



MONITORING YEAR 1 ANNUAL REPORT FINAL

DRY CREEK MITIGATION SITE

Durham County, NC
NCDEQ Contract No. 6827
DMS Project No. 97082
USACE Action ID No. SAW-2016-00880
NCDWR Project No. 2016-0369

Data Collection Period: May-November 2020
Draft Submission Date: November 23, 2020
Final Submission Date: December 16, 2020

PREPARED FOR:



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

Mitigation Project Name **Dry Creek Mitigation Site**
 DMS ID **97082**
 River Basin **Neuse**
 Cataloging Unit **03020201**
 County **Durham**

USACE Action ID **2016-00880**
 DWR Permit **2016-0369**
 Date Project Instituted **3/22/2016**
 Stream/Wet. Service Area **Neuse 03020201**
 Date Printed **9/3/2020**

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 Date: 2020.09.25 13:32:15 -04'00'

Signature of Official Approving Credit Release

Credit Release Milestone	Warm Stream Credits							
	Project Credits	Scheduled Releases %	Estimated Scheduled Release #	Proposed Released #	Not Approved # Releases	Approved Credits	Anticipated Release Year	Actual Release Date
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - Year 0 / As-Built	30.00%	2,537.380	2,537.380	0.000	2,537.380	2020	9/3/2020	
3 - Year 1 Monitoring	10.00%	845.793				2021		
4 - Year 2 Monitoring	10.00%	845.793				2022		
5 - Year 3 Monitoring	10.00%	845.793				2023		
6 - Year 4 Monitoring	5.00%	422.897				2024		
7 - Year 5 Monitoring	10.00%	845.793				2025		
8 - Year 6 Monitoring	5.00%	422.897				2026		
9 - Year 7 Monitoring	10.00%	845.793				2027		
Stream Bankfull Standard	10.00%	845.793				2022		
Totals						2,537.380		

Total Gross Credits	8,457.934
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	2,537.380
Total Percentage Released	30.00%
Remaining Unreleased Credits	5,920.554

Notes

Contingencies (if any)

Project Quantities

Mitigation Type	Restoration Type	Physical Quantity
Warm Stream	Restoration	7,659.000
Warm Stream	Enhancement I	464.000
Warm Stream	Enhancement II	1,143.000
Warm Stream	Preservation	324.000

Mitigation Project Name Dry Creek Mitigation Site
DMS ID 97082
River Basin Neuse
Cataloging Unit 03020201
County Durham

USACE Action ID 2016-00880
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Stream/Wet. Service Area Neuse 03020201
Date Printed 9/3/2020

							Warm Stream Restoration Credits	Warm Stream Restoration Equivalent Credits
Debits								
Beginning Balance (mitigation credits)							8,425.534	32.400
Released Credits							2,527.660	9.720
Unrealized Credits							0.000	0.000
Converted Credits							0.000	0.000
Owning Program	Req. Id	TIP #	Project Name	USACE Permit #	DWR Permit #	DCM Permit #		
Remaining Balance (Released credits)							2,527.660	9.720
Remaining Balance (Unreleased credits)							5,897.874	22.680
Total Remaining Balance (Released and Unreleased credits)							8,425.534	32.400

PREPARED BY:



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December 16, 2020

Lindsay Crocker

NC Department of Environmental Quality, Division of Mitigation Services
217 W. Jones Street, Suite 3000
Raleigh, NC 27609-1652

Subject: DMS Comments on Dry Creek MY1
Dry Creek, Project ID #97082, DMS Contract #6827

Dear Ms. Crocker,

We have reviewed the comments on the MY1 Report for the above referenced project dated December 4, 2020 and have revised the report based on these comments. The revised documents are submitted with this letter. Below are responses to each of your comments. For your convenience, the comments are reprinted with our response in italics.

Report Comments:

1. There are a few places in the report that have erroneous credit amounts showing for stream (8,453.734). The credit amount in your Table 1 is 8,457.732, which does not exactly match the MY0. Please revise all credits to match MY0 and debit ledger (**8,457.934**) or remove incorrect references to credit.
All credits have been updated to match the debit ledger (8,457.934).
2. Please include a response to IRT comments made at approval of MY0 / baseline behind the cover page of your MY1.
Responses to IRT comments are included in the MY1 Report.

Digital Comments:

1. The table 7 report generated by the CVS mdb only includes plots 1-8, please ensure all data are included to support Table 9 in the report and resubmit the mdb.
The CVS database only supports fixed vegetation plots (VP 1-8). VP 9-12 are random vegetation plots that have a separate excel file. Since Dry Creek has already been setup with the CVS database, Wildlands will continue reporting data in the current format.
2. If available, please provide the Mitigation Plan spatial features.
Mitigation Plan spatial features have been included in the Support Files.



If you have any questions, please contact me by phone (919) 851-9986, or by email (jlorch@wildlandseng.com).

Sincerely,

A handwritten signature in black ink, appearing to read "Jason Lorch".

Jason Lorch, *Monitoring Coordinator*



December 16, 2020

Kim Browning

Wilmington District, Regulatory Division
U.S. Army Corps of Engineers
11405 Falls of Neuse Road
Wake Forest, NC 27587

Subject: IRT Comments on Dry Creek Mitigation Site Baseline Report and Record Drawings
Dry Creek, USACE Action ID 2016-00880, DMS Project Number 97082

Dear Ms. Browning,

We have reviewed the comments on the MY0 Report for the above referenced project dated September 25, 2020. Below are responses to each of your comments. For your convenience, the comments are reprinted with our response in italics.

Report Comments:

1. DWR appreciates the bulleted detailed description of construction changes.
Thank you.
2. Does the revised break in the easement along UT1 Reach 2 require a modification to the conservation easement documentation?
No, this change was recorded in the final conservation easement and this is the conservation easement shown on the final as-built plans.
3. Mac had requested a gauge at UT1A Sta. 300+50 due to concerns about flow. Please explain why the flow gauge was installed further downstream than the requested station location (Sheer 1.17).
To accurately capture bankfull and thalweg elevations the flow gage was placed in the riffle cross-section on UT1A. If DWR prefers the gauge to be placed at station 300+50, we can move it upstream 50 feet so it is at station 300+50. However, the flow is expected to be the same at both locations on UT1A.
4. Please explain the Sheet 1.20 profile variation between the preconstruction ground, design grade and as-built grade along the UT2 Enhancement II Reach.
The as-built profile on the lower section of UT2 varies slightly from the design profile based on a slight alignment adjustment during construction to avoid some mature trees. Also, sediment was deposited in the lower section of UT2 from the main channel during a large storm event shortly after the channel was built.



5. There was a significant number of substitutions replacing stone with wood structures. DWR is concerned with long-term grade control stability, particularly on the intermittent reaches, if the log structures rot. Please pay close attention to the condition of these structures during the monitoring period.

We will monitor the condition of the log structures on the project, especially in the intermittent channels.

If you have any questions, please contact me by phone (919) 851-9986, or by email (jlorch@wildlandseng.com).

Sincerely,

A handwritten signature in black ink, appearing to read "Jason Lorch".

Jason Lorch, Monitoring Coordinator

EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) implemented a full delivery project at the Dry Creek Mitigation Site (Site) for the North Carolina Department of Environmental Quality Division of Mitigation Services (DMS) to restore a total of 9,811 linear feet of perennial and intermittent streams in Durham County, NC. The Site will generate 8,457.934 stream mitigation units (SMUs). All stream lengths were measured along the stream centerline for SMU calculations. UT1 Reach 2 crediting changed after the Mitigation Plan was approved due to the revised break in the conservation easement associated with a utility line relocation. The Site is located approximately three miles northwest of Butner, NC and approximately 2 miles west of the Granville County/Durham County line (Figure 1) in the Neuse River Basin 8-Digit Hydrologic Unit Code (HUC) 03020201. The Site is located within the Neuse River Targeted Local Watershed (TLW) as presented in the 2010 Neuse River Basin Restoration Priorities (RBRP) which highlights the importance of riparian buffers for stream restoration projects (Breeding, 2010). The Site is located in the Neuse River Basin HUC 03020201010050 and NC Division of Water Resources (NCDWR) Subbasin 03-04-01. The Site contains Dry Creek and eight unnamed tributaries (UT1-UT7; UT1a) which flow to Lake Michie on the Flat River and then into Falls Lake. The Flat River is classified as Water Supply Waters (WS-III), and Nutrient Sensitive Waters (NSW). The downstream drainage area of the Site is 807 acres. The 29.764 acre Site is protected with a permanent conservation easement.

The project goals established in the Mitigation Plan (Wildlands, 2018) were completed with careful consideration of goals and objectives described in the Neuse River RBRP. The project goals include:

- Exclude cattle from project streams;
- Stabilize eroding stream banks;
- Improve the stability of stream channels;
- Improve instream habitat;
- Reconnect channels with floodplains and riparian wetlands to allow a natural flooding regime;
- Restore and enhance native floodplain and streambank vegetation; and
- Permanently protect the Site from harmful land uses.

The project will contribute to achieving the goals for the watershed listed in the Neuse River RBRP and provide ecological benefits within the Neuse River Basin. While benefits such as habitat improvement and geomorphic stability are limited to the Site, others, such as reduced pollutant and sediment loading, have farther reaching effects.

Site construction, planting, and as-built surveys were completed in April 2020. Monitoring Year 1 (MY1) assessments and site visits were completed in November 2020. Overall, the Site has met the required vegetation and stream success criteria for MY1. Eleven of twelve vegetation monitoring plots met the interim success criteria with an average stem density of 452 stems per acre. All restored streams are stable and functioning as designed except for a short, isolated area of bank scour directly downstream of the culvert crossing on Dry Creek Reach 4. Bankfull events were recorded on each restoration reach during the 2020 annual monitoring period except for UT6 Reach 1. Additionally, the flow gages on UT1A, UT2, and UT5 Reach 1 recorded baseflow for more than 30 consecutive days.



DRY CREEK MITIGATION SITE
Monitoring Year 1 Annual Report

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Section 1: PROJECT OVERVIEW

The Dry Creek Mitigation Site (Site) is located in northeastern Durham County, approximately three miles northwest of Butner, NC and approximately 2 miles west of the Granville County/Durham County line (Figure 1). The Site contains tributaries to Lake Michie on the Flat River, which flows directly into Falls Lake. Flat River is classified as Water Supply Waters (WS-III) and Nutrient Sensitive Waters (NSW). The Site is within Hydrologic Unit Code (HUC) 03020201010050, Subbasin 03-04-01 and is located within the Neuse River Targeted Local Watershed (Figure 1) and is identified in the 2010 Neuse River Basin Restoration Priorities (RBRP) (Breeding, 2010). The Site is located in the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998). The project watershed consists primarily of agricultural and wooded land. The drainage area for the Site is 807 acres (1.26 square miles).

The project streams consist of Dry Creek and eight unnamed tributaries. Mitigation work within the Site included restoration, enhancement I, enhancement II, and preservation of 9,810 linear feet of perennial and intermittent stream channels. The riparian areas were planted with native vegetation to improve habitat and protect water quality. The final Mitigation Plan (Wildlands, 2018) was submitted to and accepted by DMS in October 2018. Construction activities were completed by Land Mechanic Designs, Inc. in April 2020. Planting and seeding activities were completed by Bruton Natural Systems, Inc. in April 2020. Baseline monitoring (MY0) was conducted between March and April 2020. Annual monitoring will occur for seven years with the close-out anticipated to commence in 2027 provided the success criteria are met. Appendix 1 provides additional details on project activity, history, contact information, and watershed background information for the Site.

Prior to construction activities, cattle were rotationally grazed along UT1, UT1a, and Dry Creek to the UT3 confluence. Cattle access to these streams resulted in significant ecological impacts. Table 4 in Appendix 1 and Tables 10a-d in Appendix 4 present the pre-restoration conditions data.

The Site is located on 9 parcels under 6 different landowners and a conservation easement was recorded on 29.764 acres. The project is expected to provide 8,457.934 SMUs at closeout. A Project Vicinity Map and directions are provided in Figure 1, and Project Components / Asset Map are illustrated in Figure 2.

