americanus	strawberry bush	Shrub	FAC	1	1							1	1	1	1	1	1
	Nyssa biflora	swamp gum	Tree	FACW							1	1						
	Platanus occidentalis	American sycamore	Tree	FACW	1	1	1	1	3	3	4	4	1	1	3	3	3	3
	Populus deltoides	eastern cottonwood	Tree	FAC	3	3			1	1			1	1	1	1		
	Quercus lyrata	overcup oak	Tree	OBL			4	4										
	Quercus michauxii	swamp chestnut oak	Tree	FACW	1	1	3	3	2	2	1	1	1	1	2	2	1	1
	Quercus phellos	willow oak	Tree	FAC	1	1			2	2			1	1	2	2		
	Salix nigra	black willow	Tree	OBL			1	1										
	Ulmus americana	American elm	Tree	FACW			2	2			2	2						
	Ulmus rubra	slippery elm	Tree	FAC	1	1			2	2			3	3			4	4
Sum				Performance Standard	14	14	14	14	15	15	13	13	14	14	13	13	15	15
Post Mitigation Plan Species	Acer negundo	boxelder	Tree	FAC														
	Fraxinus pennsylvanica	green ash	Tree	FACW														
	Gleditsia triacanthos	honeylocust	Shrub	FAC														
	Liquidambar styraciflua	*sweetgum*	*Tree*	*FAC*														
	Quercus alba	white oak	Tree	FACU														
Sum				Proposed Standard	14	14	14	14	15	15	13	13	14	14	13	13	15	15
Invasives	*Ligustrum sinense*	*Chinese privet*	*Tree*	*FACU*														
Mitigation Plan Performance Standard	Current Year Stem Count					14		14		15		13		14		13		15
	Stems/Acre					567		567		607		526		567		526		607
	Species Count					9		6		8		7		9		8		8
	Dominant Species Composition (%)					21		29		20		31		21		23		27
	Average Plot Height (ft.)					2		2		2		2		2		3		2
	% Invasives					0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					14		14		15		13		14		13		15
	Stems/Acre					567		567		607		526		567		526		607
	Species Count					9		6		8		7		9		8		8
	Dominant Species Composition (%)					21		29		20		31		21		23		27
	Average Plot Height (ft.)					2		2		2		2		2		3		2
	% Invasives					0		0		0		0		0		0		0

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

Table 6. Vegetation Plot Data
Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

Planted Acreage	43.5
Date of Initial Plant	2022-03-10
Date of Current Survey	2022-09-15
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 8 F		Veg Plot 9 F		Veg Plot 10 F		Veg Plot 11 F		Veg Plot 12 F		Veg Plot 13 F		Veg Plot 14 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Alnus serrulata	tag alder	Tree	OBL														
	Asimina triloba	pawpaw	Tree	FAC			1	1							1	1		
	Betula nigra	river birch	Tree	FACW	4	4	2	2	1	1	1	1	1	1	2	2	1	1
	Celtis laevigata	sugarberry	Tree	FACW	1	1	2	2	1	1			1	1	1	1	1	1
	Cephalanthus occidentalis	buttonbush	Shrub	OBL														
	Diospyros virginiana	common persimmon	Tree	FAC	1	1			3	3	2	2	2	2	3	3	2	2
	Euonymus americanus	strawberry bush	Shrub	FAC	1	1			1	1	1	1	1	1	1	1	1	1
	Nyssa biflora	swamp gum	Tree	FACW														
	Platanus occidentalis	American sycamore	Tree	FACW	3	3	3	3	1	1	2	2	1	1	2	2	3	3
	Populus deltoides	eastern cottonwood	Tree	FAC	1	1	2	2	3	3	1	1	2	2	1	1	2	2
	Quercus lyrata	overcup oak	Tree	OBL														
	Quercus michauxii	swamp chestnut oak	Tree	FACW	2	2	1	1			2	2	3	3			2	2
	Quercus phellos	willow oak	Tree	FAC	1	1	1	1	1	1	1	1	2	2	2	2	1	1
	Salix nigra	black willow	Tree	OBL														
	Ulmus americana	American elm	Tree	FACW			1	1										
	Ulmus rubra	slippery elm	Tree	FAC							1	1	3	3	2	2	2	2
Sum				Performance Standard	14	14	13	13	11	11	11	11	16	16	15	15	15	15
Post Mitigation Plan Species	Acer negundo	boxelder	Tree	FAC														
	Fraxinus pennsylvanica	green ash	Tree	FACW														
	Gleditsia triacanthos	honeylocust	Shrub	FAC														
	Liquidambar styraciflua	*sweetgum*	*Tree*	*FAC*														
	Quercus alba	white oak	Tree	FACU														
Sum				Proposed Standard	14	14	13	13	11	11	11	11	16	16	15	15	15	15
Invasives	*Ligustrum sinense*	*Chinese privet*	*Tree*	*FACU*														
Mitigation Plan Performance Standard				Current Year Stem Count		14		13		11		11		16		15		15
				Stems/Acre		567		526		445		445		648		607		607
				Species Count		8		8		7		8		9		9		9
				Dominant Species Composition (%)		29		23		27		18		19		20		20
				Average Plot Height (ft.)		2		3		3		2		2		2		2
				% Invasives		0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard				Current Year Stem Count		14		13		11		11		16		15		15
				Stems/Acre		567		526		445		445		648		607		607
				Species Count		8		8		7		8		9		9		9
				Dominant Species Composition (%)		29		23		27		18		19		20		20
				Average Plot Height (ft.)		2		3		3		2		2		2		2
				% Invasives		0		0		0		0		0		0		0

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3). The ""Mitigation Plan Performance Standard"" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 6. Vegetation Plot Data
Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

Planted Acreage	43.5
Date of Initial Plant	2022-03-10
Date of Current Survey	2022-09-15
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 15 F		Veg Plot 16 F		Veg Plot 17 F		Veg Plot 18 F		Veg Plot 19 F		Veg Plot 20 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Alnus serrulata	tag alder	Tree	OBL												
	Asimina triloba	pawpaw	Tree	FAC	1	1			1	1	1	1				
	Betula nigra	river birch	Tree	FACW	2	2	3	3	1	1	5	5	3	3	1	1
	Celtis laevigata	sugarberry	Tree	FACW	2	2	2	2	1	1	1	1	1	1	2	2
	Cephalanthus occidentalis	buttonbush	Shrub	OBL												
	Diospyros virginiana	common persimmon	Tree	FAC	2	2	1	1			1	1	2	2		
	Euonymus americanus	strawberry bush	Shrub	FAC			1	1			1	1			1	1
	Nyssa biflora	swamp gum	Tree	FACW												
	Platanus occidentalis	American sycamore	Tree	FACW	2	2	2	2	4	4	3	3	2	2	1	1
	Populus deltoides	eastern cottonwood	Tree	FAC	1	1	1	1	1	1	1	1	2	2	3	3
	Quercus lyrata	overcup oak	Tree	OBL												
	Quercus michauxii	swamp chestnut oak	Tree	FACW	1	1	3	3	2	2	1	1	2	2	2	2
	Quercus phellos	willow oak	Tree	FAC	1	1	2	2	1	1			1	1		
	Salix nigra	black willow	Tree	OBL												
	Ulmus americana	American elm	Tree	FACW												
	Ulmus rubra	slippery elm	Tree	FAC	2	2	1	1	2	2			1	1		
Sum				Performance Standard	14	14	16	16	13	13	14	14	14	14	10	10
Post Mitigation Plan Species	Acer negundo	boxelder	Tree	FAC												
	Fraxinus pennsylvanica	green ash	Tree	FACW												
	Gleditsia triacanthos	honeylocust	Shrub	FAC												
	Liquidambar styraciflua	*sweetgum*	*Tree*	*FAC*												
	Quercus alba	white oak	Tree	FACU												
Sum				Proposed Standard	14	14	16	16	13	13	14	14	14	14	10	10
Invasives	*Ligustrum sinense*	*Chinese privet*	*Tree*	*FACU*												
Mitigation Plan Performance Standard				Current Year Stem Count		14		16		13		14		14		10
				Stems/Acre		567		648		526		567		567		405
				Species Count		9		9		8		8		8		6
				Dominant Species Composition (%)		14		19		31		36		21		30
				Average Plot Height (ft.)		2		2		2		3		2		3
				% Invasives		0		0		0		0		0		0
Post Mitigation Plan Performance Standard				Current Year Stem Count		14		16		13		14		14		10
				Stems/Acre		567		648		526		567		567		405
				Species Count		9		9		8		8		8		6
				Dominant Species Composition (%)		14		19		31		36		21		30
				Average Plot Height (ft.)		2		2		2		3		2		3
				% Invasives		0		0		0		0		0		0

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3). The ""Mitigation Plan Performance Standard"" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 6. Vegetation Plot Data
Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

Planted Acreage	43.5
Date of Initial Plant	2022-03-10
Date of Current Survey	2022-09-15
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 21 F		Veg Plot 22 F		Veg Plot 23 F		Veg Plot 24 F		Veg Plot 25 R	Veg Plot 26 R	Veg Plot 27 R	Veg Plot 28 R	Veg Plot 29 R
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total	Total	Total	Total	Total
Species Included in Approved Mitigation Plan	Alnus serrulata	tag alder	Tree	OBL	2	2	1	1									
	Asimina triloba	pawpaw	Tree	FAC													
	Betula nigra	river birch	Tree	FACW	3	3	1	1	1	1	2	2					
	Celtis laevigata	sugarberry	Tree	FACW					2	2	1	1				1	
	Cephalanthus occidentalis	buttonbush	Shrub	OBL	1	1	1	1									
	Diospyros virginiana	common persimmon	Tree	FAC					3	3	1	1		2			1
	Euonymus americanus	strawberry bush	Shrub	FAC					1	1						1	
	Nyssa biflora	swamp gum	Tree	FACW			1	1									
	Platanus occidentalis	American sycamore	Tree	FACW	4	4	1	1	2	2	1	1	2	2	3	1	4
	Populus deltoides	eastern cottonwood	Tree	FAC					2	2	1	1	1	1			2
	Quercus lyrata	overcup oak	Tree	OBL	2	2	2	2						1			
	Quercus michauxii	swamp chestnut oak	Tree	FACW	1	1	3	3			1	1	1	2		1	1
	Quercus phellos	willow oak	Tree	FAC					1	1	2	2					
	Salix nigra	black willow	Tree	OBL			1	1									
	Ulmus americana	American elm	Tree	FACW	2	2	3	3					1	2			
	Ulmus rubra	slippery elm	Tree	FAC					1	1					1	1	2
Sum				Performance Standard	15	15	14	14	13	13	9	9	5	10	4	5	10
Post Mitigation Plan Species	Acer negundo	boxelder	Tree	FAC											**2**	**3**	
	Fraxinus pennsylvanica	green ash	Tree	FACW									**4**	**4**	**1**	**2**	
	Gleditsia triacanthos	honeylocust	Shrub	FAC											**1**	**2**	
	Liquidambar styraciflua	*sweetgum*	*Tree*	*FAC*									*2*				
	Quercus alba	white oak	Tree	FACU										**1**			
Sum				Proposed Standard	15	15	14	14	13	13	9	9	9	15	8	12	0
Invasives	*Ligustrum sinense*	*Chinese privet*	*Tree*	*FACU*												*1*	
Mitigation Plan Performance Standard				Current Year Stem Count		15		14		13		9	5	10	4	5	10
				Stems/Acre		607		567		526		364	202	405	121	202	405
				Species Count		7		9		8		7	4	6	2	5	5
				Dominant Species Composition (%)		27		21		23		22	29	20	75	17	31
				Average Plot Height (ft.)		2		2		2		1	3	2	3	2	2
				% Invasives		0		0		0		0	0	0	0	17	0
Post Mitigation Plan Performance Standard				Current Year Stem Count		15		14		13		9	9	15	8	12	10
				Stems/Acre		607		567		526		364	364	607	283	486	405
				Species Count		7		9		8		7	5	8	5	8	5
				Dominant Species Composition (%)		27		21		23		22	29	20	75	17	31
				Average Plot Height (ft.)		2		2		2		1	3	2	2	3	2
				% Invasives		0		0		0		0	0	0	0	8	0

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Table 7. Vegetation Performance Standards Summary Table
Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	567	2	9	0	567	2	6	0	607	2	8	0
Monitoring Year 0	648	2	10	0	567	2	6	0	607	2	8	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	526	2	7	0	567	2	9	0	526	3	8	0
Monitoring Year 0	607	2	8	0	567	2	9	0	567	2	9	0
	Veg Plot 7 F				Veg Plot 8 F				Veg Plot 9 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	607	2	8	0	567	2	8	0	526	3	8	0
Monitoring Year 0	648	2	9	0	607	2	8	0	607	3	8	0
	Veg Plot 10 F				Veg Plot 11 F				Veg Plot 12 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	445	3	7	0	445	2	8	0	648	2	9	0
Monitoring Year 0	567	3	8	0	567	2	9	0	648	2	9	0
	Veg Plot 13 F				Veg Plot 14 F				Veg Plot 15 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	607	2	9	0	607	2	9	0	567	2	9	0
Monitoring Year 0	607	2	9	0	607	2	9	0	567	3	9	0

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

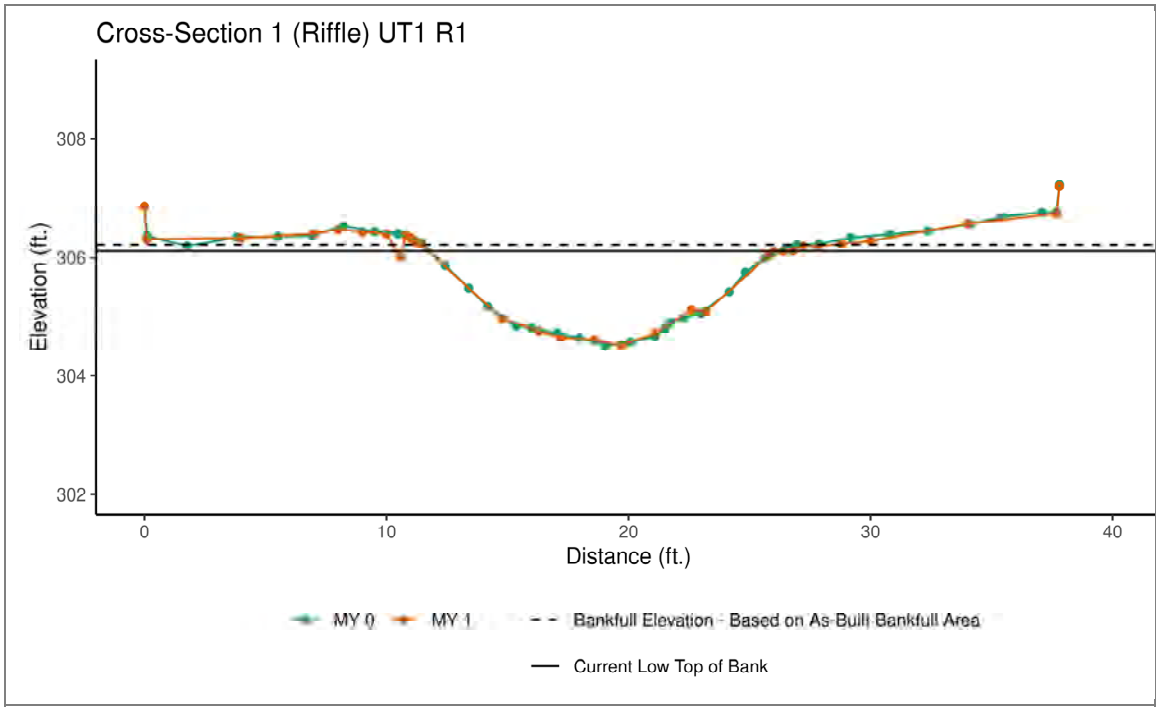
Table 7. Vegetation Performance Standards Summary Table
Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