1.1 Project Goals and Objectives

The project is intended to provide numerous ecological benefits. While benefits such as habitat improvement and geomorphic stability are limited to the Site, reduced nutrient and sediment loading have farther reaching effects. Table 1 below describes expected outcomes to water quality and ecological processes and provides project goals and objectives. These goals were established and completed with careful consideration of goals and objectives described in the RBRP and to meet the DMS mitigation needs while maximizing the ecological and water quality uplift within the watershed.



Table 1: Mitigation Goals and Objectives – Dry Creek Mitigation Site

Goals	Objectives	Expected Outcomes
Exclude cattle from project streams.	Install fencing around project areas adjacent to cattle pastures or remove cattle from the Site.	Reduce and control sediment inputs. Reduce and manage nutrient inputs. Contribute to protection of or improvement to a Water Supply Waterbody.
Stabilize eroding stream banks.	Reconstruct stream channels slated for restoration with stable dimensions. Create stable tie-ins for tributaries joining restored channels. Add bank revetments and in-stream structures to reaches to protect restored/enhanced streams.	Reduce sediment inputs. Contribute to protection of or improvement to a Water Supply Waterbody.
Improve the stability of stream channels.	Construct stream channels that will maintain a stable pattern and profile considering the hydrologic and sediment inputs to the system, the landscape setting, and the watershed conditions.	Reduce and control sediment inputs. Contribute to protection of or improvement to a Water Supply Waterbody.
Improve instream habitat.	Install habitat features such as constructed riffles, cover logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	Improve aquatic communities in project streams.
Reconnect channels with floodplains.	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to the existing floodplain.	Reduce and control sediment inputs. Reduce and manage nutrient inputs. Contribute to protection of or improvement to a Water Supply Waterbody. Enhance hydration of riparian wetlands.
Restore and enhance native floodplain vegetation.	Plant native tree species in riparian zone where currently insufficient.	Reduce and control sediment inputs. Reduce and manage nutrient inputs. Provide a canopy to shade streams and reduce thermal loadings. Contribute to protection of or improvement to a Water Supply Waterbody.
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.

1.2 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, 2018).

1.2.1 Vegetative Assessment

Planted woody vegetation is being monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008). A total of eleven standard 10 meter by 10 meter and one, 5 meter by 20 meter vegetation plots were established during

baseline monitoring. Four of the twelve vegetation plots will be relocated randomly on an annual basis to monitor vegetation health across the Site.

The final vegetation success criteria at the end of MY7 are the survival of 210 planted stems per acre averaging 10 feet in height. Interim success criteria are the survival of 320 planted stems per acre at the end of MY3 and 260 planted stems per acre with an average stem height of 7 feet at the end of MY5.

The MY1 vegetative survey was completed in November 2020. Vegetation monitoring resulted in an average stem density of 452 planted stems per acre, which is well above the interim requirement of 320 stems per acre required at MY3 and approximately 15% less than the baseline density recorded (533 planted stems per acre). There is an average of 11 stems per plot as compared to 13 stems per plot in MY0. Of the 12 vegetation plots, 11 plots individually met the interim success criteria and are on track to meet the final success criteria required for MY7. Fixed vegetation plot 6 with 283 stems per acre does not meet the interim success criteria of 310 stems per acre. However, it is on track to meet the final success criteria of 210 stems per acres. A total of five stems within this plot were documented as missing, three of which were tulip poplar (*Liriodendron tulipifera*). Tulip poplar has had low survivability across Wildlands sites and are being phased out of future planting plans. All other trees in vegetation plot 6 were healthy and no other die-off is foreseen. This vegetation plot will continue to be monitored to determine if remedial action is warranted. Refer to Appendix 2 for Vegetation Plot Photographs and the Vegetation Condition Assessment Table and Appendix 3 for Vegetation Plot Data.

1.2.2 Vegetation Areas of Concern

No vegetation areas of concern were identified during MY1.

1.2.3 Stream Assessment

Morphological surveys for MY1 were conducted in November 2020. All streams within the Site are stable and functioning as designed. All 19 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. Substrate measurements indicate the maintenance of coarser materials in the riffle reaches and finer particles in the pools. Longitudinal profile surveys are not required on the project unless visual inspection indicates reach wide vertical instability. Refer to Appendix 2 for the Visual Stream Morphology Stability Assessment Table, Integrated Current Condition Plan View (CCPV), and Stream Photographs. Refer to Appendix 4 for the Morphological Summary Data and Plots.

1.2.4 Stream Areas of Concern

Localized bank erosion on the outside bend of a pool occurred directly downstream of the culvert crossing along Dry Creek Reach 4 (Figure 3b, CCPV and Stream Areas of Concern Photographs Appendix 2). During storm events, increased discharge velocities associated with the culvert has resulted in downstream bank erosion of 15 linear feet. Refer to Section 1.2.7 for further information on the management plan for the localized erosion.

1.2.5 Hydrology Assessment

By the end of MY7, four bankfull events must have occurred in separate years within the restoration and enhancement I reaches. Bankfull events were recorded on Dry Creek Reach 2 and 3 along with UT1 Reach 2 and UT5 Reach 1. Due to crest gage malfunction, no bankfull events were recorded on UT6 Reach 1. As of November 17, 2020, the crest gage was reinstalled and is able to read bankfull events.

In addition, the presence of baseflow must be documented on restored intermittent reaches (UT1A, UT2 and UT5) for a minimum of 30 consecutive days during a normal precipitation year. In-stream flow gages equipped with pressure transducers were installed to monitor continuity of baseflow. UT1A, UT2, and



UT5 Reach 1 maintained baseflow as expected for intermittent streams. The maximum consecutive days ranged from 87 days to 237 days. Refer to Appendix 5 for hydrologic data.

1.2.6 Wetland Assessment

One groundwater gage was installed and monitored within an existing wetland zone at a location requested by North Carolina Division of Water Resources. The gage was downloaded and maintained quarterly. The purpose of the gauge is to assess potential effects to wetland hydrology from the construction of the restored stream channel through this area. The results of this monitoring are not tied to a success criterion. The measured hydroperiod was 2.7% of the growing season consecutively. Hydrology associated with the existing wetland currently being monitored was largely the result of the backwater effect of an impoundment on Dry Creek. By removing the impoundment during stream restoration activities, Wildlands anticipates an influence on hydrology and the associated gage results. While the gage results may indicate hydrological impairment, the overall ecological uplift associated with removal of the man-made impoundment outweighs the potential reduction in groundwater hydrology.

1.2.7 Adaptive Management Plan

As described above in Section 1.2.4, localized bank erosion has occurred directly downstream of the Dry Creek Reach 4 culvert crossing. Manual repairs will take place during MY2 by installing sod mats and adding live stakes. This area will be observed in subsequent monitoring years, and remedial actions will be completed if necessary.

1.3 Monitoring Year 1 Summary

Of the 12 vegetation plots, 11 are on track to meet the MY3 interim requirement of 320 planted stems per acre. The one vegetation plot that did not meet criteria is on track to meet MY5 and final criteria. No remedial action will be taken at this time. All streams within the Site are stable and functioning as designed with the exception of one area of localized bank erosion along Dry Creek Reach 4. Bankfull events were documented on all stream reaches, except for T6 Reach 1 due to a gage malfunction. Greater than 30 days of consecutive flow were recorded on monitored intermittent stream reaches UT1a, UT2, and UT5 Reach 1. Overall, the Site is on track to meet 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. Narrative background and supporting information formerly found in these reports can be found in the Mitigation Plan (Wildlands, 2018) available on DMS's website. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

Section 2: METHODOLOGY

Geomorphic data was collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). All Integrated Current Condition Mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcGIS. Crest gages and pressure transducers were installed in riffle cross-sections and monitored throughout the year. Hydrologic monitoring instrument installation and monitoring methods are in accordance with the United States Army Corps of Engineers standards (USACE, 2003). Vegetation monitoring protocols followed the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008).



Section 3: REFERENCES

- Breeding, R. 2010. Neuse River Basin Restoration Priorities 2010. NCEEP, NC
- 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.
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- United States Army Corps of Engineers. 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.
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APPENDIX 1. General Figures and Tables

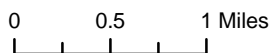
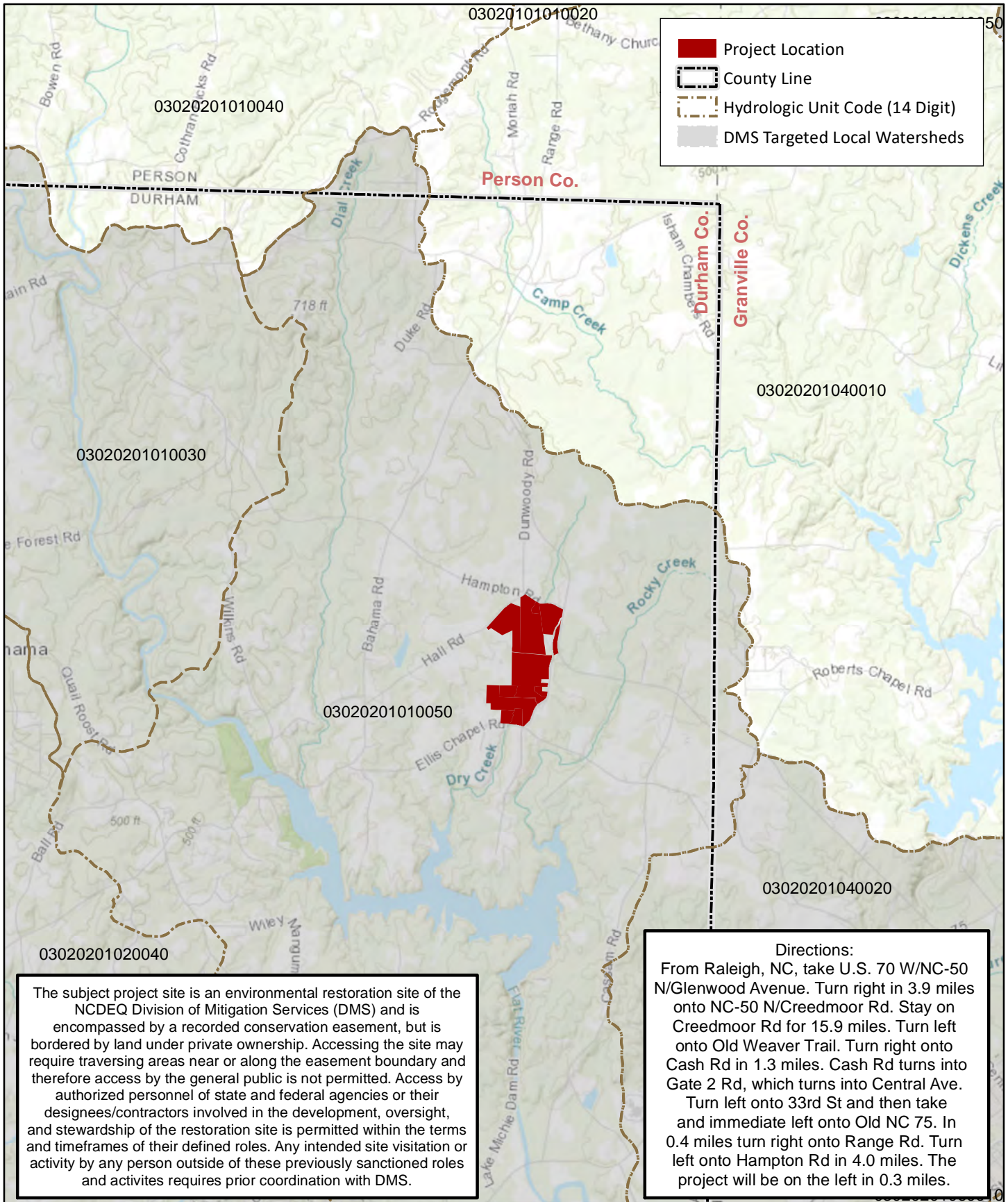


Figure 1. Project Vicinity Map
 Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

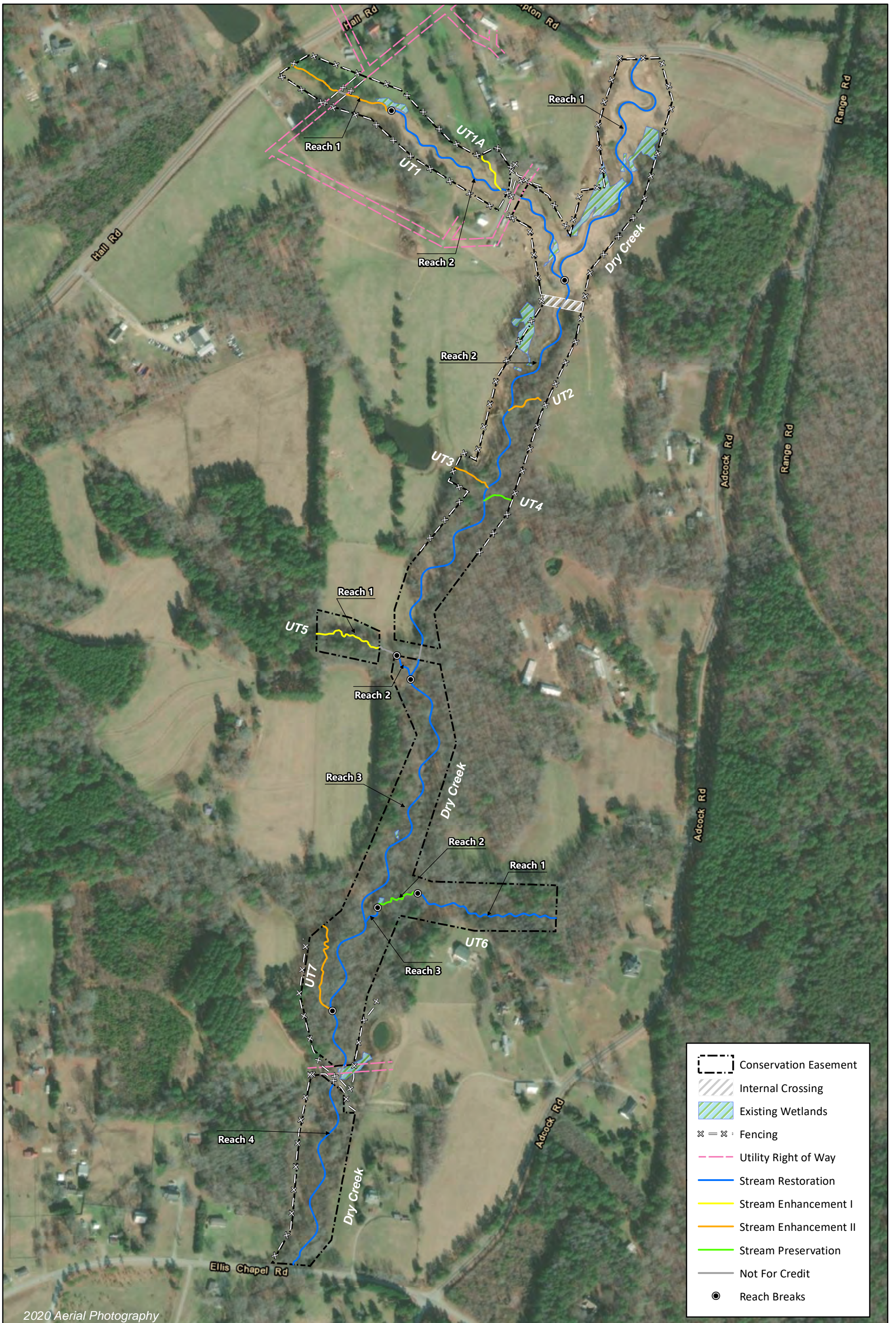


Table 1. Mitigation Assets and Components

Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

PROJECT COMPONENTS										
Reach ID	Existing Footage	Mitigation Plan Footage	Mitigation Category	Restoration Level	Priority Level	Mitigation Ratio (X:1)	Project Credits	As-Built Footage	Comments	
STREAMS										
Dry Creek Reach 1	999	1,278	Warm	R	P1	1	1,278.000	1,247	Pond Removal, Full Channel Restoration, Planted Buffer, Fencing Out Livestock	
Dry Creek Reach 2	2,104	81	Warm	R	P1	1	81.000	84	Full Channel Restoration, Planted Buffer, Fencing Out Livestock	
		44	Warm	N/A	N/A	N/A	N/A	43	Internal Easement Culvert Crossing	
		1,681	Warm	R			1	1,681.000	1,656	Full Channel Restoration, Planted Buffer, Fencing Out Livestock
		60	Warm	N/A	N/A	N/A	N/A	N/A	60	Bridge Crossing, Easement Break
		85	Warm	R	P1	1	85.000	75	Full Channel Restoration, Planted Buffer, Fencing Out Livestock	
Dry Creek Reach 3	1,955	1,603	Warm	R	P1	1	1,603.000	1,583	Full Channel Restoration, Invasive Removal	
Dry Creek Reach 4	1,495	241	Warm	R	P1	1	241.000	243	Full Channel Restoration, Invasive Removal	
		85	Warm	N/A	N/A	N/A	N/A	85	Culvert Crossing, Easement Break	
		813	Warm	R	P1	1	813.000	807	Full Channel Restoration, Invasive Removal	
UT1 Reach 1	456	216	Warm	EII	N/A	2.5	86.400	215	Bank Repairs, Fencing Out Livestock, Planted Buffer	
		35	Warm	N/A	N/A	N/A	N/A	36	Utility Crossing	
		205	Warm	EII	N/A	2.5	82.000	202	Bank Repairs, Fencing Out Livestock, Planted Buffer	
UT1 Reach 2	945	631	Warm	R	P1	1	631.000	627	Pond Removal, Full Channel Restoration, Planted Buffer, Fencing Out Livestock	
		52	Warm	N/A	N/A	N/A	N/A	53	Culvert Crossing, Utility Relocation, Easement Break	
		436	Warm	R	P1	1	436.000	426	Full Channel Restoration, Planted Buffer, Fencing Out Livestock	
UT1A	90	166	Warm	EI	N/A	1.5	110.667	165	Grade Control Structures, Fencing	
UT2	72	151	Warm	EII	N/A	2.5	60.400	135	Bank Repairs, Fencing Out Livestock	
UT3	153	156	Warm	EII	N/A	2.5	62.400	160	Bank Repairs, Fencing Out Livestock	
UT4	110	115	Warm	P	N/A	10	11.500	114	Conservation Easement	
UT5 Reach 1	371	298	Warm	EI	N/A	1.5	198.667	285	Grade Control Structures, Invasive Removal, Planted Buffer	
		80	Warm	N/A	N/A	N/A	N/A	79	Culvert Crossing, Easement Break	
UT5 Reach 2 ¹	135	119	Warm	R	P1	1	104.000	112	Full Channel Restoration	
UT6 Reach 1	582	617	Warm	R	P1	1	617.000	612	Full Channel Restoration, Invasive Removal	
UT6 Reach 2	209	209	Warm	P	N/A	10	20.900	209	Conservation Easement	
UT6 Reach 3	58	89	Warm	R	P1	1	89.000	89	Full Channel Restoration, Invasive Removal	
UT7	367	415	Warm	EII	N/A	2.5	166.000	408	Bank Repairs	

1. No credit proposed for UT5 Reach 2 Station 705+61 to 705+76 due to easement width being less than 15 feet wide.

PROJECT CREDITS							
Restoration Level	Stream			Riparian Wetland		Non-Riparian Wetland	Coastal Marsh
	Warm	Cool	Cold	Riverine	Non-Riverine		
Restoration	7,659.000						
Enhancement I	309.334						
Enhancement II	457.200						
Preservation	32.400						
Re-Establishment							
Rehabilitation							
Enhancement							
Creation							
Totals	8,457.934						

Table 2. Project Activity and Reporting History

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Activity or Report	Data Collection Complete	Completion or Scheduled Delivery
Mitigation Plan	October 2018	October 2018
Final Design - Construction Plans	November 2019	November 2019
Construction	October 2019 - April 2020	April 20, 2020
Temporary S&E mix applied to entire project area ¹	October 2019 - April 2020	April 20, 2020
Permanent seed mix applied to reach/segments ¹	October 2019 - April 2020	April 20, 2020
Bare root and live stake plantings for reach/segments	April 2020	April 24, 2020
Baseline Monitoring Document (Year 0)	Stream Survey	April 30, 2020
	Vegetation Survey	April 27, 2020
Year 1 Monitoring	Stream Survey	November 4, 2020
	Vegetation Survey	November 4, 2020
Year 2 Monitoring	Stream Survey	2021
	Vegetation Survey	2021
Year 3 Monitoring	Stream Survey	2022
	Vegetation Survey	2022
Year 4 Monitoring		December 2023
Year 5 Monitoring	Stream Survey	2024
	Vegetation Survey	2024
Year 6 Monitoring		December 2025
Year 7 Monitoring	Stream Survey	2026
	Vegetation Survey	2026

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

Table 3. Project Contact Table

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Designer Nicole Macaluso Millns, PE	Wildlands Engineering, Inc. 312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986
Construction Contractor	Land Mechanic Designs, Inc. 126 Circle G Lane Willow Spring, NC 27592
Planting Contractor	Bruton Natural Systems, Inc P.O. Box 1197 Fremont, NC 27830
Seeding Contractor	Land Mechanic Designs, Inc. 126 Circle G Lane Willow Spring, NC 27592
Seed Mix Sources	Garrett Wildflower Seed Company
Nursery Stock Suppliers Bare Roots	Dykes and Sons Nursery and Greenhouse
Live Stakes	Bruton Natural Systems, Inc
Monitoring Performers Monitoring, POC	Wildlands Engineering, Inc. Jason Lorch 919.851.9986

Table 4. Project Information and Attributes

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

PROJECT INFORMATION										
Project Name	Dry Creek Mitigation Site									
County	Durham County									
Project Area (acres)	29.764									
Planted (acres)	14.040									
Project Coordinates (latitude and longitude)	36° 11' 07.92" N, 78° 49' 39.00" W									
PROJECT WATERSHED SUMMARY INFORMATION										
Physiographic Province	Carolina Slate Belt of the Piedmont Physiographic Province									
River Basin	Neuse River									
USGS Hydrologic Unit 8-digit	03020201									
USGS Hydrologic Unit 14-digit	03020201010050									
DWR Sub-basin	03-04-01									
Project Drainage Area (acres)	807									
Project Drainage Area Percentage of Impervious Area	<1%									
CGIA Land Use Classification	50% Forested, 40% Cultivated, 9% Residential Area									
REACH SUMMARY INFORMATION										
Parameters	Dry Creek	UT1	UT1a	UT2	UT3	UT4	UT5	UT6	UT7	
Length of Reach (linear feet) - Post-Restoration	5,883	1,559	165	135	160	114	397	910	408	
Drainage Area (acres)	807	85	22	4	17	33	40	17	64	
NCDWR Stream Identification Score	50.5	32.25	27.5	24.5	26	24	25.5	36	35.5	
NCDWR Water Quality Classification	WS-III (NSW)									
Morphological Description (stream type)	Perennial		Intermittent					Perennial		
Evolutionary Trend (Simon's Model) - Pre-Restoration	IV: Degradation and Widening				III Channelized	I Premodified	IV Degradation and Widening			
Underlying Mapped Soils	Chewacla loam, Herndon silt loam, Tatum silt loam									
Drainage Class	-									
Soil Hydric Status	-									
Slope	-									
FEMA Classification	Zone X									
Native Vegetation Community	Piedmont Bottomland Forest									
Percent Composition Exotic Invasive Vegetation - Post-Restoration	0%									
REGULATORY CONSIDERATIONS										
Regulation	Applicable?	Resolved?	Supporting Documentation							
Waters of the United States - Section 404	Yes	Yes	USACE Nationwide Permit No. 27 and DWQ 401 Water Quality Certification No. 4134.							
Waters of the United States - Section 401	Yes	Yes								
Division of Land Quality (Dam Safety)	N/A	N/A								
Endangered Species Act	Yes	Yes	Dry Creek Mitigation Plan; Wildlands determined "no effect" on Orange County listed endangered species. The USFWS responded on May 5, 2016 and concurred with NCWRC stating that "the proposed action is not likely to adversely affect any federally-listed endangered or threatened species, their formally designated critical habitat, or species currently proposed for listing under the Act."							
Historic Preservation Act	Yes	Yes	Correspondence from SHPO on April 26, 2016 indicating they were not aware of any historic resources that would be affected by the project.							
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	N/A	N/A	N/A							
FEMA Floodplain Compliance	Yes	Yes	Durham County Floodplain Development Permit No. 19800028 was obtained on August 1, 2019							
Essential Fisheries Habitat	N/A	N/A	N/A							