	Veg Plot 16 F				Veg Plot 17 F				Veg Plot 18 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	648	2	9	0	526	2	8	0	567	3	8	0
Monitoring Year 0	648	2	9	0	567	2	8	0	688	3	9	0
	Veg Plot 19 F				Veg Plot 20 F				Veg Plot 21 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	567	2	8	0	405	3	6	0	607	2	7	0
Monitoring Year 0	607	3	8	0	567	2	8	0	648	3	8	0
	Veg Plot 22 F				Veg Plot 23 F				Veg Plot 24 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	567	2	9	0	526	2	8	0	364	1	7	0
Monitoring Year 0	607	2	10	0	607	2	8	0	607	2	9	0
	Veg Plot Group 25 R				Veg Plot Group 26 R				Veg Plot Group 27 R			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	202	3	4	0	405	2	6	0	121	3	2	0
Monitoring Year 0	445	2	5	0	445	2	4	0	607	2	10	0
	Veg Plot Group 28 R				Veg Plot Group 29 R							
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives				
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1	202	2	5	17	405	2	5	0				
Monitoring Year 0	607	3	9	0	526	2	6	0				

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

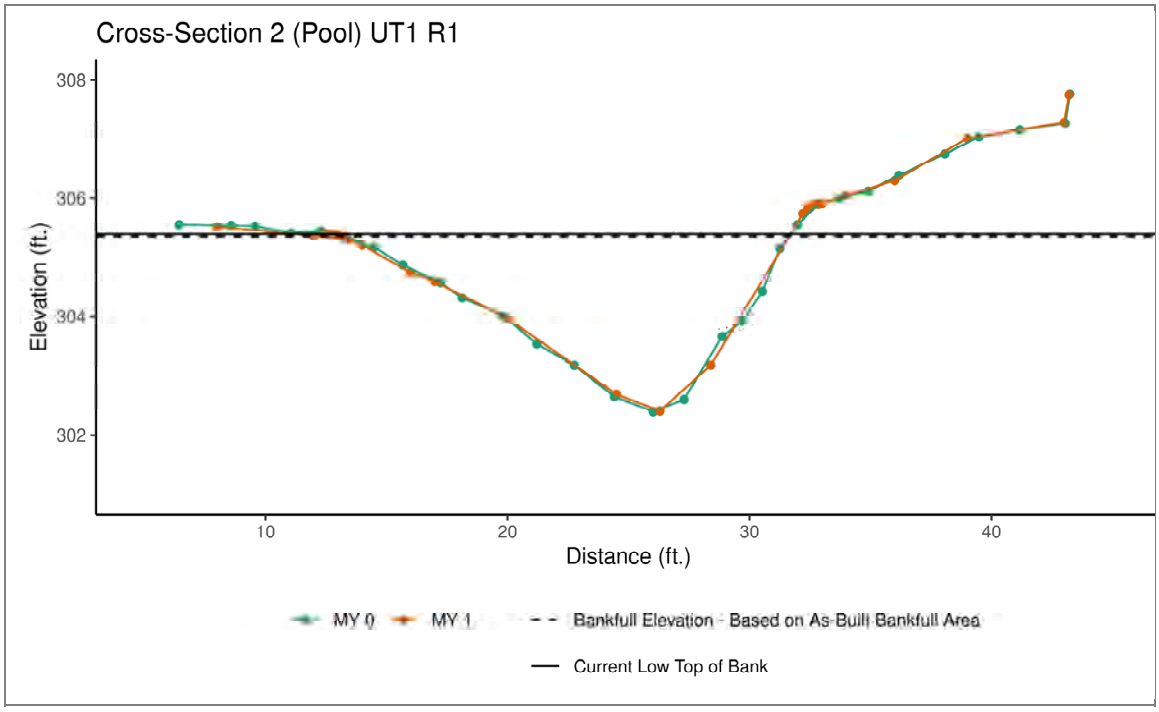
APPENDIX C. STREAM GEOMORPHOLOGY DATA

CROSS-SECTION PLOTS



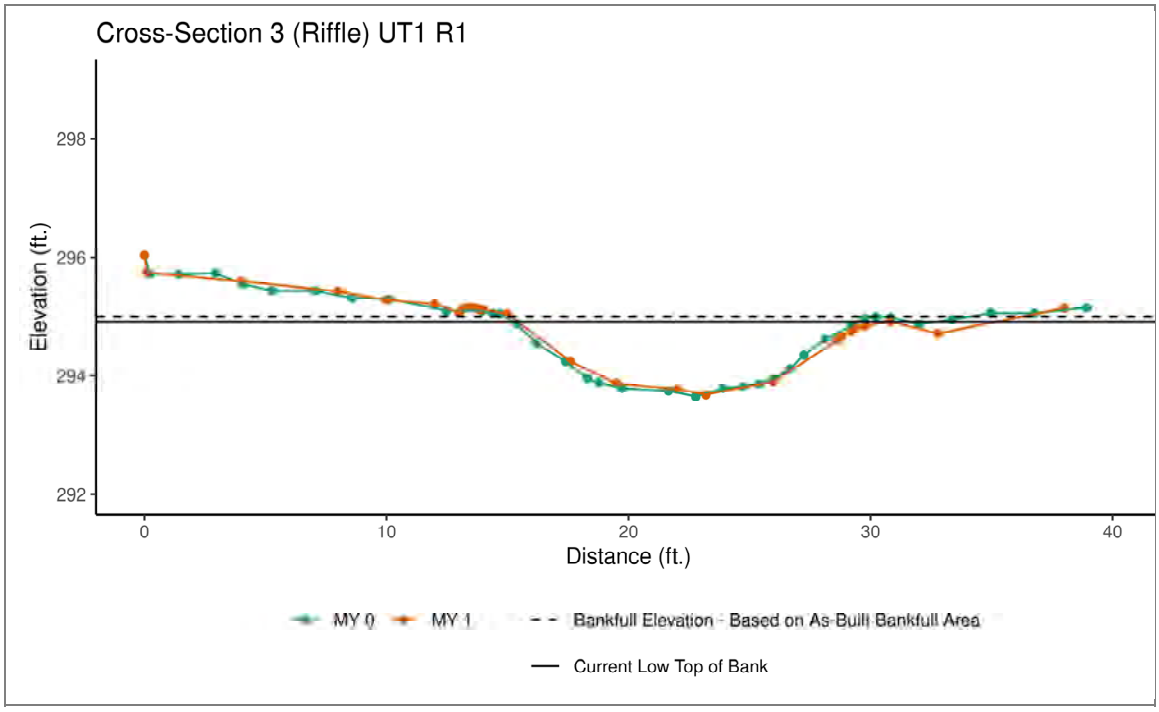
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	306.21	306.21				
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.94				
Thalweg Elevation	304.50	304.51				
LTOB Elevation	306.21	306.11				
LTOB Max Depth	1.71	1.60				
LTOB Cross-Sectional Area	16.20	14.67				

Downstream *(10/17/2022)*



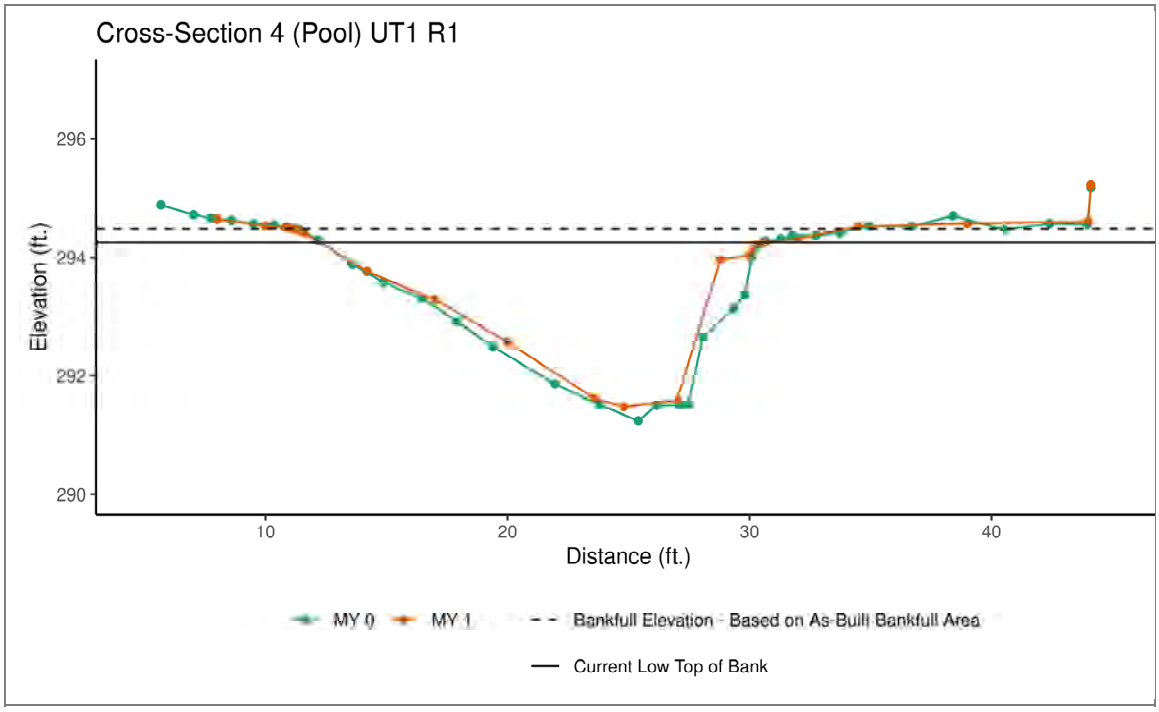
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A				
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A				
Thalweg Elevation	302.39	302.41				
LTOB Elevation	305.35	305.40				
LTOB Max Depth	2.96	2.99				
LTOB Cross-Sectional Area	27.97	28.75				

Downstream *(10/17/2022)*



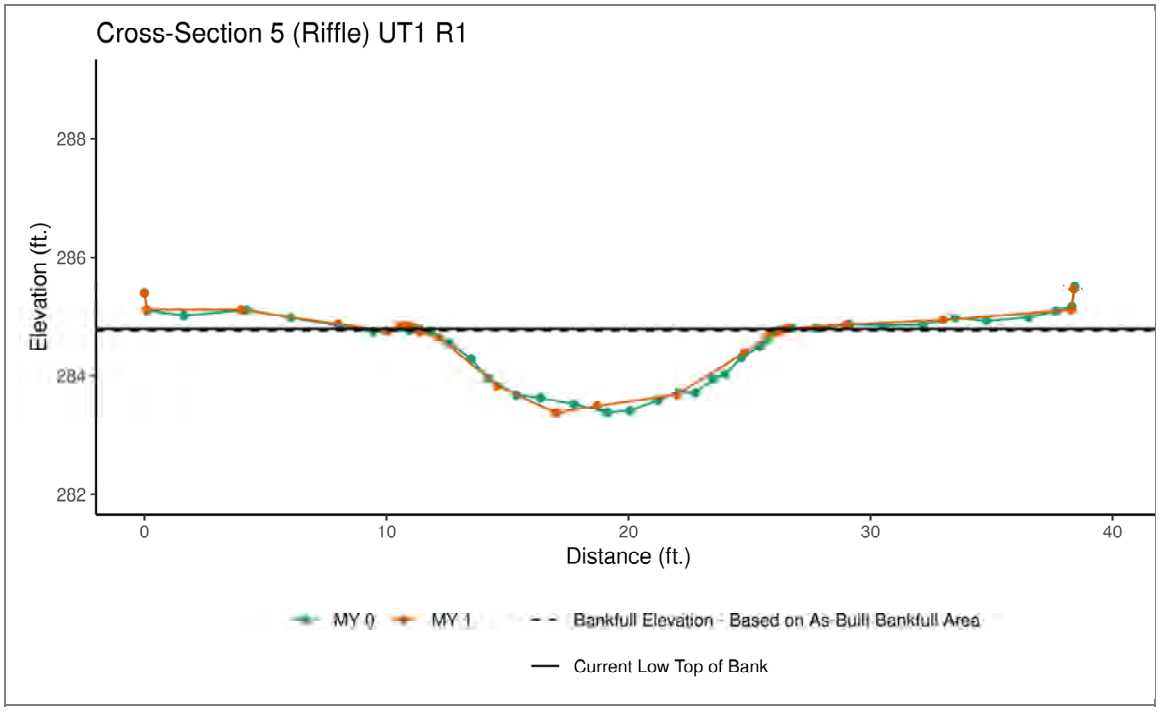
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	294.99	295.00				
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.93				
Thalweg Elevation	293.65	293.68				
LTOB Elevation	294.99	294.91				
LTOB Max Depth	1.35	1.23				
LTOB Cross-Sectional Area	12.96	11.60				

Downstream *(10/17/2022)*



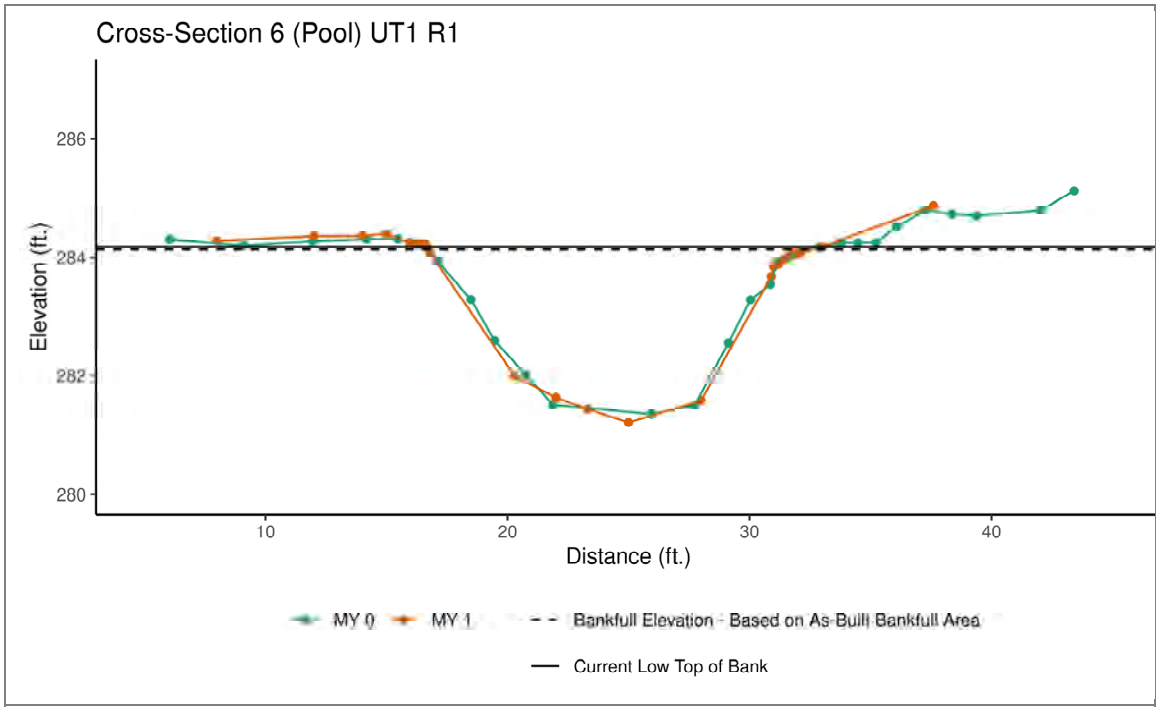
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A				
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A				
Thalweg Elevation	291.24	291.48				
LTOB Elevation	294.28	294.26				
LTOB Max Depth	3.04	2.78				
LTOB Cross-Sectional Area	30.77	26.57				