APPENDIX 2. Visual Assessment Data

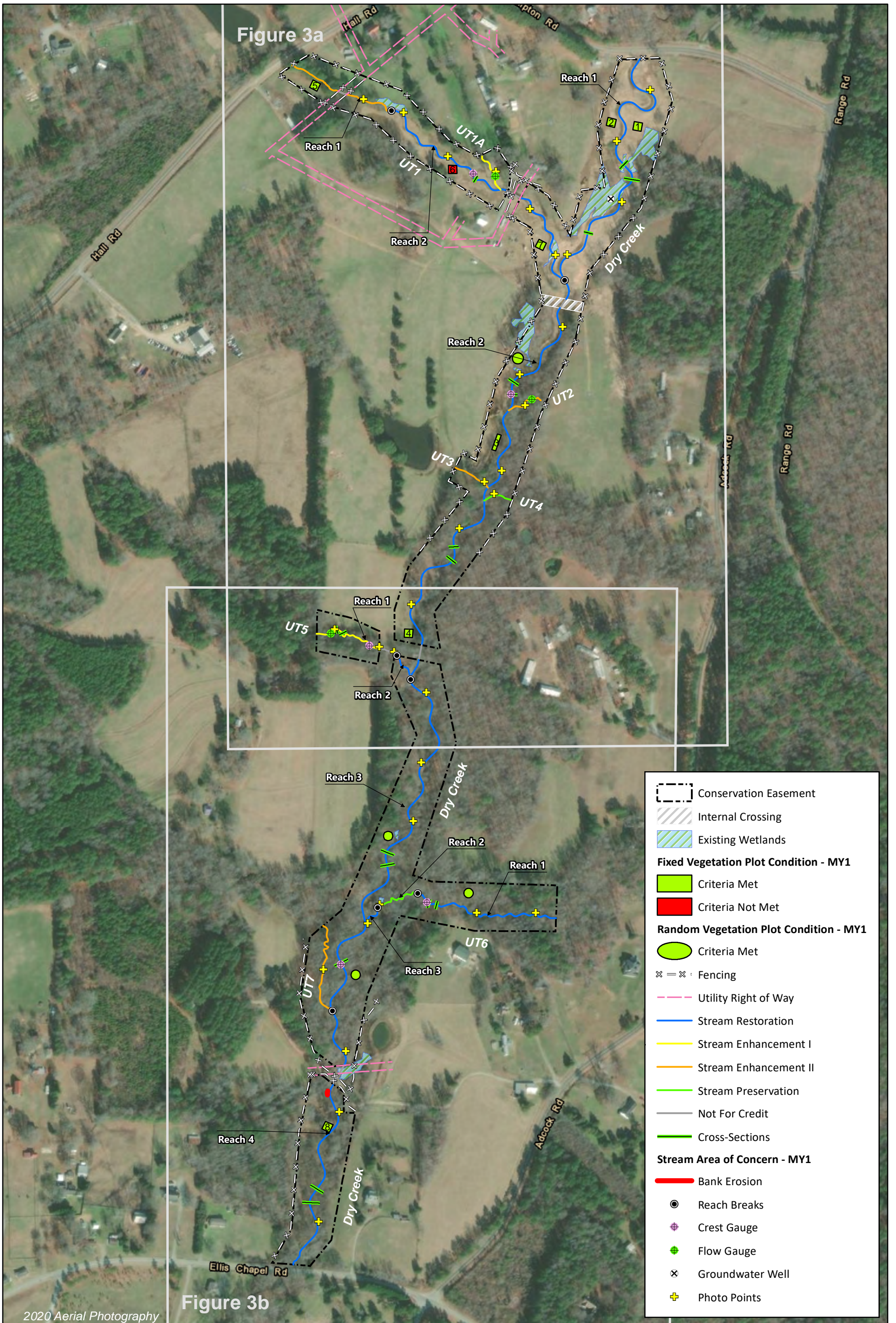
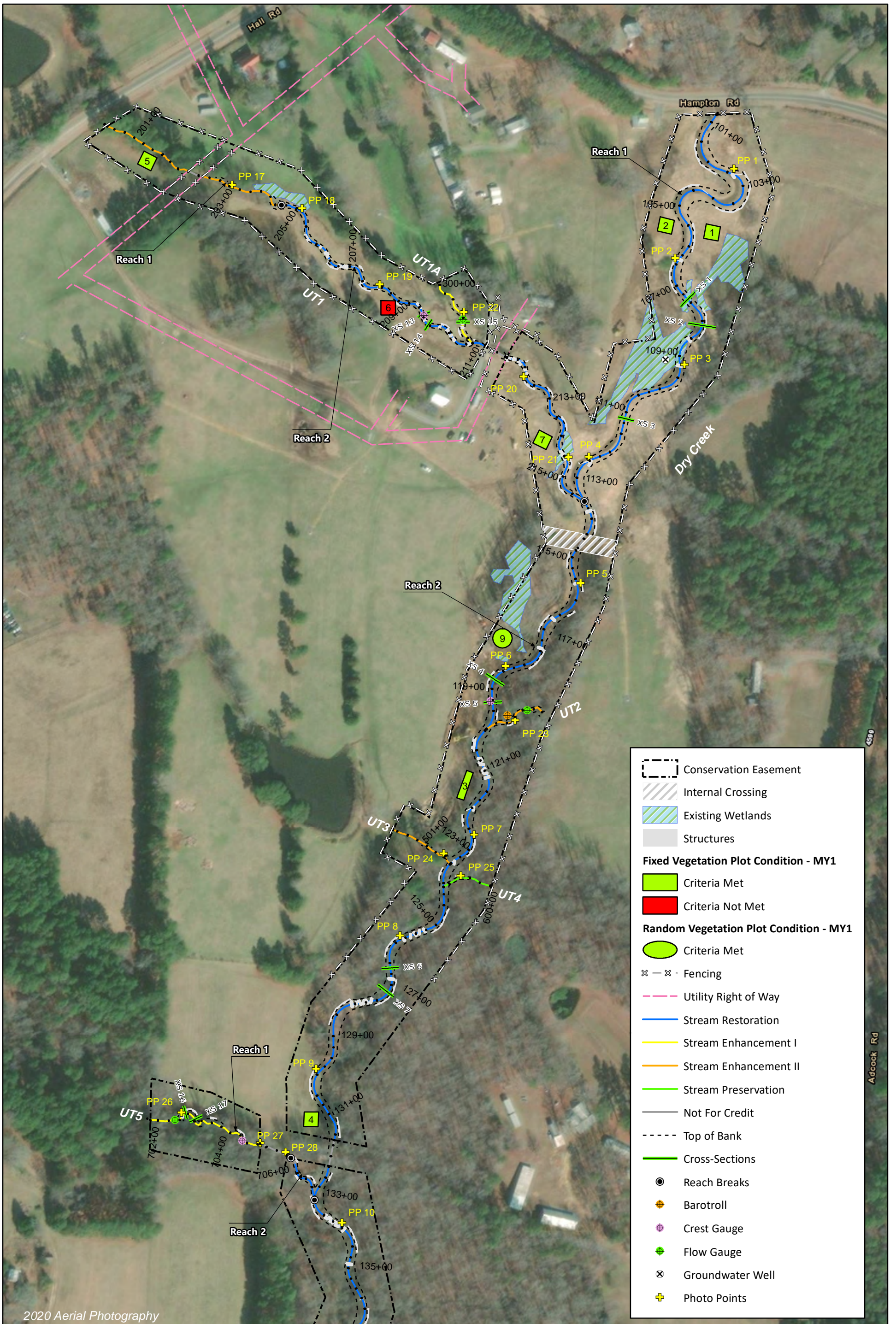


Figure 3a

Figure 3b

	Conservation Easement
	Internal Crossing
	Existing Wetlands
Fixed Vegetation Plot Condition - MY1	
	Criteria Met
	Criteria Not Met
Random Vegetation Plot Condition - MY1	
	Criteria Met
	Fencing
	Utility Right of Way
	Stream Restoration
	Stream Enhancement I
	Stream Enhancement II
	Stream Preservation
	Not For Credit
	Cross-Sections
Stream Area of Concern - MY1	
	Bank Erosion
	Reach Breaks
	Crest Gauge
	Flow Gauge
	Groundwater Well
	Photo Points



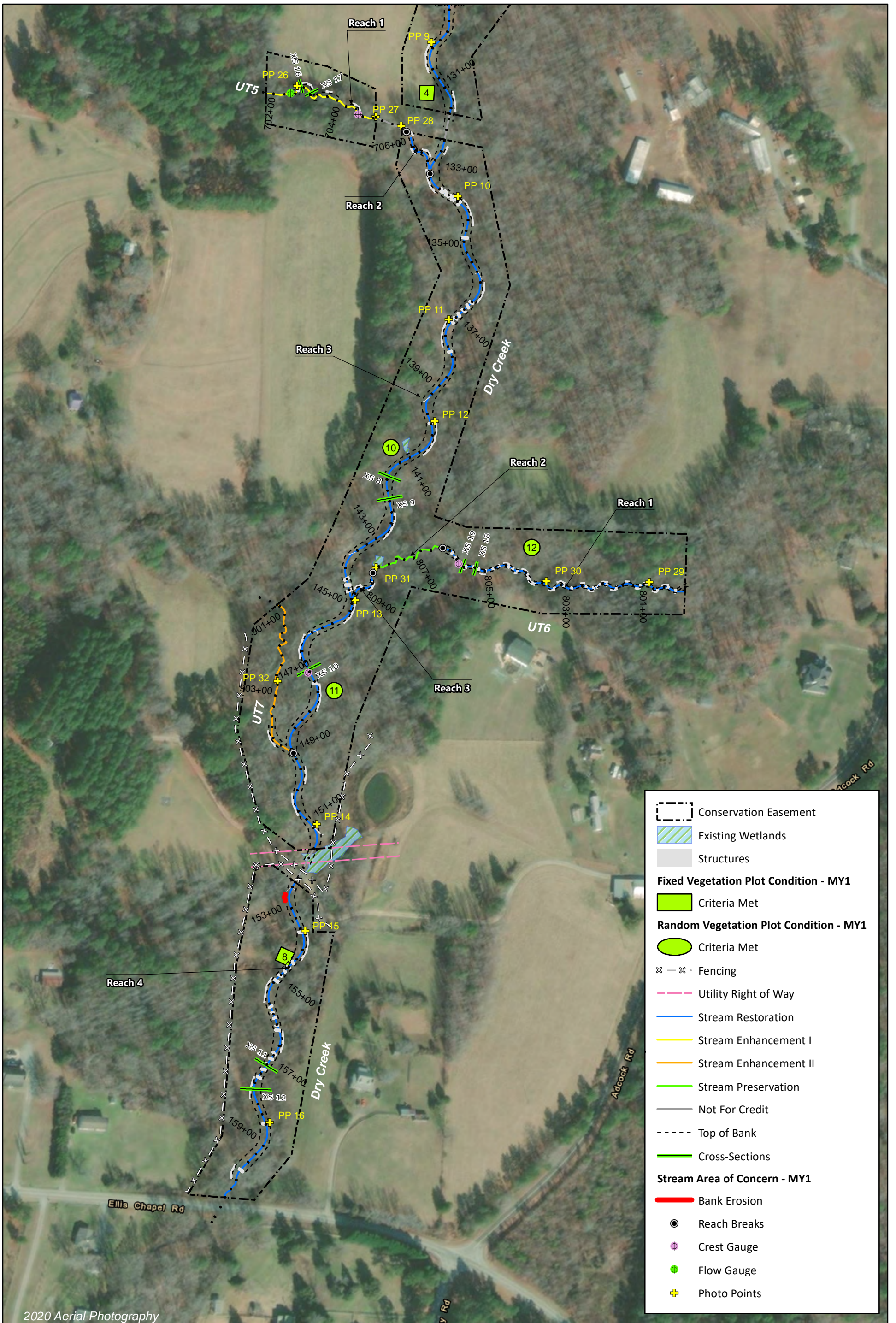


Table 5a. Visual Stream Morphology Stability Assessment Table

Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

Dry Creek Reach 1-4: 5,883 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	55	55			100%			
	3. Meander Pool Condition	Depth Sufficient	58	58			100%			
		Length Appropriate	58	58			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	55	55			100%			
		Thalweg centering at downstream of meander bend (Glide)	55	55			100%			
Totals					0	0	99%	n/a	n/a	n/a
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			1	15	99%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse.			0	0	100%	n/a	n/a	n/a
3. Engineered Structures¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	12	12			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	12	12			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	36	36			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	36	36			100%			

¹Excludes constructed riffles since they are evaluated in section 1.