Downstream *(10/17/2022)*



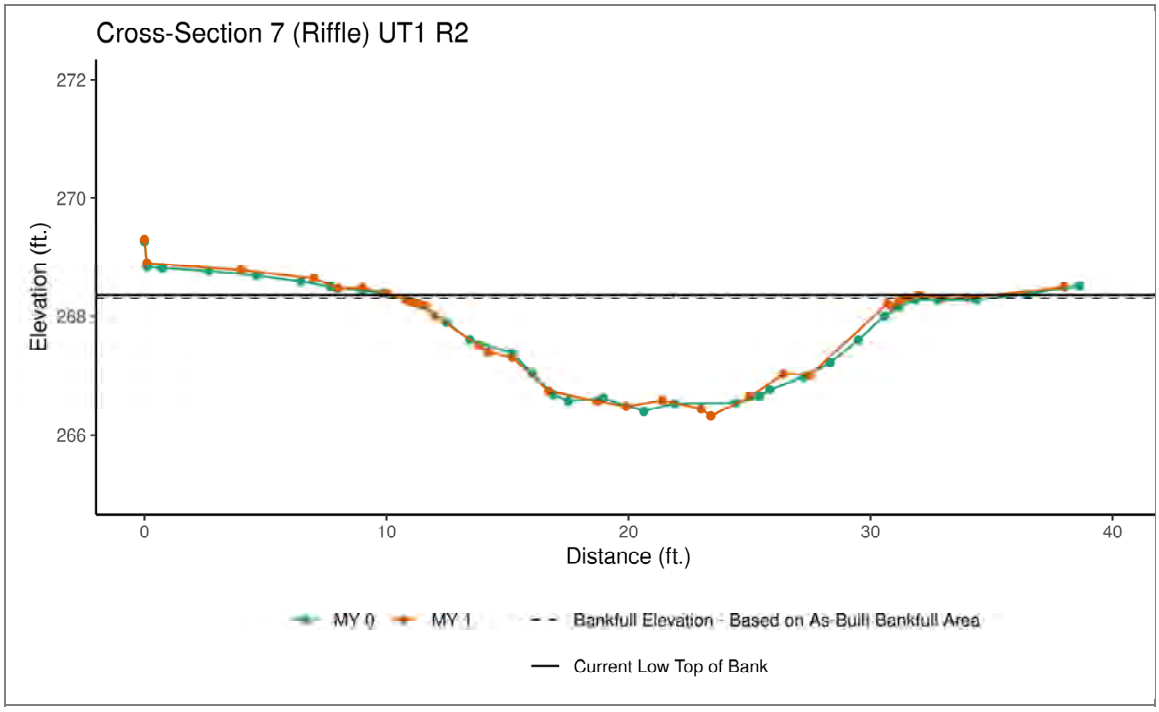
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	284.75	284.76				
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.02				
Thalweg Elevation	283.38	283.37				
LTOB Elevation	284.75	284.79				
LTOB Max Depth	1.37	1.42				
LTOB Cross-Sectional Area	12.58	12.99				

Downstream *(10/17/2022)*



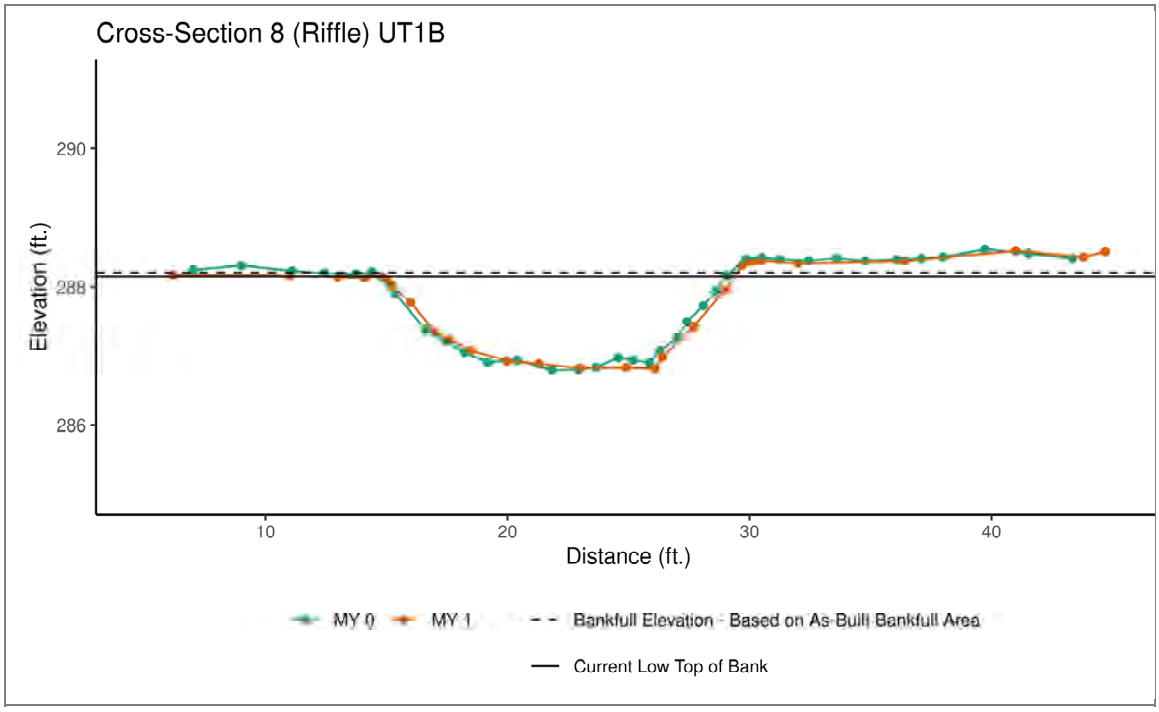
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A				
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A				
Thalweg Elevation	281.35	281.21				
LTOB Elevation	284.20	284.18				
LTOB Max Depth	2.85	2.97				
LTOB Cross-Sectional Area	28.69	29.48				

Downstream *(10/17/2022)*



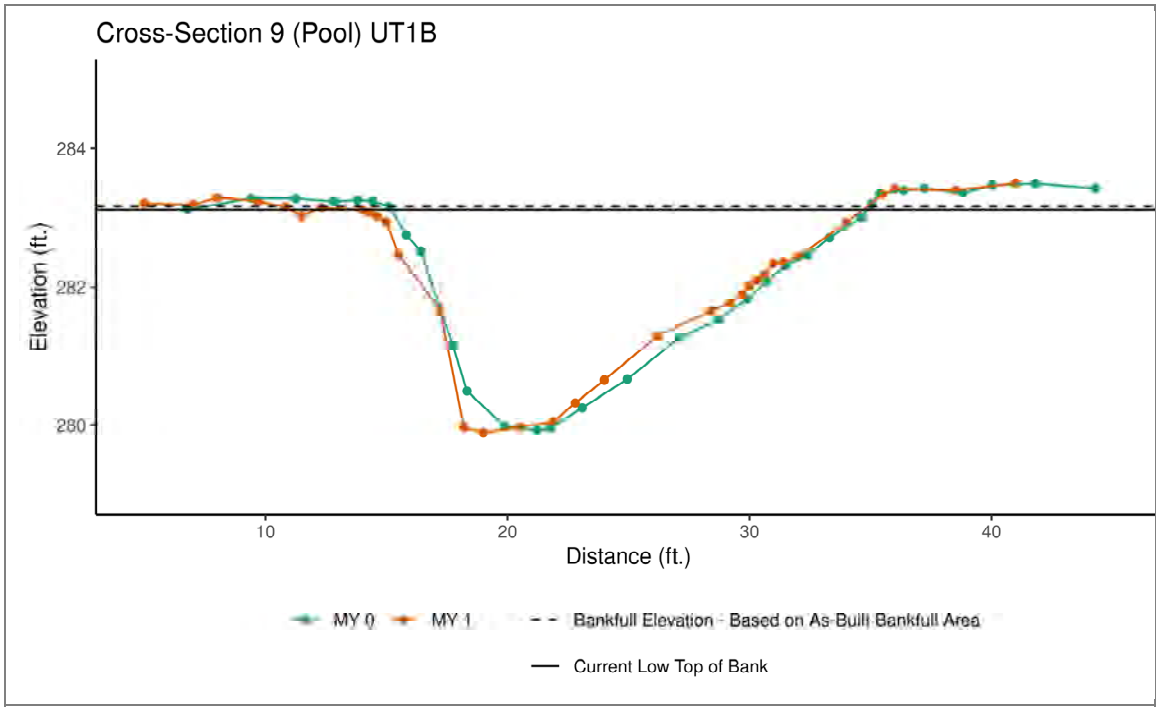
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	268.28	268.30				
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.03				
Thalweg Elevation	266.40	266.32				
LTOB Elevation	268.28	268.37				
LTOB Max Depth	1.88	2.05				
LTOB Cross-Sectional Area	24.72	26.14				

Downstream *(10/17/2022)*



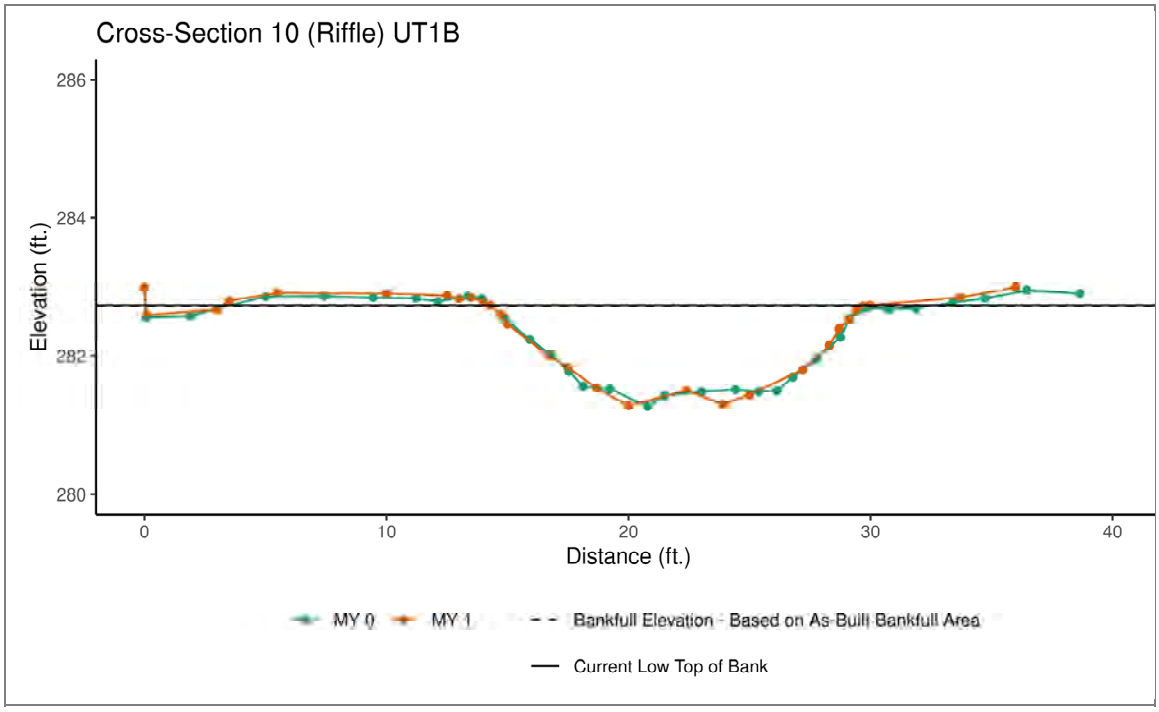
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	288.22	288.21				
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.96				
Thalweg Elevation	286.80	286.81				
LTOB Elevation	288.22	288.15				
LTOB Max Depth	1.42	1.34				
LTOB Cross-Sectional Area	14.94	14.17				

Downstream *(10/17/2022)*



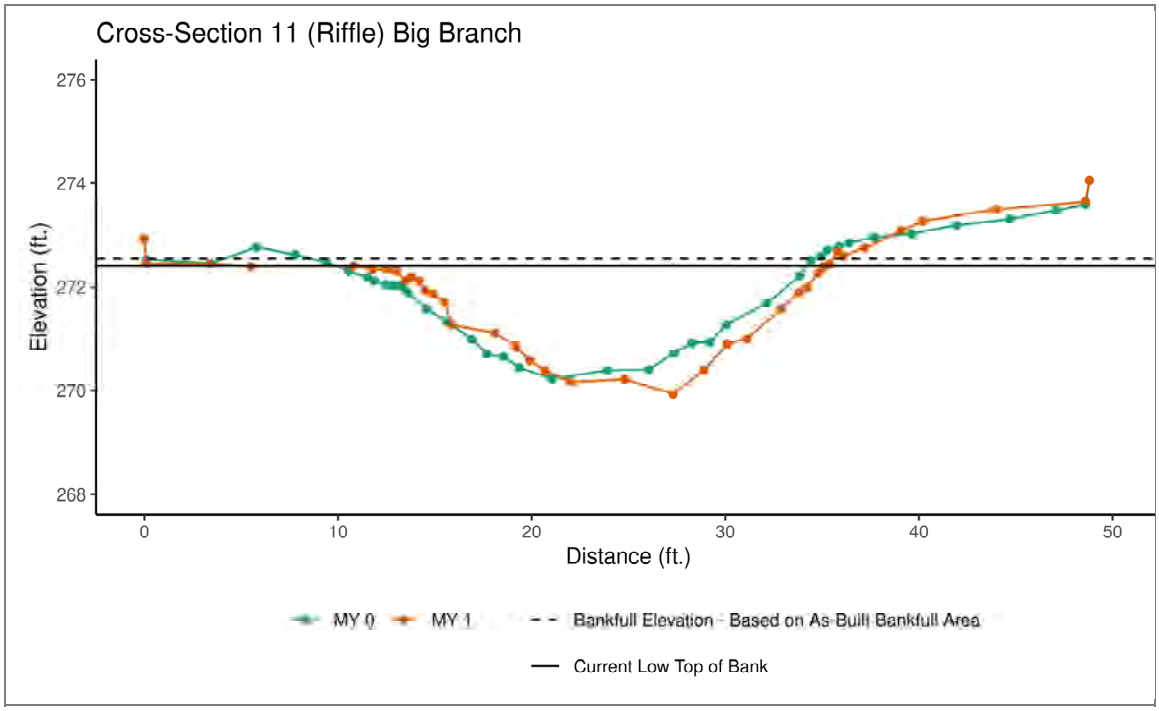
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A				
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A				
Thalweg Elevation	279.93	279.89				
LTOB Elevation	283.16	283.12				
LTOB Max Depth	3.24	3.23				
LTOB Cross-Sectional Area	36.04	34.98				

Downstream *(10/17/2022)*



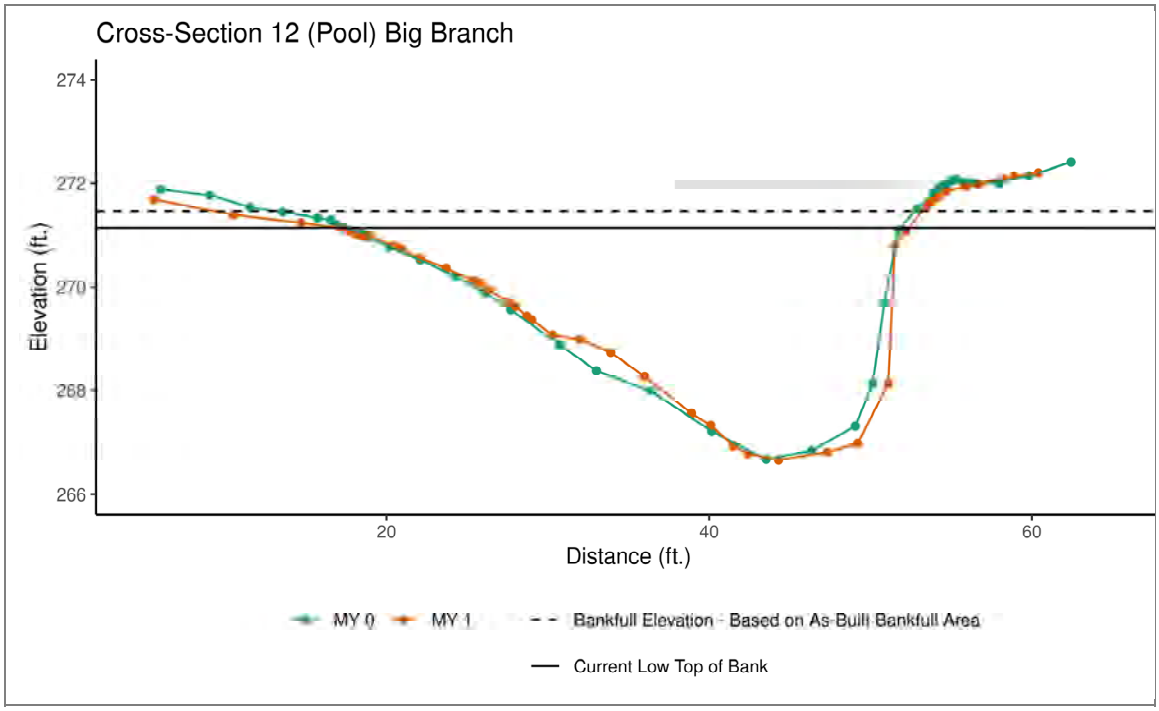
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	282.69	282.71				
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.01				
Thalweg Elevation	281.27	281.30				
LTOB Elevation	282.69	282.73				
LTOB Max Depth	1.42	1.43				
LTOB Cross-Sectional Area	14.21	14.46				

Downstream *(10/17/2022)*



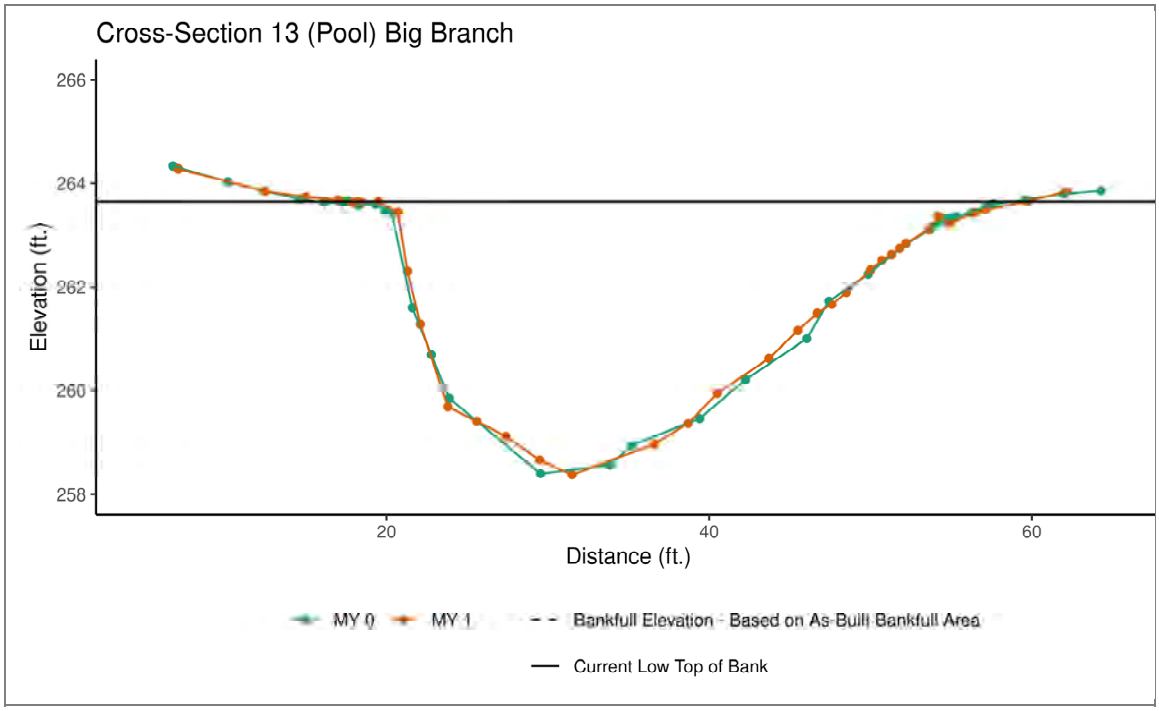
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	272.62	272.55				
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.95				
Thalweg Elevation	270.22	269.93				
LTOB Elevation	272.62	272.41				
LTOB Max Depth	2.40	2.47				
LTOB Cross-Sectional Area	36.87	33.41				

Downstream *(10/17/2022)*



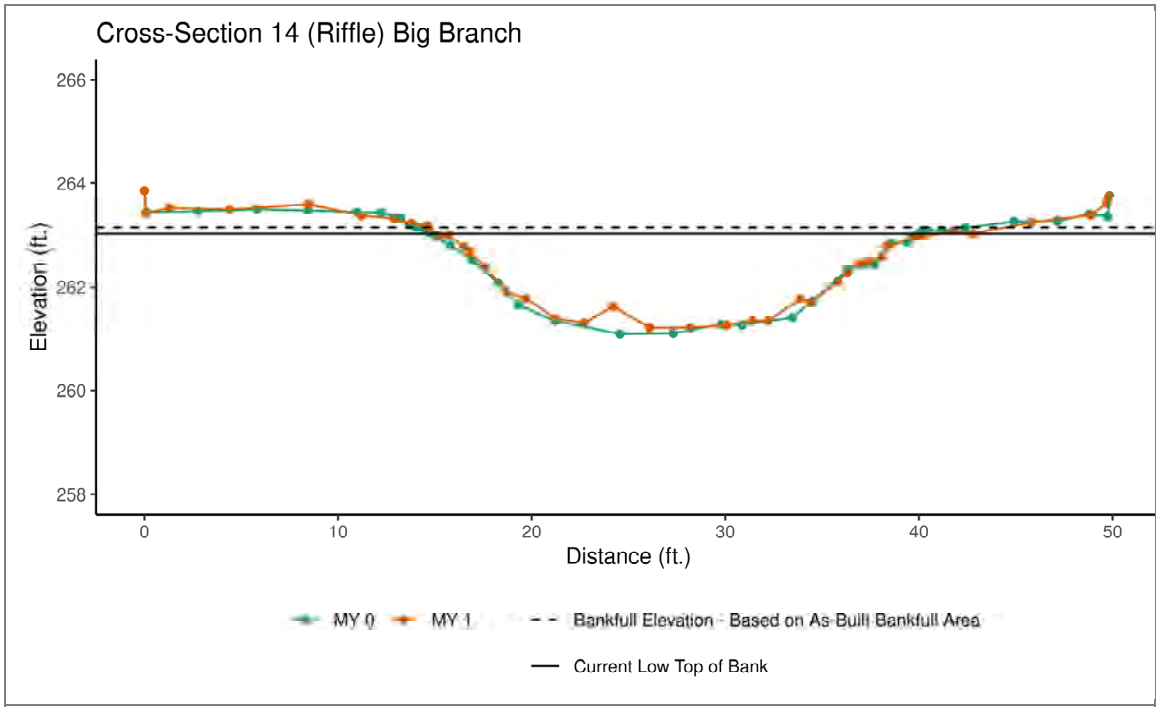
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A				
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A				
Thalweg Elevation	266.67	266.66				
LTOB Elevation	271.45	271.14				
LTOB Max Depth	4.77	4.48				
LTOB Cross-Sectional Area	96.74	85.39				

Downstream *(10/17/2022)*



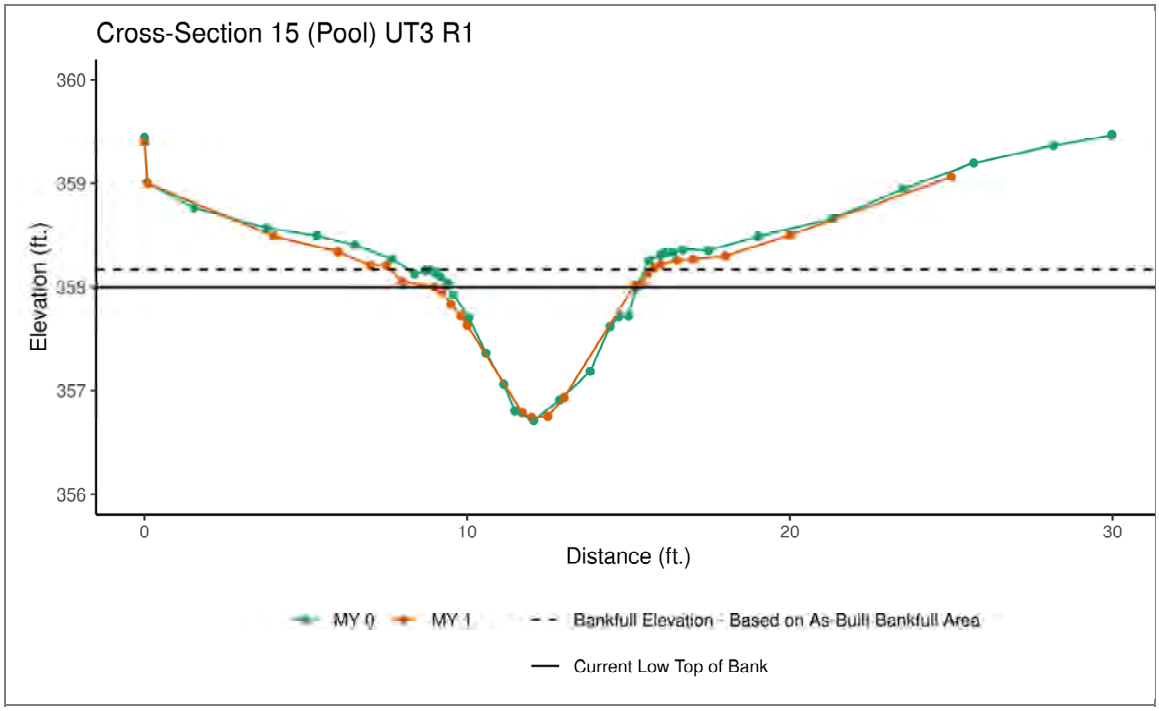
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A				
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A				
Thalweg Elevation	258.40	258.38				
LTOB Elevation	263.60	263.65				
LTOB Max Depth	5.20	5.27				
LTOB Cross-Sectional Area	113.83	113.86				

Downstream *(10/17/2022)*



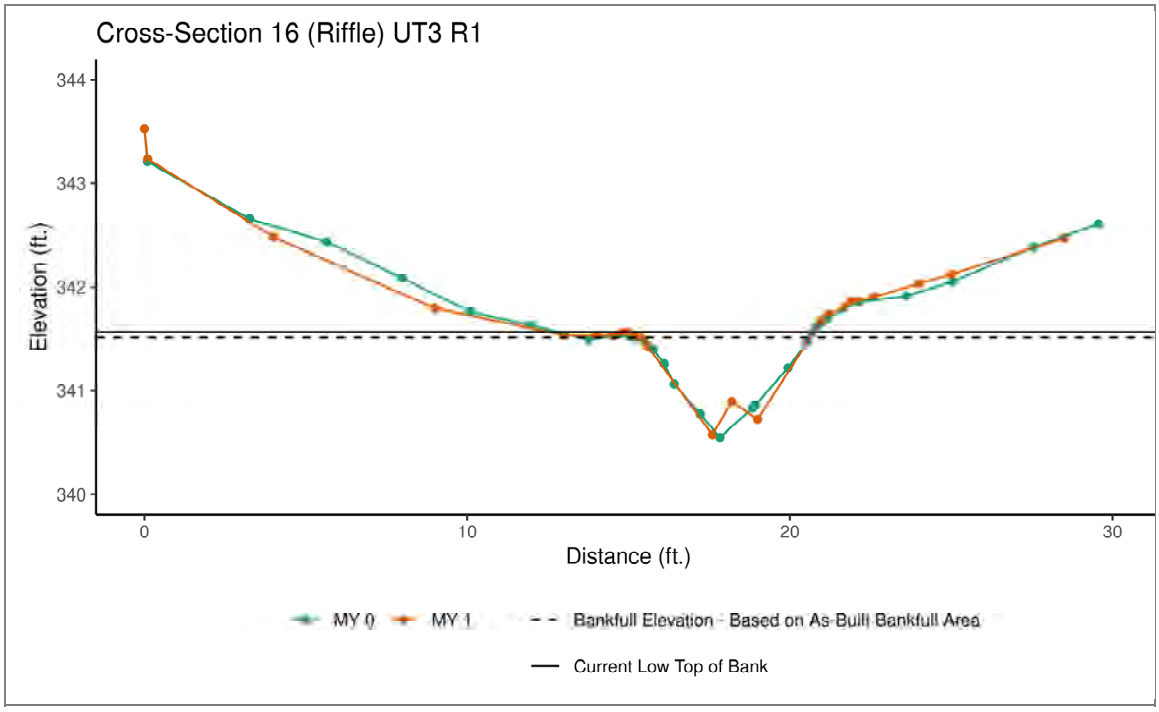
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	263.06	263.15				
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.94				
Thalweg Elevation	261.09	261.21				
LTOB Elevation	263.06	263.03				
LTOB Max Depth	1.97	1.82				
LTOB Cross-Sectional Area	33.50	30.24				