Table 5b. Visual Stream Morphology Stability Assessment Table

Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

UT1 Reach 2: 1,053 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	22	22			100%			
	3. Meander Pool Condition	Depth Sufficient	21	21			100%			
		Length Appropriate	21	21			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	22	22			100%			
		Thalweg centering at downstream of meander bend (Glide)	22	22			100%			
Totals					0	0	100%	n/a	n/a	n/a
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
Totals					0	0	100%	n/a	n/a	n/a
3. Engineered Structures¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	3	3			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	3	3			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	3	3			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	10	10			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	10	10			100%			

¹Excludes constructed riffles since they are evaluated in section 1.

Table 5c. Visual Stream Morphology Stability Assessment Table

Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

UTIA: 165 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	5	5			100%			
	3. Meander Pool Condition	Depth Sufficient	5	5			100%			
		Length Appropriate	5	5			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	5	5			100%			
		Thalweg centering at downstream of meander bend (Glide)	5	5			100%			
Totals					0	0	100%	n/a	n/a	n/a
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
Totals					0	0	100%	n/a	n/a	n/a
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	0	0			N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	0	0			N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	0	0			N/A			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	1	1			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	1	1			100%			

¹Excludes constructed riffles since they are evaluated in section 1.

Table 5d. Visual Stream Morphology Stability Assessment Table

Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

UT5 Reach 1-2: 397 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	10	10			100%			
	3. Meander Pool Condition	Depth Sufficient	11	11			100%			
		Length Appropriate	11	11			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	10	10			100%			
		Thalweg centering at downstream of meander bend (Glide)	10	10			100%			
Totals					0	0	100%	n/a	n/a	n/a
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
Totals					0	0	100%	n/a	n/a	n/a
3. Engineered Structures¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	0	0			N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	0	0			N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	0	0			N/A			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	6	6			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	6	6			100%			

¹Excludes constructed riffles since they are evaluated in section 1.

Table 5e. Visual Stream Morphology Stability Assessment Table

Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

UT6 Reach 1 & 3: 701 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	34	34			100%			
	3. Meander Pool Condition	Depth Sufficient	32	32			100%			
		Length Appropriate	32	32			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	34	34			100%			
		Thalweg centering at downstream of meander bend (Glide)	34	34			100%			
Totals										
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
Totals										
3. Engineered Structures¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	0	0			N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	0	0			N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	0	0			N/A			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	17	17			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	17	17			100%			

¹Excludes constructed riffles since they are evaluated in section 1.

Table 6. Vegetation Condition Assessment Table

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Planted Acreage 14.04

Vegetation Category	Definitions	Mapping Threshold (Ac)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.1	0	0	0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1	0	0	0%
Total			0	0	0%
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 Ac	0	0	0%
Cumulative Total			0	0.0	0%

Easement Acreage 29.76

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Areas of points (if too small to render as polygons at map scale).	1,000	0	0	0%
Easement Encroachment Areas	Areas of points (if too small to render as polygons at map scale).	none	0	0	0%

STREAM PHOTOGRAPHS



PHOTO POINT 1 Dry Creek R1 – upstream (11/4/2020)



PHOTO POINT 1 Dry Creek R1 – downstream (11/4/2020)



PHOTO POINT 2 Dry Creek R1 – upstream (11/4/2020)



PHOTO POINT 2 Dry Creek R1 – downstream (11/4/2020)



PHOTO POINT 3 Dry Creek R1 – upstream (11/4/2020)



PHOTO POINT 3 Dry Creek R1 – downstream (11/4/2020)





PHOTO POINT 4 Dry Creek R1 – upstream (11/4/2020)



PHOTO POINT 4 Dry Creek R1 – downstream (11/4/2020)



PHOTO POINT 5 Dry Creek R2 – upstream (11/4/2020)



PHOTO POINT 5 Dry Creek R2 – downstream (11/4/2020)



PHOTO POINT 6 Dry Creek R2 – upstream (11/4/2020)



PHOTO POINT 6 Dry Creek R2 – downstream (11/4/2020)





PHOTO POINT 7 Dry Creek R2 – upstream (11/4/2020)



PHOTO POINT 7 Dry Creek R2 – downstream (11/4/2020)



PHOTO POINT 8 Dry Creek R2 – upstream (11/4/2020)



PHOTO POINT 8 Dry Creek R2 – downstream (11/4/2020)



PHOTO POINT 9 Dry Creek R2 – upstream (11/4/2020)



PHOTO POINT 9 Dry Creek R2 – downstream (11/4/2020)





PHOTO POINT 10 Dry Creek R3 – upstream (11/4/2020)



PHOTO POINT 10 Dry Creek R3 – downstream (11/4/2020)



PHOTO POINT 11 Dry Creek R3 – upstream (11/4/2020)



PHOTO POINT 11 Dry Creek R3 – downstream (11/4/2020)



PHOTO POINT 12 Dry Creek R3 – upstream (11/4/2020)



PHOTO POINT 12 Dry Creek R3 – downstream (11/4/2020)





PHOTO POINT 13 Dry Creek R3 – upstream (11/4/2020)



PHOTO POINT 13 Dry Creek R3 – downstream (11/4/2020)



PHOTO POINT 14 Dry Creek R3 – upstream (11/4/2020)



PHOTO POINT 14 Dry Creek R3 – downstream (11/4/2020)



PHOTO POINT 15 Dry Creek R4 – upstream (11/4/2020)



PHOTO POINT 15 Dry Creek R4 – downstream (11/4/2020)





PHOTO POINT 16 Dry Creek R4 – upstream (11/4/2020)



PHOTO POINT 16 Dry Creek R4 – downstream (11/4/2020)



PHOTO POINT 17 UT1 R1 – upstream (11/4/2020)



PHOTO POINT 17 UT1 R1 – downstream (11/4/2020)



PHOTO POINT 18 UT1 R2 – upstream (11/4/2020)



PHOTO POINT 18 UT1 R2 – downstream (11/4/2020)





PHOTO POINT 19 UT1 R2 – upstream (11/4/2020)



PHOTO POINT 19 UT1 R2 – downstream (11/4/2020)



PHOTO POINT 20 UT1 R2 – upstream (11/4/2020)



PHOTO POINT 20 UT1 R2 – downstream (11/4/2020)



PHOTO POINT 21 UT1 R2 – upstream (11/4/2020)



PHOTO POINT 21 UT1 R2 – downstream (11/4/2020)





PHOTO POINT 22 UT1a – upstream (11/4/2020)



PHOTO POINT 22 UT1a – downstream (11/4/2020)



PHOTO POINT 23 UT2 – upstream (11/4/2020)



PHOTO POINT 23 UT2 – downstream (11/4/2020)



PHOTO POINT 24 UT3 – upstream (11/4/2020)



PHOTO POINT 24 UT3 – downstream (11/4/2020)





PHOTO POINT 25 UT4 – upstream (11/4/2020)



PHOTO POINT 25 UT4 – downstream (11/4/2020)



PHOTO POINT 26 UT5 R1 – upstream (11/4/2020)



PHOTO POINT 26 UT5 R1 – downstream (11/4/2020)



PHOTO POINT 27 UT5 R1 – upstream (11/4/2020)



PHOTO POINT 28 UT5 R2 – downstream (11/4/2020)





PHOTO POINT 29 UT6 R1 – upstream (11/4/2020)



PHOTO POINT 29 UT6 R1 – downstream (11/4/2020)



PHOTO POINT 30 UT6 R1 – upstream (11/4/2020)



PHOTO POINT 30 UT6 R1 – downstream (11/4/2020)



PHOTO POINT 31 UT6 R2 – upstream (11/4/2020)



PHOTO POINT 31 UT6 R2 – downstream (11/4/2020)





PHOTO POINT 32 UT7 – upstream (11/4/2020)



PHOTO POINT 32 UT7 – downstream (11/4/2020)



Stream Area of Concern Photographs
Dry Creek Reach 4



Localized Erosion (11/4/2020)



Localized Erosion (11/4/2020)

VEGETATION PLOT PHOTOGRAPHS



FIXED VEG PLOT 1 (11/4/2020)



FIXED VEG PLOT 2 (11/4/2020)



FIXED VEG PLOT 3 (11/4/2020)



FIXED VEG PLOT 4 (11/4/2020)



FIXED VEG PLOT 5 (11/4/2020)



FIXED VEG PLOT 6 (11/4/2020)





FIXED VEG PLOT 7 (11/4/2020)



FIXED VEG PLOT 8 (11/4/2020)



RANDOM VEG PLOT 9 (11/4/2020)



RANDOM VEG PLOT 10 (11/4/2020)



RANDOM VEG PLOT 11 (11/4/2020)



RANDOM VEG PLOT 12 (11/4/2020)



APPENDIX 3. Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment Table

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Plot	Success Criteria Met *	Tract Mean
Fixed Vegetation Plot 1	Yes	92%
Fixed Vegetation Plot 2	Yes	
Fixed Vegetation Plot 3	Yes	
Fixed Vegetation Plot 4	Yes	
Fixed Vegetation Plot 5	Yes	
Fixed Vegetation Plot 6	No	
Fixed Vegetation Plot 7	Yes	
Fixed Vegetation Plot 8	Yes	
Random Vegetation Plot 9	Yes	
Random Vegetation Plot 10	Yes	
Random Vegetation Plot 11	Yes	
Random Vegetation Plot 12	Yes	

*Success Criteria Met is based on the interim success criteria for MY3 of 320 planted stems per acre.

Table 8. CVS Vegetation Tables - Metadata

Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

Report Prepared By	Kaitlyn Hogarth
Date Prepared	11/9/2020 12:07
Database Name	Dry Creek MY1.mdb
Database Location	F:\Monitoring\Dry Creek\MY1
Computer Name	KAITLYN2020
File Size	74514432
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Project Planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Project Total Stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and Spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY-----	
Project Code	97082
Project Name	Dry Creek
Description	
Sampled Plots	8

Table 9a. Fixed Plots: Planted and Total Stem Counts

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Scientific Name	Common Name	Species Type	Current Plot Data (MY1 2020)														
			VP 1			VP 2			VP 3			VP 4			VP 5		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Betula nigra</i>	River Birch	Tree	6	6	6	2	2	2				1	1	1	4	4	4
<i>Fraxinus pennsylvanica</i>	Green Ash	Tree							3	3	3	1	1	1	1	1	1
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree	1	1	1				1	1	1				1	1	1
<i>Platanus occidentalis</i>	Sycamore	Tree	2	2	2	6	6	6	6	6	6	2	2	2			
<i>Populus deltoides</i>	Eastern Cottonwood	Tree	2	2	2												
<i>Quercus michauxii</i>	Swamp Chestnut Oak	Tree	1	1	1				2	2	2	5	5	5			
<i>Quercus pagoda</i>	Cherrybark Oak	Tree				2	2	2	3	3	3	1	1	1	2	2	2
<i>Quercus phellos</i>	Willow Oak	Tree				2	2	2				1	1	1	1	1	1
Stem count			12	12	12	12	12	12	15	15	15	11	11	11	9	9	9
size (ares)			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02		
Species count			5	5	5	4	4	4	5	5	5	6	6	6	5	5	5
Stems per ACRE			486	486	486	486	486	486	607	607	607	445	445	445	364	364	364

Color for Density

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

PnoLS: Number of planted stems excluding live stakes

P-all: Number of planted stems including live stakes

T: Total stems

Table 9a. Fixed Plots: Planted and Total Stem Counts

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Scientific Name	Common Name	Species Type	Current Plot Data (MY1 2020)									Annual Means					
			VP 6			VP 7			VP 8			MY1 (2020)			MY0 (2020)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Betula nigra</i>	River Birch	Tree	2	2	2	1	1	1	3	3	3	19	19	19	26	26	26
<i>Fraxinus pennsylvanica</i>	Green Ash	Tree	1	1	1				1	1	1	7	7	7	7	7	7
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree										3	3	3	10	10	10
<i>Platanus occidentalis</i>	Sycamore	Tree	2	2	2	4	4	4	4	4	4	26	26	26	26	26	26
<i>Populus deltoides</i>	Eastern Cottonwood	Tree	2	2	2	1	1	1				5	5	5	9	9	9
<i>Quercus michauxii</i>	Swamp Chestnut Oak	Tree				2	2	2	1	1	1	11	11	11	10	10	10
<i>Quercus pagoda</i>	Cherrybark Oak	Tree							1	1	1	9	9	9	9	9	9
<i>Quercus phellos</i>	Willow Oak	Tree				1	1	1	3	3	3	8	8	8	10	10	10
		Stem count	7	7	7	9	9	9	13	13	13	88	88	88	107	107	107
		size (ares)	1			1			1			8			8		
		size (ACRES)	0.02			0.02			0.02			0.20			0.20		
		Species count	4	4	4	5	5	5	6	6	6	8	8	8	8	8	8
		Stems per ACRE	283	283	283	364	364	364	526	526	526	445	445	445	541	541	541

Color for Density

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

PnoLS: Number of planted stems excluding live stakes

P-all: Number of planted stems including live stakes

T: Total stems

Table 9b. Random Plots: Planted and Total Stem Counts

Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

Scientific Name	Common Name	Species Type	Current Plot Data (MY0 2020)								Annual Means		Annual Means	
			VP 9		VP 10		VP 11		VP 12		MY1 (2020)		MY0 (2020)	
			Te	Total	Te	Total	Te	Total	Te	Total	Te	Total	Te	Total
<i>Asimina Triloba</i>	Paw Paw	Tree					2	2	1	1	3	3		
<i>Betula nigra</i>	River Birch	Tree	2	2	5	5			9	9	16	16	16	16
<i>Fraxinus pennsylvanica</i>	Green Ash	Tree	1	1	2	2					3	3	3	3
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree	1	1							1	1	6	6
<i>Platanus occidentalis</i>	Sycamore	Tree	5	5			5	5	1	1	11	11	10	10
<i>Populus deltoides</i>	Eastern Cottonwood	Tree											2	2
<i>Quercus pagoda</i>	Cherrybark Oak	Tree			1	1	5	5	1	1	7	7	3	3
<i>Quercus michauxii</i>	Swamp Chestnut Oak	Tree											5	5
<i>Quercus phellos</i>	Willow Oak	Tree	2	2	1	1			1	1	4	4	6	6
<i>Salix nigra</i>	Black Willow	Tree					1	1			1	1		
	Stem count		11	11	9	9	13	13	13	13	46	46	51	51
	size (ares)		1		1		1		1		2		2	
	size (ACRES)		0.02		0.02		0.02		0.02		0.10		0.10	
	Species count		5	5	4	4	4	4	5	5	8	8	8	8
	Stems per ACRE		445	445	364	364	526	526	526	526	465	465	516	516

Color for Density

- Exceeds requirements by 10%
- Exceeds requirements, but by less than 10%
- Fails to meet requirements, by less than 10%
- Fails to meet requirements by more than 10%

Te - Number of stems including exotic species

Total - Number of stems excluding exotic species

APPENDIX 4. Morphological Summary Data and Plots

Table 10a. Baseline Stream Data Summary

Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

Dry Creek Reach 1 & 2

Parameter	Gage	PRE-RESTORATION CONDITION				REFERENCE REACH DATA						DESIGN				AS-BUILT/BASELINE				
		Dry Creek Reach 1		Dry Creek Reach 2		Long Branch		Spencer Creek 2		UT to Varnals		Dry Creek Reach 1		Dry Creek Reach 2		Dry Creek Reach 1		Dry Creek Reach 2		
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
Dimension and Substrate - Riffle																				
Bankfull Width (ft)	N/A	16		13.5		14.8	18.6	10.7	11.2	9.3	10.5	17.8		17.8		14.6	18.2	15.9	18.2	
Floodprone Width (ft)		140		15		50		60	114	60	100	39	89	39	89	70	152	126	155	
Bankfull Mean Depth		0.7		0.9		1.3	2.1	1.6	1.8	1.1	1.2	1.3		1.3		1.0	1.1	1.0	1.2	
Bankfull Max Depth		2.5		1.3		1.9	2.9	2.1	2.6	1.5	1.7	1.6	2.0	1.6	2.0	1.6	1.8	1.8	2.1	
Bankfull Cross Sectional Area (ft ²)		11.0		12.8		25.0	34.6	17.8	19.7	10.3	12.3	23.6		23.6		14.2	19.4	16.5	22.4	
Width/Depth Ratio		23.0		14.2		7.9	13.8	5.8	7.1	8.1	9.3	13.0		13.0		14.9	17.1	14.7	15.3	
Entrenchment Ratio		8.9		1.1		3.4		5.5	10.2	5.7	10.0	2.2	5.0	2.2	5.0	3.9	10.4	7.9	8.5	
Bank Height Ratio		1.3		2.6		1.2	1.5	1.0		1.0		1.0		1.0		1.0		1.0		
D50 (mm)						---		---		---		---		---		33.9	36.7	30.0	47.7	
Profile																				
Riffle Length (ft)	N/A																			
Riffle Slope (ft/ft)		---		---		0.0130	0.0120	0.0130		0.0240	0.0570	0.0056	0.0214	0.0087	0.0328	0.0034	0.0126	0.0056	0.0262	
Pool Length (ft)																				
Pool Max Depth (ft)		---		---		2.2		3.3		2.5	2.6	4.0	5.3	4.0	5.3	3.3	5.4	3.4	4.8	
Pool Spacing (ft)		---		---		50	105	71		8	82	28	126	28	126	67	137	46	121	
Pool Volume (ft ³)																				
Pattern																				
Channel Beltwidth (ft)	N/A	27	57	41	89	60		38	41	15	45	45	142	36	117	45	142	36	117	
Radius of Curvature (ft)		16	33	19	69	16	87	11	15	8.3	47	36	89	36	53	36	89	36	53	
Rc:Bankfull Width (ft/ft)		1	2.1	1.4	5	1.1	4.7	1.3	1.4	0.57	3.2	2.0	5.0	2.0	3.0	2.0	5.0	2.0	3.0	
Meander Length (ft)		5.7	13	98	346	66.0	191	46.0	48.0	---		53	303	134	267	53	303	134	267	
Meander Width Ratio		1.7	3.6	3.1	7.0	3.2	4.1	3.4	3.6	---		2.5	8.0	2.0	6.6	2.5	8.0	2.0	6.6	
Substrate, Bed and Transport Parameters																				
Ri%/Ru%/P%/G%/S%	N/A																			
SC%/Sa%/G%/C%/B%/Be%																				
d16/d35/d50/d84/d95/d100		---		1.1, 4.5, 11.3, 47.3, 126.9, --		8.1, 26.6, 41.6, 124.8, 225.5, --, --		<0.062, 3, 8.8, 42.90, --		---		---		---		SC, 0.63, 3.8, 46.3, 64.0, 128		SC, 9.38, 20.4, 78.1, 128, 362		
Reach Shear Stress (Competency) lb/ft ²		---		0.47												0.26	0.29	0.42	0.50	
Max part size (mm) mobilized at bankfull																				
Stream Power (Capacity) W/m ²																				
Additional Reach Parameters																				
Drainage Area (SM)	N/A	0.67		0.95		1.49		0.96		0.41		0.67		0.95		0.67		0.95		
Watershed Impervious Cover Estimate (%)		0.8%		0.7%		---		---		---		0.8%		0.7%		0.8%		0.7%		
Rosgen Classification		C4		F4		C4/E4		E4		C4/E4		C4		C4		C4		C4		
Bankfull Velocity (fps)		3.4		4		3.6	4	4.9	5.4	4.5	5.4	2.5		3.4		2.4	2.5	3.1	3.4	
Bankfull Discharge (cfs)		58		75		101	124		97		54		58		75		34	49	50	77
Q-NFF regression																				
Q-USGS extrapolation																				
Q-Mannings																				
Valley Length (ft)		---		---		---		---		---		---		---		---		---		
Channel Thalweg Length (ft)		999		2,014		---		---		---		1,278		1,950		1,247		1,918		
Sinuosity		1.19		1.07		1.30		2.30		1.20		1.20	1.30	1.20	1.30	1.30		1.20		
Water Surface Slope (ft/ft) ²		0.006		0.005		0.004		0.0047		0.0017		0.0059		0.0059		0.0034		0.0069		
Bankfull Slope (ft/ft)		---		---		---		---		---		0.0059		0.0059		0.0044		0.0067		

(---): Data was not provided

Table 10b. Baseline Stream Data Summary

Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

Dry Creek Reach 3 & 4

Parameter	Gage	PRE-RESTORATION CONDITION				REFERENCE REACH DATA						DESIGN				AS-BUILT/BASELINE				
		Dry Creek Reach 3		Dry Creek Reach 4		Long Branch		Spencer Creek 2		UT to Varnals		Dry Creek Reach 3		Dry Creek Reach 4		Dry Creek Reach 3		Dry Creek Reach 4		
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
Dimension and Substrate - Riffle																				
Bankfull Width (ft)	N/A	1.9	1.4	1.9	1.4	14.8	18.6	10.7	11.2	9.3	10.5	17.8		17.8		16.9	17.6	16.7		
Floodprone Width (ft)		18	26	18	26	50		60	114	60	100	39	89	39	89	175	219	190		
Bankfull Mean Depth		1.2	1.5	1.2	1.5	1.3	2.1	1.6	1.8	1.1	1.2	1.3		1.3		1.1	1.3	1.2		
Bankfull Max Depth		1.6	2.5	1.6	2.5	1.9	2.9	2.1	2.6	1.5	1.7	1.5		1.5		2.0		2.1		
Bankfull Cross Sectional Area (ft ²)		15.0	27.9	15.0	27.9	25.0	34.6	17.8	19.7	10.3	12.3	23.6		23.6		18.1	22.4	20.5		
Width/Depth Ratio		11.2	12.7	11.2	12.7	7.9	13.8	5.8	7.1	8.1	9.3	13.0		13.0		13.9	15.9	13.5		
Entrenchment Ratio		1.4		1.4		3		5.5	10.2	5.7	10.0	2.2	5.0	2.2	5.0	9.9	12.9	11.4		
Bank Height Ratio		2.1		2.1		1.2	1.5	1.0		1.0		1.0		1.0		1.0		1.0		
D50 (mm)																	30.4	32.0	42.6	
Profile																				
Riffle Length (ft)	N/A																			
Riffle Slope (ft/ft)						0.0130	0.0120	0.0130		0.0240	0.0570	0.0071	0.0268	0.0045	0.0050	0.0070	0.0166	0.0096	0.0236	
Pool Length (ft)																				
Pool Max Depth (ft)		2.2	2.4	2.2	2.4	2.2		3.3		2.5	2.6	4.0	5.3	4.0	5.3	3.4	5.2	4.6	6.0	
Pool Spacing (ft)		22	127	22	127	50	105	71		8	82	28	126	28	126	75	128	61	119	
Pool Volume (ft ³)																				
Pattern																				
Channel Beltwidth (ft)	N/A	45	107	45	107	60		38	41	15	45	36	117	36	117	36	117	36	117	
Radius of Curvature (ft)		24	78	24	78	16	87	11	15	8.3	47	36	53	36	53	36	53	36	53	
Rc:Bankfull Width (ft/ft)		1.87	6	1.87	6	1.1	4.7	1.3	1.4	0.6	3.2	2.0	3.0	2.0	3.0	2.0	3.0	2.0	3.0	
Meander Length (ft)		108	422	108	422	66.0	191	46.0	48.0	---		134	267	134	267	134	267	134	267	
Meander Width Ratio		2.4	8.3	2.4	8.3	3.2	4.1	3.4	3.6	---		2.0	6.6	2.0	6.6	2.0	6.6	2.0	6.6	
Substrate, Bed and Transport Parameters																				
Ri%/Ru%/P%/G%/S%	N/A																			
SC%/Sa%/G%/C%/B%/Be%																				
d16/d35/d50/d84/d95/d100		0.9, 5.0, 9.5, 27.2, 55.4, -, -															0.28, 2.24, 21.5,	0.28, 2.80, 16.8,		
Reach Shear Stress (Competency) lb/ft ²		0.43															0.32	0.37	0.39	
Max part size (mm) mobilized at bankfull																				
Stream Power (Capacity) W/m ²																				
Additional Reach Parameters																				
Drainage Area (SM)	N/A	1.09		1.26		1.49		0.96		0.41		1.09		1.26		1.09		1.26		
Watershed Impervious Cover Estimate (%)		0.8%		0.8%		---		---		---		0.8%		0.8%		0.8%		0.8%		
Rosgen Classification		F4		F4		C4/E4		E4		C4/E4		C4		C4		C4		C4		
Bankfull Velocity (fps)		1.9	4.1	1.9	4.1	3.6	4	4.9	5.4	4.5	5.4	3.2		3.8		2.7	3.0	3.0		
Bankfull Discharge (cfs)		83		92		101	124	97		54		83		92		48	67	62		
Q-NFF regression																				
Q-USGS extrapolation																				
Q-Mannings																				
Valley Length (ft)																				
Channel Thalweg Length (ft)		1,955		1,495		---		---		---		1,603		1,140		1,593		1,135		
Sinuosity		1.39		1.39		1.30		2.30		1.20		1.20		1.20		1.20		1.20		
Water Surface Slope (ft/ft) ²		0.0040		0.0040		---		---		0.0017		0.0054		0.0075		0.0049		0.0087		
Bankfull Slope (ft/ft)		---		---		0.004		0.005		---		0.0054		0.0075		0.0049		0.0053		