Downstream *(10/17/2022)*



	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A				
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A				
Thalweg Elevation	356.71	356.74				
LTOB Elevation	358.16	358.00				
LTOB Max Depth	1.45	1.26				
LTOB Cross-Sectional Area	5.29	4.24				

Downstream *(10/17/2022)*



	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	341.52	341.51				
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.05				
Thalweg Elevation	340.55	340.57				
LTOB Elevation	341.52	341.56				
LTOB Max Depth	0.97	0.99				
LTOB Cross-Sectional Area	2.72	3.00				

Downstream *(10/17/2022)*

Table 8. Baseline Stream Data Summary

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

	PRE-EXISTING CONDITIONS			DESIGN			MONITORING BASELINE (MY0)		
Parameter	**UT1 R1**								
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**n**	**Min**	**Max**	**n**
Bankfull Width (ft)	10.3		1	14.5			14.3	15.4	3
Floodprone Width (ft)	50.0		1	31.9	72.5		132.0	195.0	3
Bankfull Mean Depth	1.3		1	1.0			0.8	1.1	3
Bankfull Max Depth	2.4		1	1.3			1.3	1.7	3
Bankfull Cross Sectional Area (ft^2)	13.3		1	13.8			12.6	16.2	3
Width/Depth Ratio	8.0		1	15.3			14.7	18.1	3
Entrenchment Ratio	>2.2		1	2.2	5.0		8.6	13.6	3
Bank Height Ratio	1.0		1	1.0			1.0		3
Max part size (mm) mobilized at bankfull	42			44			44		
Rosgen Classification	E4/1			C4/1			C4/1		
Bankfull Discharge (cfs)	58.5		1	52.0			50.0	72.1	3
Sinuosity	1.19			1.20			1.20		
Water Surface Slope ($ft/ft)^2$	0.0130			0.0118			0.0140		
Other	---			---			---		
Parameter	**UT1 R2**								
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**n**	**Min**	**Max**	**n**
Bankfull Width (ft)	11.6		1	20.0			21.1		1
Floodprone Width (ft)	13.8		1	44.0	100.0		240.0		1
Bankfull Mean Depth	1.0		1	1.2			1.2		1
Bankfull Max Depth	1.4		1	1.5			1.9		1
Bankfull Cross Sectional Area (ft^2)	11.9		1	23.3			24.7		1
Width/Depth Ratio	11.2		1	17.2			17.9		1
Entrenchment Ratio	1.2		1	2.2	5.0		11.4		1
Bank Height Ratio	4.6		1	1.0			1.0		1
Max part size (mm) mobilized at bankfull	47			50			50		
Rosgen Classification	G3c/1			C4/1			C4/1		
Bankfull Discharge (cfs)	54.5		1	85.0			120.6		1
Sinuosity	1.17			1.20			1.20		
Water Surface Slope ($ft/ft)^2$	0.0160			0.0080			0.0143		
Other	---			---			---		
Parameter	**UT1B**								
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**n**	**Min**	**Max**	**n**
Bankfull Width (ft)	11.7		1	15.2			14.8	15.4	2
Floodprone Width (ft)	19.1		1	33.4	76.0		105.0	140.0	2
Bankfull Mean Depth	0.9		1	1.0			0.9	1.0	2
Bankfull Max Depth	1.6		1	1.3			1.4		2
Bankfull Cross Sectional Area (ft^2)	10.7		1	14.7			14.2	14.8	2
Width/Depth Ratio	12.9		1	15.7			14.7	16.8	2
Entrenchment Ratio	1.6		1	2.2	5.0		7.1	9.1	2
Bank Height Ratio	2.0		1	1.0			1.0		2
Max part size (mm) mobilized at bankfull	34			45			45		
Rosgen Classification	F1			B4			B4		
Bankfull Discharge (cfs)	40.5		1	49.0			60.1	66.5	2
Sinuosity	1.19			1.20			1.20		
Water Surface Slope ($ft/ft)^2$	0.0130			0.0092			0.0151		
Other	---			---			---		

Table 8. Baseline Stream Data Summary

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**Big Branch**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	15.8	23.3	2	24.0		20.0	25.4	2
Floodprone Width (ft)	19.4	50.0	2	52.8	120.0	230.0	260.0	2
Bankfull Mean Depth	1.6	1.8	2	1.4		1.2	1.4	2
Bankfull Max Depth	2.2	2.6	2	2.0		2.0	2.4	2
Bankfull Cross Sectional Area (ft^2)	28.5	34.4	2	34.0		33.4	36.8	2
Width/Depth Ratio	8.8	13.3	2	16.9		19.3	20.1	2
Entrenchment Ratio	1.2	2.3	2	2.2	5.0	9.1	9.6	2
Bank Height Ratio	2.3	3.0	2	1.0		1.0		2
Max part size (mm) mobilized at bankfull	44			37		37		
Rosgen Classification	C4/1 - G4c/1			C4/1		C4/1		
Bankfull Discharge (cfs)	136.0		2	144.0		139.8	156.8	2
Sinuosity	1.14			1.20		1.20		
Water Surface Slope ($ft/ft)^2$	0.0070			0.0083		0.0090		
Other	---			---		---		
Parameter	**UT3 R1**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	6.4		1	5.2		5.6		1
Floodprone Width (ft)	8.7		1	7.3	11.4	24.0		1
Bankfull Mean Depth	0.3		1	0.4		0.5		1
Bankfull Max Depth	1.0		1	0.5		1.0		1
Bankfull Cross Sectional Area (ft^2)	2.0		1	1.9		2.7		1
Width/Depth Ratio	20.6		1	14.6		11.5		1
Entrenchment Ratio	1.3		1	1.4	2.2	4.3		1
Bank Height Ratio	2.4		1	1.0		1.0		1
Max part size (mm) mobilized at bankfull	39			52		52		
Rosgen Classification	F1			B4		B4		
Bankfull Discharge (cfs)	7.6		1	10.0		11.6		1
Sinuosity	1.00			1.10		1.10		
Water Surface Slope ($ft/ft)^2$	0.0290			0.0327		0.0372		
Other	---			---		---		

Table 9. Cross-Section Morphology Monitoring Summary

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

	UT1 R1																	
	Cross-Section 1 (Riffle)						Cross-Section 2 (Pool)						Cross-Section 3 (Riffle)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	306.21	306.21					N/A	N/A					294.99	295.00				
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00	0.94					N/A	N/A					1.00	0.93				
Thalweg Elevation	304.50	304.51					302.39	302.41					293.65	293.68				
LTOB[2] Elevation	306.21	306.11					305.35	305.40					294.99	294.91				
LTOB[2] Max Depth (ft)	1.71	1.60					2.96	2.99					1.35	1.23				
LTOB[2] Cross Sectional Area (ft^2)	16.20	14.67					27.97	28.75					12.96	11.60				
	UT1 R1																	
	Cross-Section 4 (Pool)						Cross-Section 5 (Riffle)						Cross-Section 6 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	N/A	N/A					284.75	284.76					N/A	N/A				
Bank Height Ratio - Based on AB Bankfull[1] Area	N/A	N/A					1.00	1.02					N/A	N/A				
Thalweg Elevation	291.24	291.48					283.38	283.37					281.35	281.21				
LTOB[2] Elevation	294.28	294.26					284.75	284.79					284.20	284.18				
LTOB[2] Max Depth (ft)	3.04	2.78					1.37	1.42					2.85	2.97				
LTOB[2] Cross Sectional Area (ft^2)	30.77	26.57					12.58	12.99					28.69	29.48				
	UT1 R2						UT1B											
	Cross-Section 7 (Riffle)						Cross-Section 8 (Riffle)						Cross-Section 9 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	268.28	268.30					288.22	288.21					N/A	N/A				
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00	1.03					1.00	0.96					N/A	N/A				
Thalweg Elevation	266.40	266.32					286.80	286.81					279.93	279.89				
LTOB[2] Elevation	268.28	268.37					288.22	288.15					283.16	283.12				
LTOB[2] Max Depth (ft)	1.88	2.05					1.42	1.34					3.24	3.23				
LTOB[2] Cross Sectional Area (ft^2)	24.72	26.14					14.94	14.17					36.04	34.98				

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

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

Table 9. Cross-Section Morphology Monitoring Summary

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

	UT1B						Big Branch											
	Cross-Section 10 (Riffle)						Cross-Section 11 (Riffle)						Cross-Section 12 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	282.69	282.71					272.62	272.55					N/A	N/A				
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00	1.01					1.00	0.95					N/A	N/A				
Thalweg Elevation	281.27	281.30					270.22	269.93					266.67	266.66				
LTOB[2] Elevation	282.69	282.73					272.62	272.41					271.45	271.14				
LTOB[2] Max Depth (ft)	1.42	1.43					2.40	2.47					4.77	4.48				
LTOB[2] Cross Sectional Area (ft^2)	14.21	14.46					36.87	33.41					96.74	85.39				
	Big Branch												UT3 R1					
	Cross-Section 13 (Pool)						Cross-Section 14 (Riffle)						Cross-Section 15 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	N/A	N/A					263.06	263.15					N/A	N/A				
Bank Height Ratio - Based on AB Bankfull[1] Area	N/A	N/A					1.00	0.94					N/A	N/A				
Thalweg Elevation	258.40	258.38					261.09	261.21					356.71	356.74				
LTOB[2] Elevation	263.60	263.65					263.06	263.03					358.16	358.00				
LTOB[2] Max Depth (ft)	5.20	5.27					1.97	1.82					1.45	1.26				
LTOB[2] Cross Sectional Area (ft^2)	113.83	113.86					33.50	30.24					5.29	4.24				
	UT3 R1																	
	Cross-Section 16 (Riffle)																	
	MY0	MY1	MY2	MY3	MY5	MY7												
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	341.52	341.51																
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00	1.05																
Thalweg Elevation	340.55	340.57																
LTOB[2] Elevation	341.52	341.56																
LTOB[2] Max Depth (ft)	0.97	0.99																
LTOB[2] Cross Sectional Area (ft^2)	2.72	3.00																

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

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

APPENDIX D. HYDROLOGY DATA

Table 10. Bankfull Events

Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

Reach	MY1 (2022)	MY2 (2023)	MY3 (2024)	MY4 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
UT1 Reach 1	N/A						
UT1B	N/A						
UT3 Reach 1	N/A						
Big Branch	3/12/2022 3/16/2022 3/31/2022 4/18/2022 5/27/2022 7/15/2022						

N/A: No bankfull events were recorded before 11/21/2022. Data will be updated in MY2.

Table 11. Rainfall Summary

Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

	MY1 (2022)	MY2 (2023)	MY3 (2024)	MY4 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
Annual Precip Total	45.69*						
WETS 30th Percentile	44.54						
WETS 70th Percentile	52.92						
Normal	*						

*Annual precipitation total was collected up until 11/30/2022. Data will be updated in MY2.

Table 12. Recorded In-Stream Flow Events Summary

Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

Reach	Max Consecutive Days/Total Days Meeting Success Criteria*						
	MY1 (2022)**	MY2 (2023)	MY3 (2024)	MY4 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
UT3 R1	64 Days/ 73 Days						

*Success criteria is 30 consecutive days of flow.

**Data was colleted through 11/21/2022. Data will be updated in MY2.

Recorded In-Stream Flow Events Plot

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

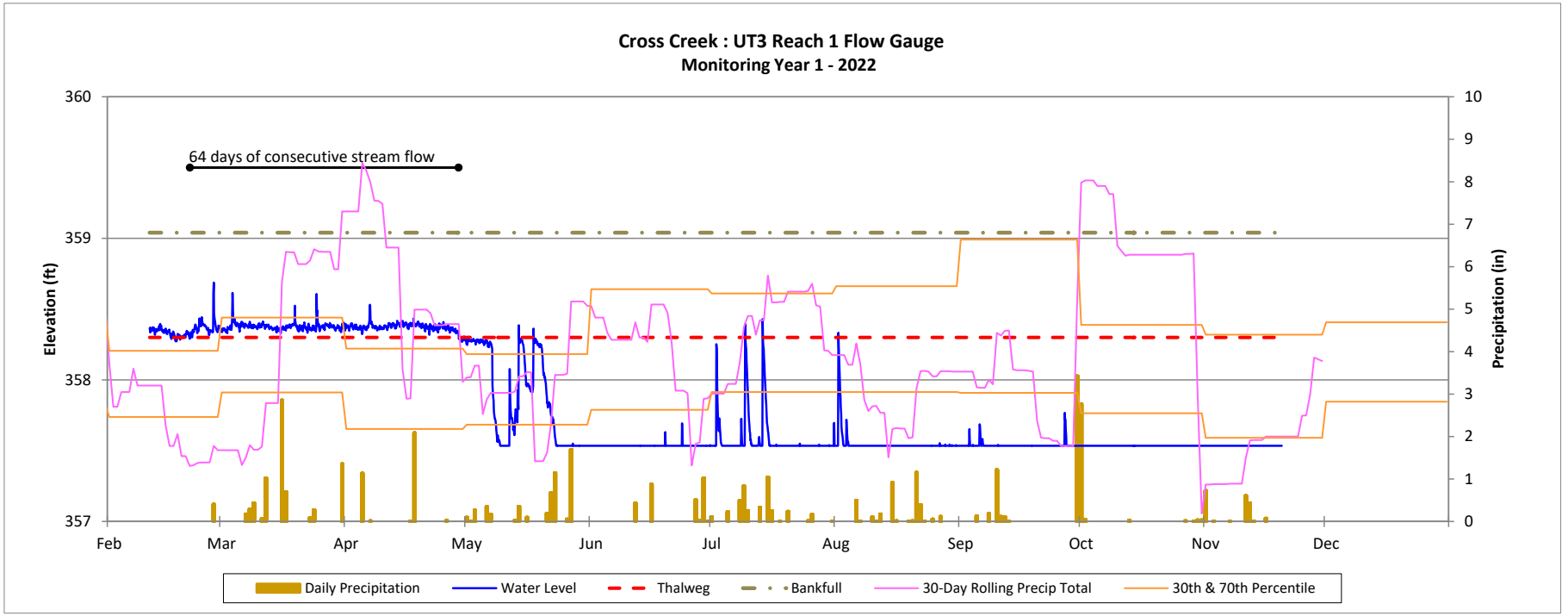


Table 13. Groundwater Gauge Summary

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

Gauge	Max. Consecutive Hydroperiod (Percentage)						
	MY1 (2022)	MY2 (2023)	MY3 (2024)	MY4 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
1	99 Days (37.4%)						
2	18 Days (6.8%)						
3	59 Days (22.3%)						
4	64 Days (24.2%)						
5	81 Days (30.6%)						
6	78 Days (29.4%)						
7	20 Days (7.5%)						
8	65 Days (24.5%)						
9	21 Days (7.9%)						

Performance Standard: **GW 5 and GW 6 have an 11% (28 consecutive day) hydroperiod criterion.**

GW 1-4 and GW 7-9 have a 12% (30 consecutive day) hyrdoperiod criterion.

WETS Station: **Montgomery Co. Jackson Springs 5 WNW**

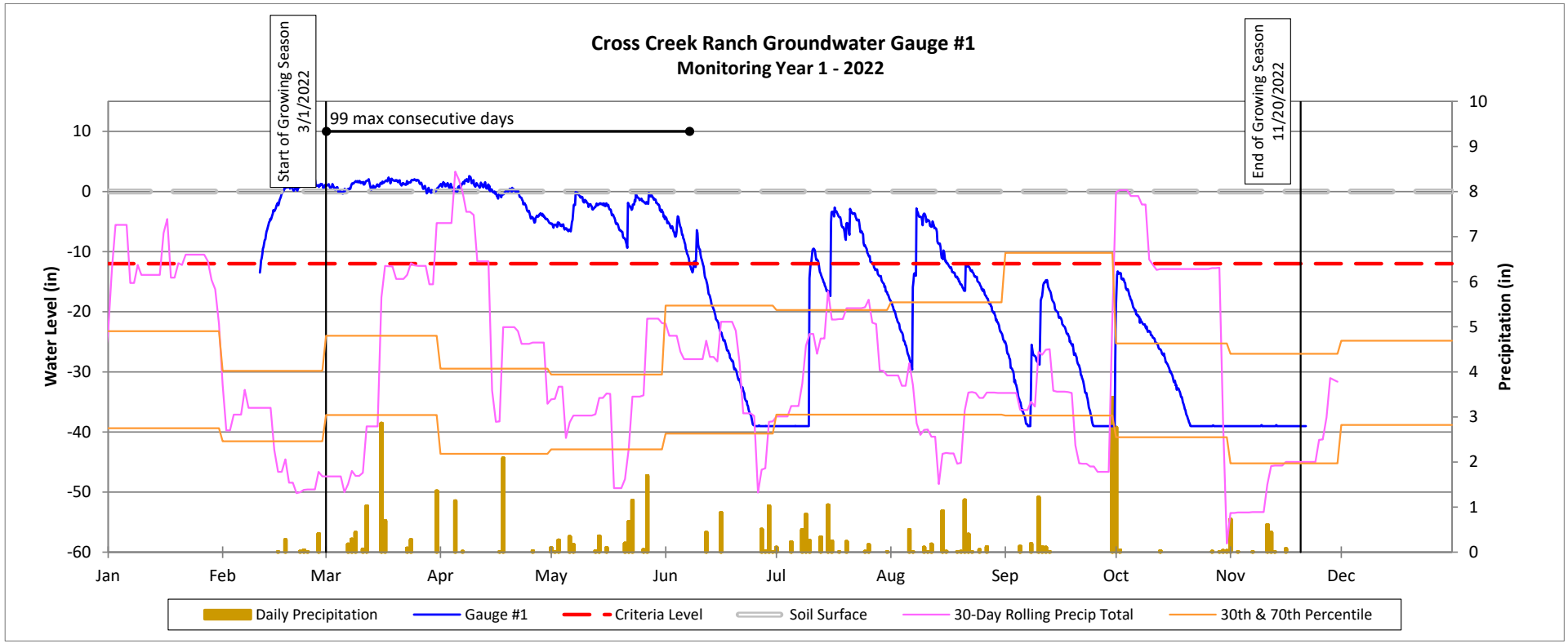
Growing Season: **3/1/2021 to 11/20/2022 (264 Days)**