(---): Data was not provided

Table 10c. Baseline Stream Data Summary
 Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

UT1 Reach 2 & UT1A

Parameter	Gage	PRE-RESTORATION CONDITION				REFERENCE REACH DATA						DESIGN				AS-BUILT/BASELINE					
		UT1 Reach 2		UT1A		UT to Wells		UT to Cane Creek		UT4 (UT to Cedar)		UT1 Reach 2		UT1A		UT1 Reach 2		UT1A			
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Dimension and Substrate - Riffle																					
Bankfull Width (ft)	N/A	14		---		6.2	8.6	9.3		7.3		8.4		7.5		9.1		10.6			
Floodprone Width (ft)		18		---		15	25	>30		20		18	42	17	38		116		78		
Bankfull Mean Depth		0.4		---		0.6	1	0.9		0.6		0.6		0.7		0.4		0.8		0.8	
Bankfull Max Depth		1		---		0.6	1.4	1.5		1.1		1.0		1.0		0.8		1.4		1.4	
Bankfull Cross Sectional Area (ft ²)		5.1		---		3.9	6.3	8.6		4.2		5.4		5.2		3.6		8.3		8.3	
Width/Depth Ratio		38		---		6.1	12.6	10.1		12.6		13.0		11.0		23.0		13.5		13.5	
Entrenchment Ratio		1.3		---		1.9	4.1	>3.2		2.7		2.2	5.0	2.2	5.0		12.8		7.4		7.4
Bank Height Ratio		2.7		---		1.0	1.8	1.0		1.0		1.0		1.0		1.0		1.0		1.0	
D50 (mm)					---		---		---		---		---		---		36.9		30.8		30.8
Profile																					
Riffle Length (ft)	N/A																				
Riffle Slope (ft/ft)		---		---		0.0280		0.0057		0.0173		0.0148	0.0573	0.0102	0.0394		0.0107	0.0519	0.0198	0.0230	
Pool Length (ft)																					
Pool Max Depth (ft)		---		1.1		---		2.2		1.4	1.5	1.9	2.6	2.1	2.8		1.4	2.9	2.0	2.7	
Pool Spacing (ft)		48	112	23		17	63	14.8	87	18	24	13	52	12	47		33	58	28	42	
Pool Volume (ft ³)																					
Pattern																					
Channel Beltwidth (ft)	N/A	23	25	---		10	35	15	50	3	6	17	45	15	41	17	45	15	41		
Radius of Curvature (ft)		6	13	---		2	32	9	26	5	13	17	25	15	23	17	25	15	23		
Rc:Bankfull Width (ft/ft)		0.4	1	---		0.3	4.5	0.9	2.8	0.7	1.7	2.0	3.0	2.0	3.0	2.0	3.0	2.0	3.0		
Meander Length (ft)		93	145	---		---		---		---		63	126	56	113	63	126	56	113		
Meander Width Ratio		1.6	1.8	---		---		---		---		2.0	5.4	2.0	5.4	2.0	5.4	2.0	5.4		
Substrate, Bed and Transport Parameters																					
Ri%/Ru%/P%/G%/S%	N/A																				
SC%/Sa%/G%/C%/B%/Be%																					
d16/d35/d50/d84/d95/d100		---		---		---		---		---		---		---		SC, 5.94, 12.7, 58.1, 90, 362		0.11, 4.0, 7.1, 60.4, 11.2, 256			
Reach Shear Stress (Competency) lb/ft ²		0.69		---		---		---		---		---		---		0.40		1.08			
Max part size (mm) mobilized at bankfull																					
Stream Power (Capacity) W/m ²																					
Additional Reach Parameters																					
Drainage Area (SM)	N/A	0.14		0.03		0.13		0.28		0.11		0.14		0.03		0.14		0.03			
Watershed Impervious Cover Estimate (%)		1.4%		2.2%		---		---		---		1.4%		2.2%		1.4%		2.2%			
Rosgen Classification		---		---		C4/1		C4/E4		C4		C4		C4		C4		C4			
Bankfull Velocity (fps)		2.7		---		3.8		2.2		5.2	6.1	3.6		4.1		2.6		4.7			
Bankfull Discharge (cfs)		20		---		15		19		22	26	20		8		9		39			
Q-NFF regression																					
Q-USGS extrapolation																					
Q-Mannings																					
Valley Length (ft)		---		---		---		---		---		---		---		---		---			
Channel Thalweg Length (ft)		945		90		---		---		---		1,118		166		1,106		165			
Sinuosity		1.1		1.1		1.4		1.2		1.1		1.2		1.2		1.2		1.2			
Water Surface Slope (ft/ft) ²		0.0160		0.0100		0.0199		0.0046		0.0156		0.0180		0.0210		0.0179		0.0119			
Bankfull Slope (ft/ft)		---		---		0.0199		0.0046		0.0156		0.0180		0.0210		0.0168		0.0230			

(---): Data was not provided

Table 10d. Baseline Stream Data Summary
 Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

UT5 Reach 1 & UT6 Reach 1

Parameter	Gage	PRE-RESTORATION CONDITION				REFERENCE REACH DATA						DESIGN				AS-BUILT/BASELINE			
		UT5 Reach 1		UT6 Reach 1		UT to Wells		UT to Cane Creek		UT4 (UT to Cedar)		UT5 Reach 1		UT6 Reach 1		UT5 Reach 1		UT6 Reach 1	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																			
Bankfull Width (ft)		3.4	3	4.6	6.2	8.6	9.3	7.3	6.8	5.2	8.3	5.5							
Floodprone Width (ft)		5	4	150	15	25	>30	20	15	34	11	25	20	55					
Bankfull Mean Depth		0.6	0.4	0.5	0.6	1	0.9	0.6	0.5	0.4	0.8	0.5							
Bankfull Max Depth		0.9		0.6	0.6	1.4	1.5	1.1	0.8	0.6	1.3	1.0							
Bankfull Cross Sectional Area (ft ²)	N/A	1.9	1.4	1.9	3.9	6.3	8.6	4.2	3.7	2.0	7.0	2.9							
Width/Depth Ratio		5.9	6.3	11.5	6.1	12.6	10.1	12.6	13.0	13.0	9.8	10.4							
Entrenchment Ratio		1.4	1.2	32.4	1.9	4.1	>3.2	2.7	2.2	5.0	2.2	5.0	2.4	10.0					
Bank Height Ratio		3.0	1.2	6.9	1.0	1.8	1.0	1.0	1.0	1.0	1.0	1.0							
D50 (mm)							---	---	---	---	16.0	25.4							
Profile																			
Riffle Length (ft)																			
Riffle Slope (ft/ft)		---		---		0.0280		0.0057		0.0173		0.0309	0.1201	0.0310	0.1205	0.0110	0.0670	0.0175	0.1073
Pool Length (ft)																			
Pool Max Depth (ft)	N/A	---		0.4	0.8	---		2.2	1.4	1.5	1.6	2.1	1.2	1.5	2.4	3.2	C4b	2.3	
Pool Spacing (ft)		23	116	17	283	17	63	14.8	87	18	24	11	42	8	31	19	74	10	25
Pool Volume (ft ³)																			
Pattern																			
Channel Beltwidth (ft)		22	33	13	30	10	35	15	50	3	6	14	37	10	27	14	37	10	27
Radius of Curvature (ft)		9	25	5	47	2	32	9	26	5	13	14	20	10	15	14	20	10	15
Rc:Bankfull Width (ft/ft)	N/A	2.5	7	0.4	15.7	0.3	4.5	0.9	2.8	0.7	1.7	2.0	3.0	2.0	3.0	2.0	3.0	2.0	3.0
Meander Length (ft)		47	175	25	141	---	---	---	---	---	---	51	102	38	75	51	102	38	75
Meander Width Ratio		14.0	51.0	2.8	10.0	---	---	---	---	---	---	2.0	5.4	2.0	5.4	2.0	5.4	2.0	5.4
Substrate, Bed and Transport Parameters																			
Ri%/Ru%/P%/G%/S%																			
SC%/Sa%/G%/C%/B%/Be%																			
d16/d35/d50/d84/d95/d100	N/A	---		1.2, 6.2, 10.6, 64, 119.3, -, -	---	---	---	---	---	---	---	---	---	---	0.16, 4.0, 11.0, 41.3, 90.0, 180	1.0, 1.87, 8.7, 55.6, 120.7, 180			
Reach Shear Stress (Competency) lb/ft ²		---		0.62	---	---	---	---	---	---	---	---	---	---	1.14	0.96			
Max part size (mm) mobilized at bankfull																			
Stream Power (Capacity) W/m ²																			
Additional Reach Parameters																			
Drainage Area (SM)		0.06		0.03		0.13		0.28		0.11		0.06		0.03		0.06		0.03	
Watershed Impervious Cover Estimate (%)		0.0%		0.0%		---		---		---		0.0%		0.0%		0.0%		0.0%	
Rosgen Classification		---		E4		C4/1		C4/E4		C4		C4b		C4b		C4b		C4b	
Bankfull Velocity (fps)		3.7	1.9	2.4		3.8		2.2		5.2	6.1	3.2		3.2		4.8		4.1	
Bankfull Discharge (cfs)		11.5		6.4		15.0		19.4		21.7	25.8	11.5		6.4		33.7		12.0	
Q-NFF regression																			
Q-USGS extrapolation	N/A																		
Q-Mannings																			
Valley Length (ft)		---		---		---		---		---		---		---		---		---	
Channel Thalweg Length (ft)		137		582		---		---		---		378		617		365		612	
Sinuosity		1.2		1.2		1.4		1.2		1.1		1.2		1.2		1.2		1.2	
Water Surface Slope (ft/ft) ²		0.0330		0.0260		0.0199		0.0046		0.0156		0.0180		0.0270		0.0268		0.0324	
Bankfull Slope (ft/ft)		---		---		0.0199		0.0046		0.0156		0.0180		0.0270		0.0236		0.0310	