Groundwater Gauge Plots

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

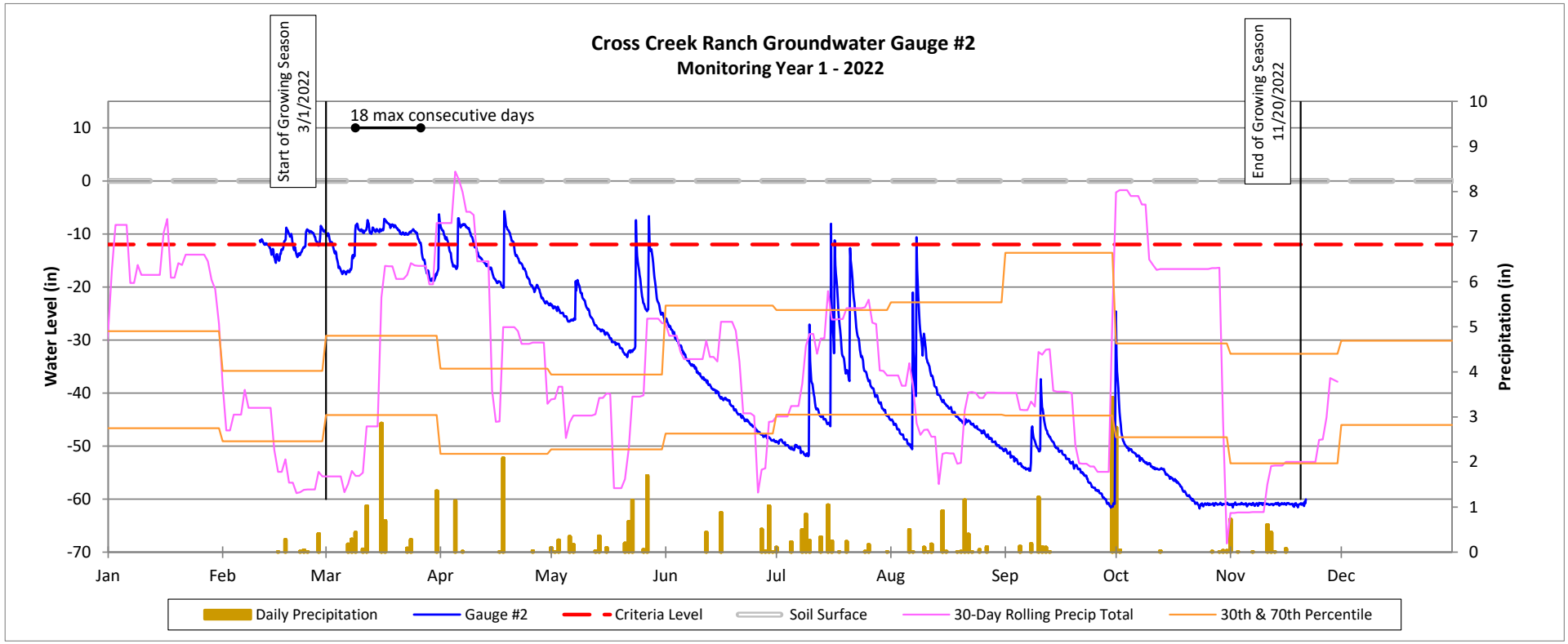


Groundwater Gauge Plots

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

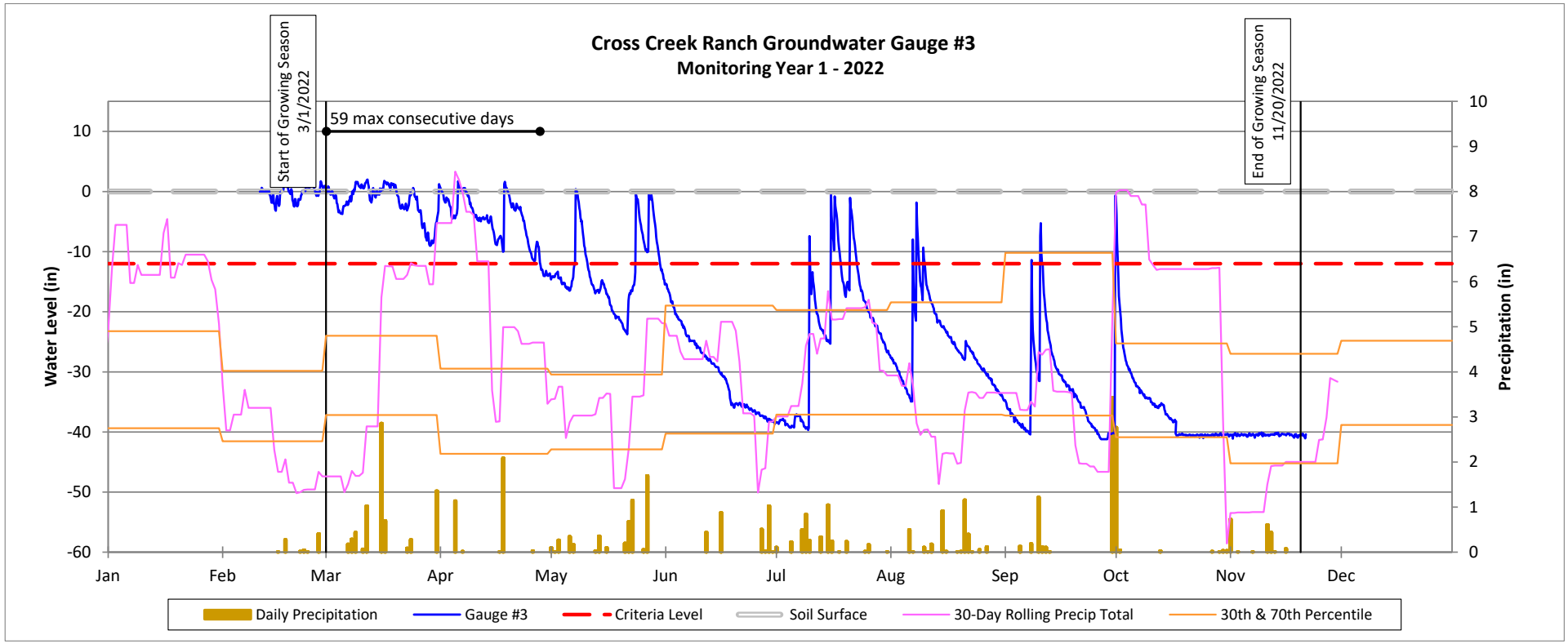


Groundwater Gauge Plots

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

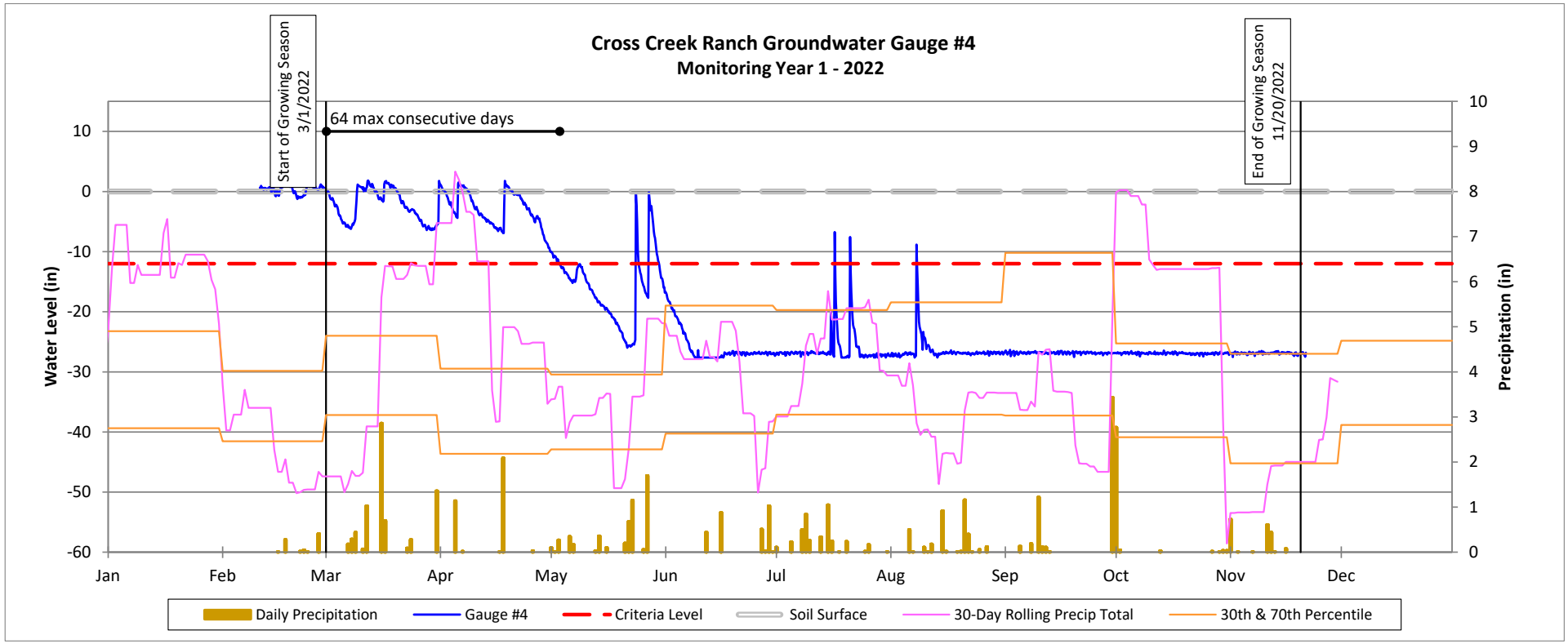


Groundwater Gauge Plots

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

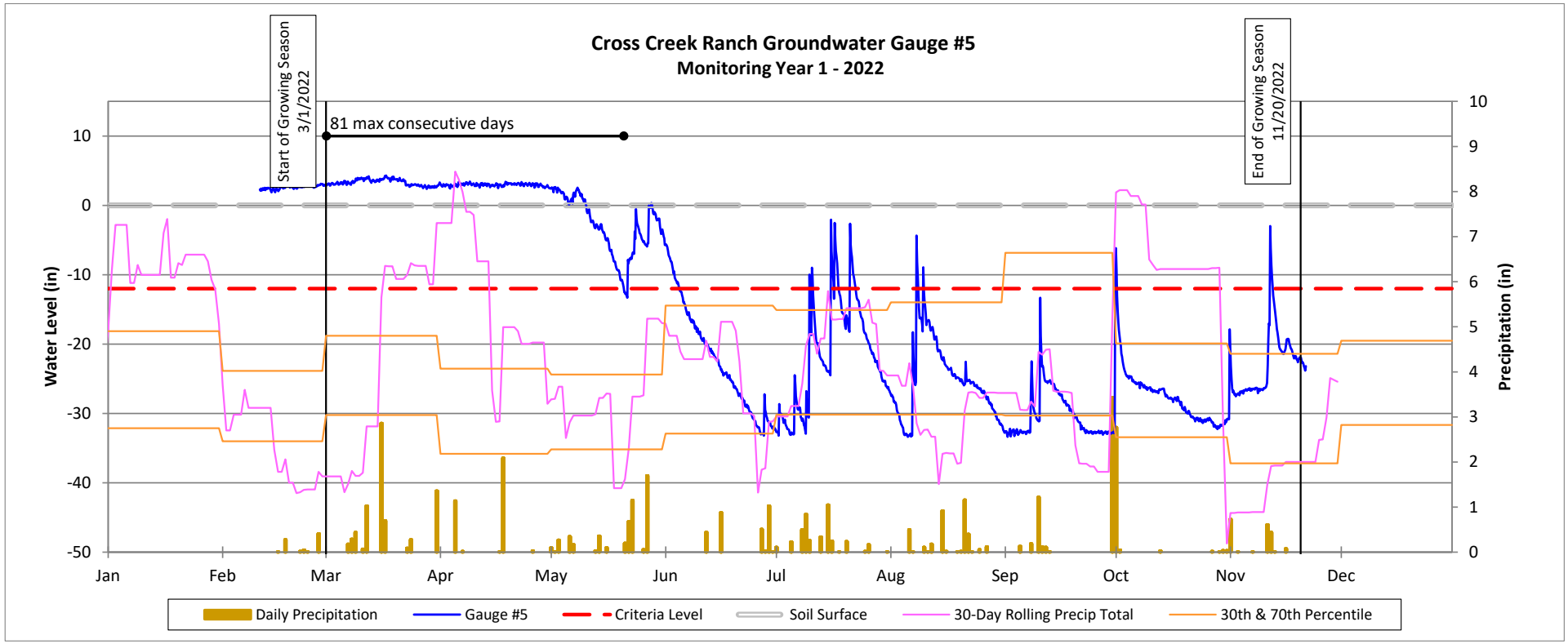


Groundwater Gauge Plots

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

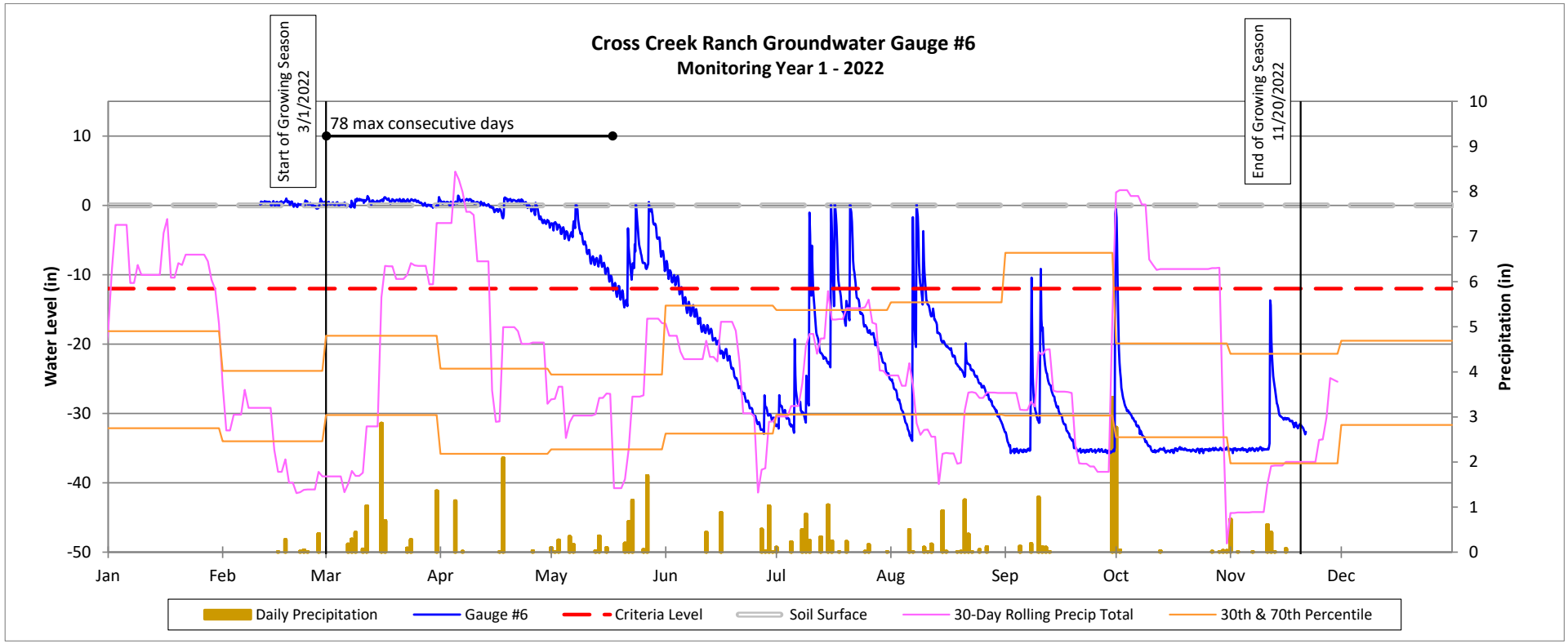


Groundwater Gauge Plots

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

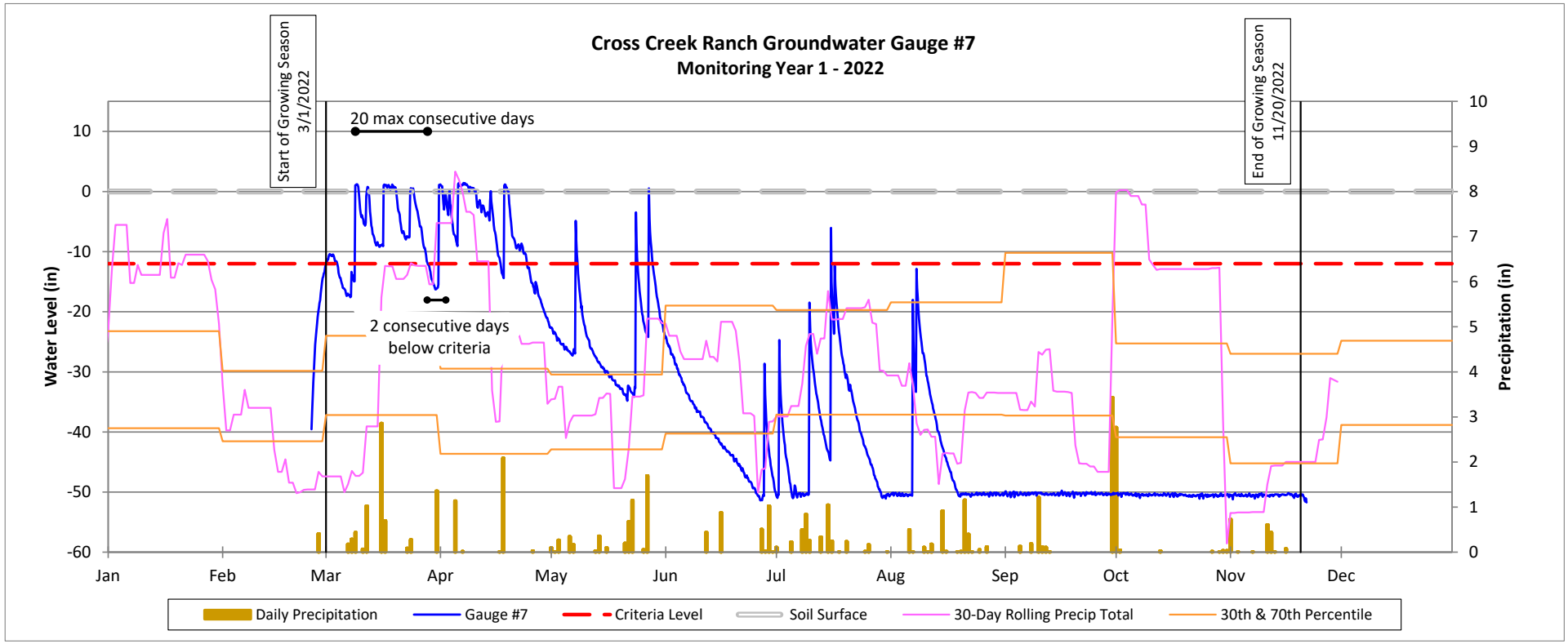


Groundwater Gauge Plots

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

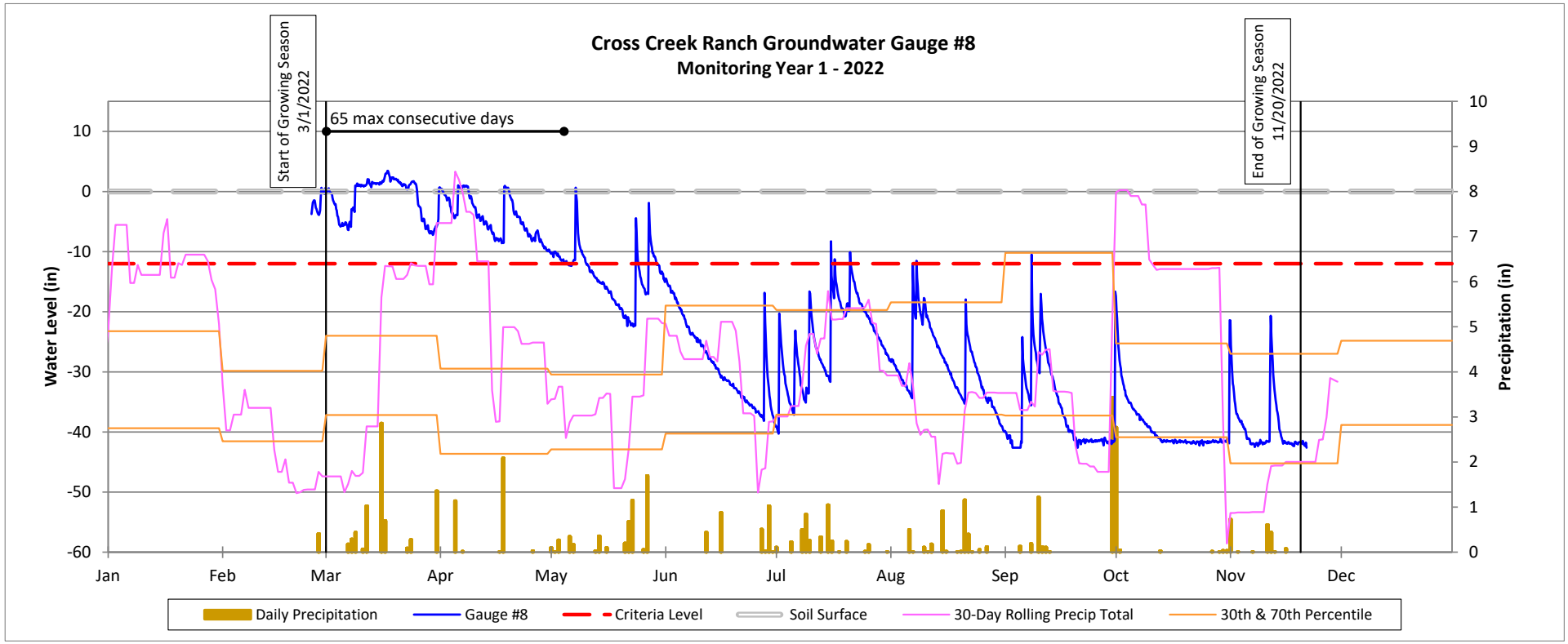


Groundwater Gauge Plots

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

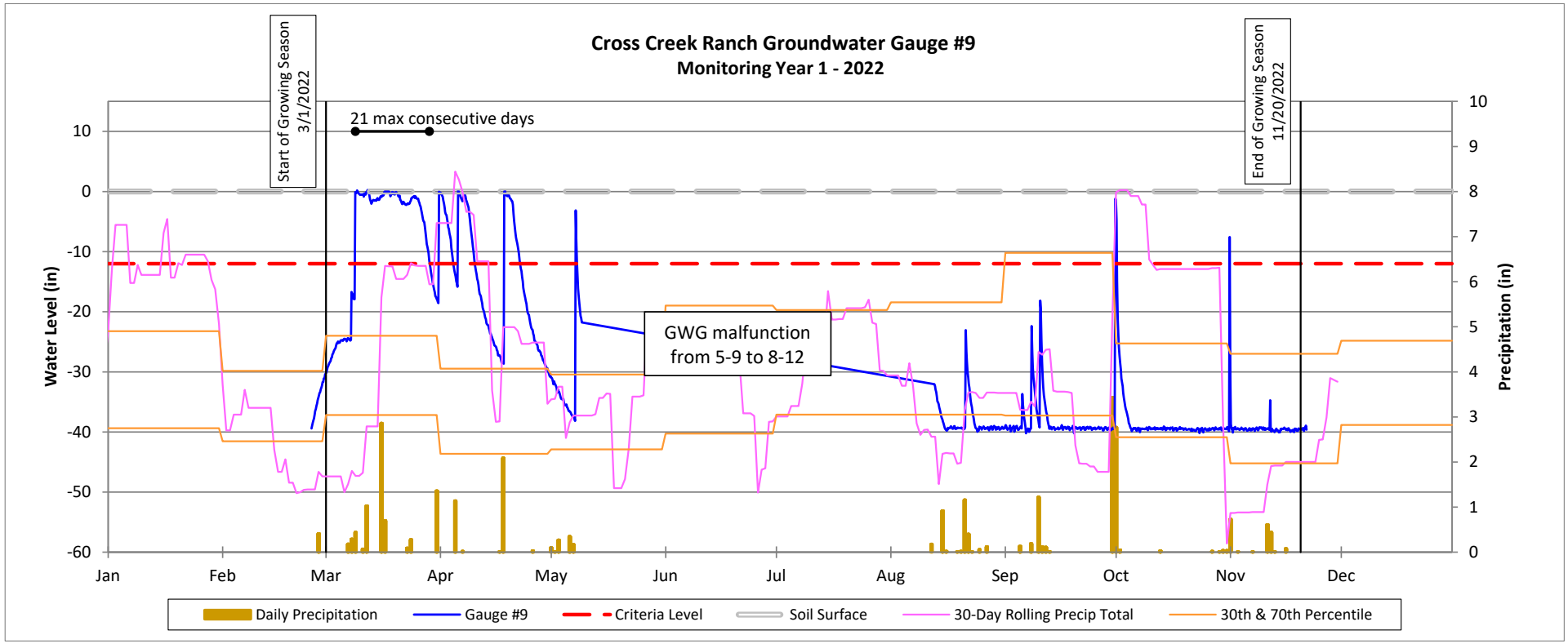


Groundwater Gauge Plots

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022

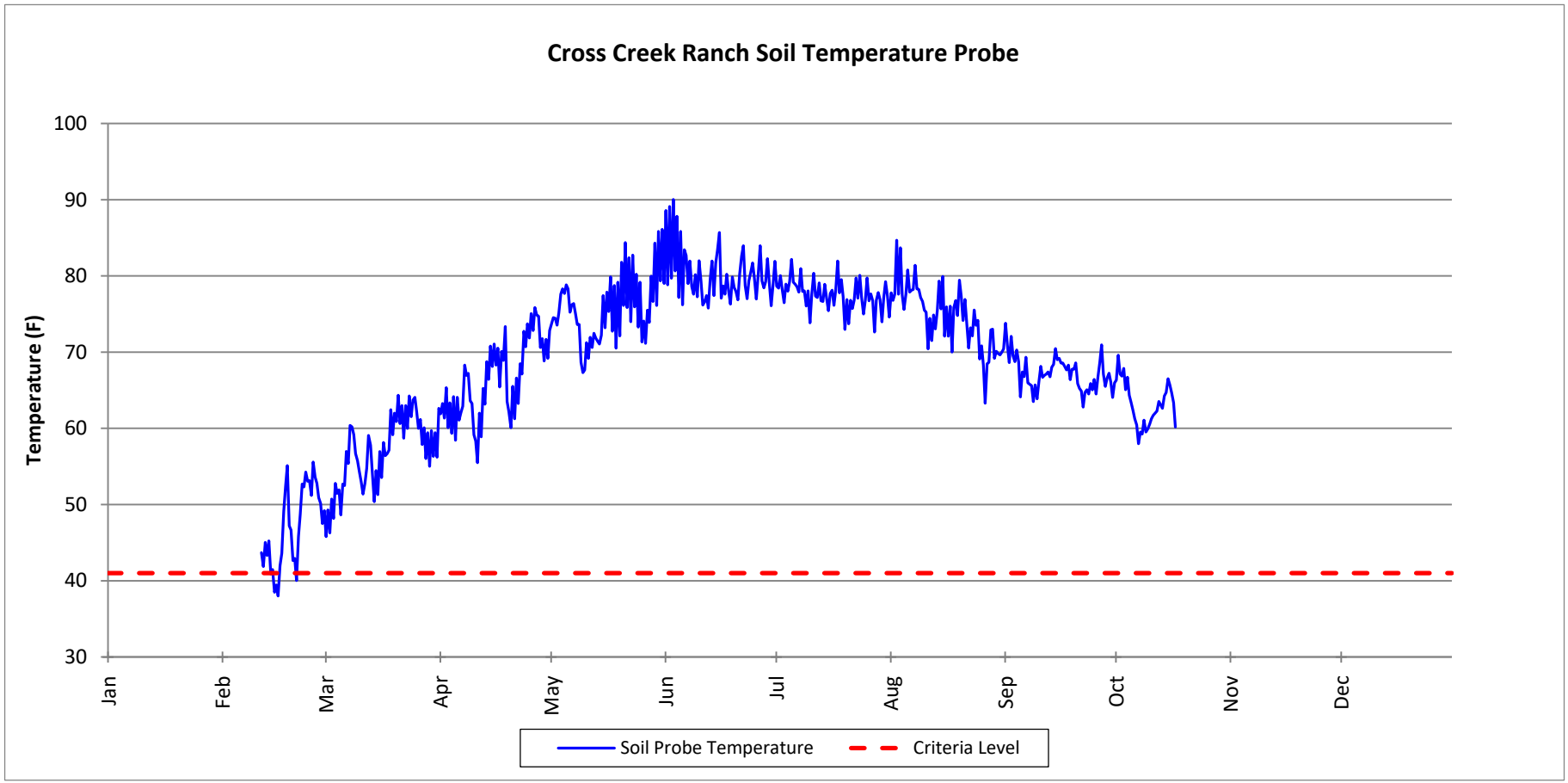


Soil Temperature Probe Plot

Cross Creek Ranch Site

DMS Project No. 100138

Monitoring Year 1 - 2022



Data after 3/13/2022 was obtained from a nearby mitigation site (~28 miles SW of Cross Creek Ranch Site).

APPENDIX E. PROJECT TIMELINE AND CONTACT INFO

Table 14. Project Activity and Reporting History

Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

Activity or Deliverable		Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted		NA	November 2019
Mitigation Plan Approved		NA	September 2021
Construction (Grading) Completed		NA	February 2022
Planting Completed		NA	March 10, 2022
As-Built Survey Completed		March 2022	March 2022
Baseline Monitoring Document (Year 0)	Stream Survey	March 2022	July 2022
	Vegetation Survey	March 2022	
Invasive Vegetation Treatment			March 2022
Year 1 Monitoring	Stream Survey	October 2022	December 2022
	Vegetation Survey	September 2022	
Year 2 Monitoring	Stream Survey	2023	December 2023
	Vegetation Survey	2023	
Year 3 Monitoring	Stream Survey	2024	December 2024
	Vegetation Survey	2024	
Year 4 Monitoring			December 2025
Year 5 Monitoring	Stream Survey	2026	December 2026
	Vegetation Survey	2026	
Year 6 Monitoring			December 2027
Year 7 Monitoring	Stream Survey	2028	December 2028
	Vegetation Survey	2028	

Table 15. Project Contact Table

Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 1 - 2022

Designer Abigail Vieira, PE	**Wildlands Engineering, Inc.** 312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986	
Construction Contractors	**Wildlands Construction** 312 West Millbrook Road, Suite 225 Raleigh, NC 27609	**Main Stream Earthwork, Inc.** 631 Camp Dan Valley Rd. Reidsville, NC 27320
Monitoring Performers Monitoring, POC	**Wildlands Engineering, Inc.** Jason Lorch 919.851.9986	

APPENDIX F. ADDITIONAL DOCUMENTATION

IRT CORRESPONDENCE

November 2, 2022

Ms. Kim Isenhour
Mitigation Project Manager
USACE – Regulatory Division

Subject: [External] Notice of Initial Credit Release/ NCDMS Cross Creek Ranch Mitigation Site/ SAW-2020-00051/ Montgomery County
Yadkin River Basin – CU# 03040104
Montgomery County
DMS Project ID No. 100138

Dear Ms. Isenhour:

On October 12, 2022, Wildlands Engineering received comments from the North Carolina Interagency Review Team (IRT) regarding the 15-Day As-Built/MY0 review for the Cross Creek Ranch Mitigation Site (SAW-2020-00051) in accordance with Section 332.8(o)(9) of the 2008 Mitigation Rule. The following letter documents DMS feedback and Wildlands' corresponding responses and additions to the Monitoring Year 1 Annual Report.

Casey Haywood, USACE:

1. Several adjustments were made during construction to save trees. Please note visual observations of tree survival in these areas in future monitoring reports; the IRT is interested in tree survival on mitigation sites following construction.

Response: Wildlands will visually observe tree survival and note this in future monitoring reports.

2. Vegetation plot data indicates the site is on a trajectory for success. When was the site planted? Table 10 shows it was planted in March 2022 but does not specify the day.

Response: As stated in Table 6 found in Appendix B of the Monitoring Year 0 Annual Report, the planting date is March 10, 2022. Wildlands will include this in Table 14, Project Activity and Reporting History, found within Appendix E of the Monitoring Year 1 Annual Report.

3. Concur with DWR's comment 3. In addition, please make sure to capture the wetland rehabilitation areas with a random veg plot in future monitoring reports.

Response: Wildlands will work to capture the wetland rehabilitation areas in future random vegetation plots. However, wetland rehabilitation zones are small, and may be difficult to fully represent using random vegetation plots. Both wetland re-establishment and rehabilitation zones were planted with the same species.

Todd Bowers, USEPA:

1. There is a lack of, or at least I expected, a comprehensive summary of the work performed in the opening paragraphs that outlines the length of streams and acres of wetlands restored/enhanced/preserved and any additional features (monitoring devices etc.) of the site that were implemented.

Response: In an effort to keep reports concise, information regarding work performed, length of streams and acres of wetlands restored/enhanced/preserved is outlined in Tables 1 and 2 of the Monitoring Year

0 Annual Report, rather than within the text. Additional features, including monitoring devices implemented on the site, are portrayed in Figures 1a-c of the Monitoring Year 0 Annual Report.

2. The 19.57 acres of mechanically treated Chinese privet will receive a follow up chemical treatment in MY1. Noted.

3. One random veg plot has a dominant species (Eastern cottonwood) but this is a random plot so there is no expectation that this result will be repeated. Noted.

4. The photo of the culverts from the stream perspective are great but I would like to see some additional photos of the crossing from the at-grade perspective to illustrate the crossing width.

Response: Wildlands will include additional culvert photos from the at-grade perspective in Appendix A of the Monitoring Year 1 Annual Report. However, the width of the crossing is detailed in the as-built plans, and is best observed by scaling from the plans.

Erin Davis, NCDWR:

1. As per the 2016 NCIRT guidance, please provide soil boring descriptions near all groundwater monitoring gauges.

Response: Wildlands will include soil boring descriptions in Appendix F of the Monitoring Year 1 Annual Report.

2. CCPV – The groundwater gauges in the two larger wetland reestablishment areas appear to have shifted a bit more interior. DWR has mentioned in the past that the sections of wetland credit areas we are most concerned with meeting the minimum hydroperiod threshold are near the credit boundary, close to the upland transition and close to the stream. If during monitoring, vegetation establishment and soils aren't consistent across a wetland credit area, DWR may request another gauge be installed for better representation.

Response: If requested in the future, Wildlands will install additional gauges for better representation of the credit boundary and upland transition of the two larger wetland reestablishment areas.

3. CCPV – Most of the permanent veg plots are close to the stream, which is helpful to capture any priority 2 cuts that we're concerned about. However, there's limited representation of the outer buffer near the easement boundary by permanent veg plots. Please use a few of the random plots each year to cover this zone, as well as, paying specific attention during the visual assessment.

Response: Wildlands will use a few of the random plots each year to represent vegetation in the outer buffer near the easement boundary.

4. Sheet 1.3.8 – Is the additional riprap shown lining the pool downstream of the culvert or did it replace the pool as more of a riffle?

Response: There is a pool downstream of the culvert. It was lined with riprap for outlet protection, which may have given the appearance of a riffle.

5. Sheet 1.4.1 – Of all the added riprap reinforcement areas, the only one that appears to extend along the stream credit area is the top of UT1B. Does maintenance of this riprap area need to be added as an allowable activity by Stewardship? With the culvert ending on the easement boundary, what is the likelihood that future crossing maintenance/replacement may impact the easement area?

Response: Wildlands does not anticipate the riprap reinforcement area at the top of UT1B to require maintenance.

The culvert that ends on the easement boundary of UT1B is a box culvert, which is unlikely to fail and likely won't need future maintenance, nor will maintenance impact the easement area.

6. Many of the construction changes are tied to attempts to save trees. Does the project engineer work with the project ecologist on these decisions? Is tree health assessed? Are construction shifts away from trees far enough not to impact critical root zones?

Response: Most alignment shifts during construction are made by the construction manager when the project ecologist is not on site. Tree health is a key factor in these decisions.

Construction shifts are made as far away from the design alignment as possible, but there is no guarantee that critical root masses won't be impacted.

7. Photo Point 34, UT3 R2 – Were there any field indicators that the right bank shown in the photo is actively eroding?

Response: Photo Point 34 at UT3 R2 shows a vertical, stable bank that has experienced erosion in the past. There are no signs of active or recent erosion. Additionally, there are trees present with root masses in place to further stabilize the bank. Wildlands will include additional photos of the bank in Appendix F of the Monitoring Year 1 Annual Report.

8. DWR appreciated the planted species diversity.

Response: Thank you, we are pleased with vegetation survival and diversity thus far.

Thank you for your review and providing comments on this submittal. If you have any further questions, please contact me at (919) 851-9986, or by email (jlorch@wildlandseng.com).

Sincerely,

Jason Lorch, *Monitoring Coordinator*

SOIL BORING DESCRIPTIONS

Soil Boring Descriptions

Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 0 - 2022

Soil Profile Description at Location of Groundwater Well 1:

Depth Range (in.)	Color	Redox	Texture	Notes
0-4	10YR 5/2 (85%)	7.5YR 6/8 (15%)	SIL	
4-20	10YR 5/2 (90%)	7.5YR 5/6 (10%)	SIL	Grass/pond bed
20-40	2.5Y 4/2 (95%)	10YR 6/8 (5%)	SICL	
40-44	10YR 5/2 (60%)	10YR 6/8 (40%)	CL	
44-45	2.5Y 5/1 (75%)	10YR 6/8 (25%)	SICL	
45+	Bedrock layer			

Soil Profile Description at Location of Groundwater Well 2:

Depth Range (in.)	Color	Redox	Texture	Notes
0-6	10YR 5/2 (95%)	7.5YR 6/8 (5%)	SIL	
6-24	5Y 7/2	7.5YR 6/8	SICL	
24-41	5Y 6/1	10YR 6/8	CL	
41-65	2.5Y 6/1	10YR 6/8	CL	

Soil Profile Description at Location of Groundwater Well 3:

Depth Range (in.)	Color	Redox	Texture	Notes
0-2	10YR 5/2 (100%)			
2-16	5Y 6/3 (40%)	10YR 6/6 (60%)	SIL	
16-32	5Y 6/2 (85%)	10YR 6/6 (15%)	SICL	
32-45	5Y 7/1 (75%)	10YR 6/8 (25%)	SICL	Medium/large gravel
45+	Bedrock layer		SICL	

Soil Profile Description at Location of Groundwater Well 4:

Depth Range (in.)	Color	Redox	Texture	Notes
0-2	2.5YR 5/2 (100%)		SIL	
2-10	2.5Y 6/2 (82%)	7.5YR 5/6 (12%)	SIL	
10-15	2.5Y 6/1 (85%)	7.5YR 5/8 (15%)	CL	
15-24	5Y 7/1 (80%)	10YR 6/8 (20%)	SICL	
24-33	5Y 6/1 (90%)	10YR 6/8 (10%)	SICL	
33+	Bedrock layer			

Soil Profile Description at Location of Groundwater Well 5:

Depth Range (in.)	Color	Redox	Texture	Notes
0-11	5Y 6/1 (85%)	6.5 6/8 (15%)	SIC	
11-25	2.5Y 5/4 (50%)	10R 3/6 (5%), 2.5YR 4/6 (45%)	C	
25-38	2.5Y 6/2 (70%)	7.5YR 6/8 (30%)	SIC	
38-45	2.5YR 4/8 (80%)	2.5Y 6/4 (20%)	CL (80%), Gravel (20%)	

Soil Profile Description at Location of Groundwater Well 6:

Depth Range (in.)	Color	Redox	Texture	Notes
0-3	2.5Y 6/1 (90%)	2.5YR 4/8 (10%)	SIL	
3-18	2.5Y 6/2 (90%)	5Y 5/8 (10%)	CL	
18-30	2.5Y 7/1 (90%)	5Y 5/8 (10%)	CL	
30-36	5Y 7/1 (50%)	7.5 6/8 (50%)	Sandy CL	
36-50	2.5Y 6/1 (70%)	7.5YR 6/8 (30%)	C	

Soil Boring Descriptions

Cross Creek Ranch Site
DMS Project No. 100138
Monitoring Year 0 - 2022

Soil Profile Description at Location of Groundwater Well 7:

Depth Range (in.)	Color	Redox	Texture	Notes
0-2	2.5Y 6/2 (95)	7.5YR 5/6 (50	SiL	
2-35	5Y 7/1 (90)	10YR 6/8 (10)	SiCL	Mg Conc
35-47	5Y 6/1 (75)	10YR 6/8 (25)	SiCL	
47-56	5Y 6/1 (65)	10YR 6/8 (35)	CL	10% gravel, inc redox

Soil Profile Description at Location of Groundwater Well 8:

Depth Range (in.)	Color	Redox	Texture	Notes
0-6	10YR 5/2 (93)	10YR 7/8 (7)	SiL	
6-14	2.5Y 7/2 (90)	10YR 6/8 (10)	SiCL	
14-25	2.5Y 7/1 (75)	10YR 6/8 (25)	CL	
25-34	5Y 6/1 (85)	10YR 6/8 (15)	C	
34+	2.5Y 6/1 (75)	10YR 6/8 (25)	C	

Soil Profile Description at Location of Groundwater Well 9:

Depth Range (in.)	Color	Redox	Texture	Notes
0-7	2.5Y 6/2 (95)	7.5YR 5/6 (5)	SiL	
7-15	2.5Y 7/1 (90)	10YR 6/8 (10)	CL	
15-42	2.5Y 7/1 (80)	10YR 6/8 (20)	SiCL	

Photo Point 34 Bank Photos

	
PHOTO POINT 34 UT3 R2 – Right Bank *(10/26/2022)*	**PHOTO POINT 34 UT3 R2 – Right Bank *(10/26/2022)***