(---): Data was not provided

Table 11a. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Dimension and Substrate	Dry Creek Reach 1							Dry Creek Reach 2																	
	Cross-Section 1 (Riffle)			Cross-Section 2 (Pool)				Cross-Section 3 (Riffle)				Cross-Section 4 (Pool)													
	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	
Bankfull Elevation (ft)	424.23	424.16					424.30	424.30					422.77	422.83					418.19	418.26					
Low Bank Elevation (ft)	424.23	424.16					424.30	424.30					422.77	422.83					418.19	418.26					
Bankfull Width (ft)	14.6	13.4					21.8	21.2					18.2	18.0					24.1	23.5					
Floodprone Width (ft)	152	152					N/A	N/A					70	70					N/A	N/A					
Bankfull Mean Depth (ft)	1.0	0.9					2.1	2.0					1.1	1.1					2.7	2.8					
Bankfull Max Depth (ft)	1.6	1.5					3.9	4.0					1.8	1.7					4.4	4.4					
Bankfull Cross-Sectional Area (ft ²)	14.2	12.3					46.4	42.0					19.4	19.0					65.4	65.8					
Bankfull Width/Depth Ratio	14.9	14.6					10.2	10.7					17.1	17.1					8.9	8.4					
Entrenchment Ratio ¹	10.4	11.4					N/A	N/A					3.9	3.9					N/A	N/A					
Bankfull Bank Height Ratio ²	1.0	<1.0					N/A	N/A					1.0	1.0					N/A	N/A					
Dimension and Substrate	Dry Creek Reach 2							Dry Creek Reach 3																	
	Cross-Section 5 (Riffle)			Cross-Section 6 (Riffle)				Cross-Section 7 (Pool)				Cross-Section 8 (Pool)													
	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	
Bankfull Elevation (ft)	418.18	418.05					413.29	413.37					412.88	412.88					405.36	405.31					
Low Bank Elevation (ft)	418.18	418.05					413.29	413.37					412.88	412.88					405.36	405.31					
Bankfull Width (ft)	18.2	16.6					15.9	16.7					22.1	21.9					22.3	21.9					
Floodprone Width (ft)	155	155					126	126					N/A	N/A					N/A	N/A					
Bankfull Mean Depth (ft)	1.2	1.2					1.0	1.1					2.5	2.4					2.3	2.3					
Bankfull Max Depth (ft)	2.1	1.9					1.8	2.0					5.2	5.1					4.1	4.1					
Bankfull Cross-Sectional Area (ft ²)	22.4	20.0					16.5	18.2					55.2	53.3					52.3	51.0					
Bankfull Width/Depth Ratio	14.7	13.8					15.3	15.3					8.9	9.0					9.5	9.4					
Entrenchment Ratio ¹	8.5	9.3					7.9	7.6					N/A	N/A					N/A	N/A					
Bankfull Bank Height Ratio ²	1.0	<1.0					1.0	1.1					N/A	N/A					N/A	N/A					
Dimension and Substrate	Dry Creek Reach 3							Dry Creek Reach 4																	
	Cross-Section 9 (Riffle)			Cross-Section 10 (Riffle)				Cross-Section 11 (Riffle)				Cross-Section 12 (Pool)													
	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	
Bankfull Elevation (ft)	405.37	405.37					402.52	402.38					396.59	396.59					396.54	396.55					
Low Bank Elevation (ft)	405.37	405.37					402.52	402.38					396.59	396.59					396.54	396.55					
Bankfull Width (ft)	17.6	17.3					16.9	15.8					16.7	15.7					20.3	20.4					
Floodprone Width (ft)	175	175					219	219					190	190					N/A	N/A					
Bankfull Mean Depth (ft)	1.3	1.3					1.1	1.0					1.2	1.2					2.3	2.4					
Bankfull Max Depth (ft)	2.0	2.0					2.0	1.8					2.1	2.0					5.0	5.4					
Bankfull Cross-Sectional Area (ft ²)	22.4	22.0					18.1	16.0					20.5	19.4					46.8	48.7					
Bankfull Width/Depth Ratio	13.9	13.6					15.9	15.6					13.5	12.8					8.8	8.5					
Entrenchment Ratio ¹	9.9	10.1					12.9	13.9					11.4	12.1					N/A	N/A					
Bankfull Bank Height Ratio ²	1.0	1.0					1.0	<1.0					1.0	1.0					N/A	N/A					

¹Entrenchment Ratio is calculated using the method specified in the Industry Technical Workgroup Memorandum.

²Bank Height Ratio is calculated using the method specified in the Industry Technical Workgroup Memorandum.

Table 11b. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Dimension and Substrate	UT1 Reach 2												UT1A						UT5 Reach 1					
	Cross-Section 13 (Riffle)						Cross-Section 14 (Pool)						Cross-Section 15 (Riffle)						Cross-Section 16 (Pool)					
	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft)	433.07	433.02					432.64	432.64					431.67	431.68					417.85	417.63				
Low Bank Elevation (ft)	433.07	433.02					432.64	432.64					431.67	431.68					417.85	417.63				
Bankfull Width (ft)	9.1	7.3					11.4	11.6					10.6	11.1					6.8	6.4				
Floodprone Width (ft)	116	116					N/A	N/A					78	78					N/A	N/A				
Bankfull Mean Depth (ft)	0.4	0.4					0.9	0.9					0.8	0.8					1.4	1.0				
Bankfull Max Depth (ft)	0.8	0.7					1.8	1.9					1.4	1.4					2.0	1.6				
Bankfull Cross-Sectional Area (ft ²)	3.6	3.1					10.7	11.0					8.3	8.5					9.4	6.6				
Bankfull Width/Depth Ratio	23.0	17.3					12.1	12.3					13.5	14.5					5.0	6.3				
Entrenchment Ratio ¹	12.8	15.9					N/A	N/A					7.4	7.0					N/A	N/A				
Bankfull Bank Height Ratio ²	1.0	<1.0					N/A	N/A					1.0	1.0					N/A	N/A				
Dimension and Substrate	UT5 Reach 1						UT6 Reach 1																	
	Cross-Section 17 (Riffle)						Cross-Section 18 (Riffle)						Cross-Section 19 (Pool)											
	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7	Base	MY1	MY2	MY3	MY5	MY7						
Bankfull Elevation (ft)	417.15	417.11					410.70	410.80					409.60	409.60										
Low Bank Elevation (ft)	417.15	417.11					410.70	410.80					409.60	409.60										
Bankfull Width (ft)	8.3	8.9					5.5	6.5					6.7	6.5										
Floodprone Width (ft)	20	20					55	55					N/A	N/A										
Bankfull Mean Depth (ft)	0.8	0.6					0.5	0.5					0.8	0.6										
Bankfull Max Depth (ft)	1.3	1.3					1.0	0.9					1.9	1.1										
Bankfull Cross-Sectional Area (ft ²)	7.0	5.7					2.9	3.0					5.2	3.7										
Bankfull Width/Depth Ratio	9.8	14.1					10.4	13.8					8.6	11.3										
Entrenchment Ratio ¹	2.4	2.2					10.0	8.5					N/A	N/A										
Bankfull Bank Height Ratio ²	1.0	<1.0					1.0	1.0					N/A	N/A										

¹Entrenchment Ratio is calculated using the method specified in the Industry Technical Workgroup Memorandum.

²Bank Height Ratio is calculated using the method specified in the Industry Technical Workgroup Memorandum.

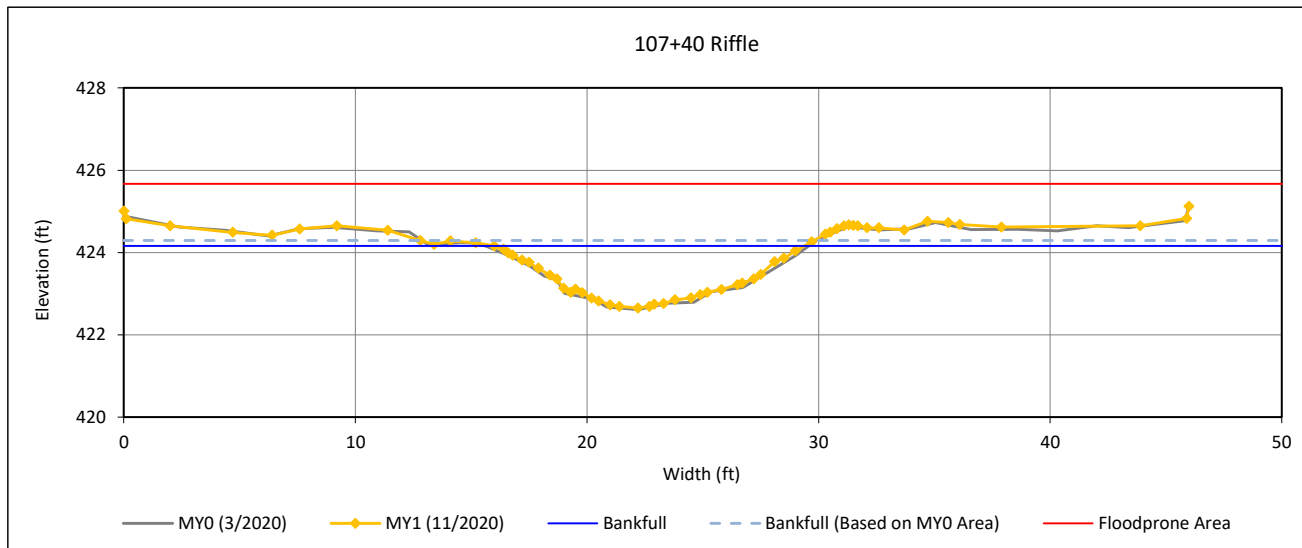
Cross-Section Plots

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Cross-Section 1 - Dry Creek Reach 1



Bankfull Dimensions

12.3	x-section area (ft.sq.)
13.4	width (ft)
0.9	mean depth (ft)
1.5	max depth (ft)
13.9	wetted perimeter (ft)
0.9	hydraulic radius (ft)
14.6	width-depth ratio
152.0	W flood prone area (ft)
11.4	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 11/2020

Field Crew: Wildlands Engineering

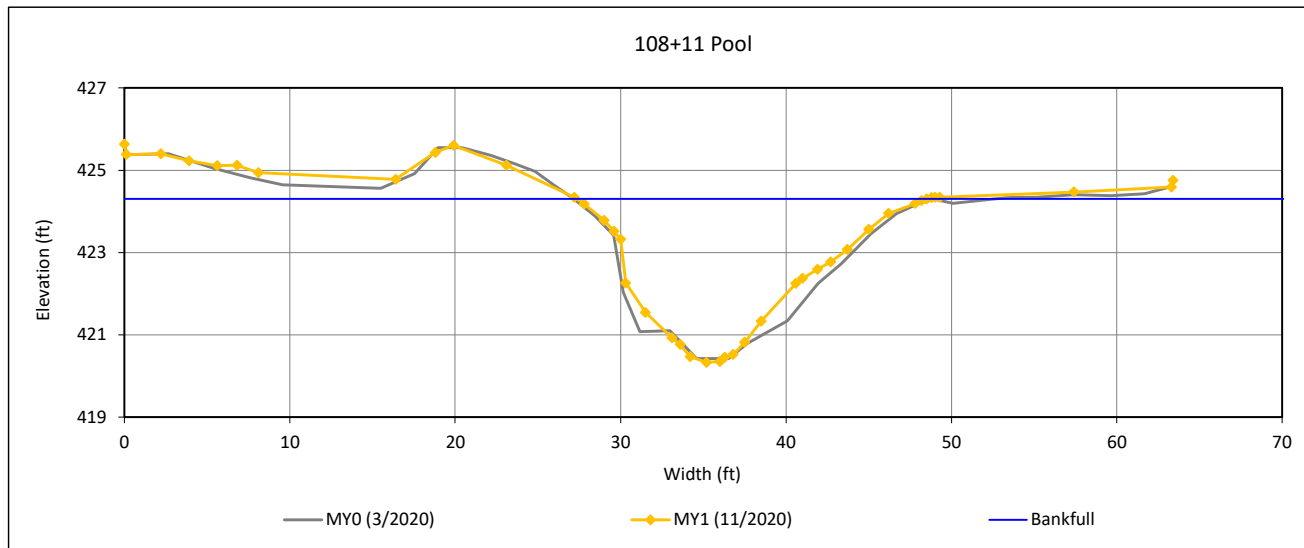


View Downstream

Cross-Section Plots

Dry Creek Mitigation Site
DMS Project No. 97082
Monitoring Year 1 - 2020

Cross-Section 2 - Dry Creek Reach 1



Bankfull Dimensions

42.0	x-section area (ft.sq.)
21.2	width (ft)
2.0	mean depth (ft)
4.0	max depth (ft)
23.2	wetted perimeter (ft)
1.8	hydraulic radius (ft)
10.7	width-depth ratio

Survey Date: 11/2020
Field Crew: Wildlands Engineering

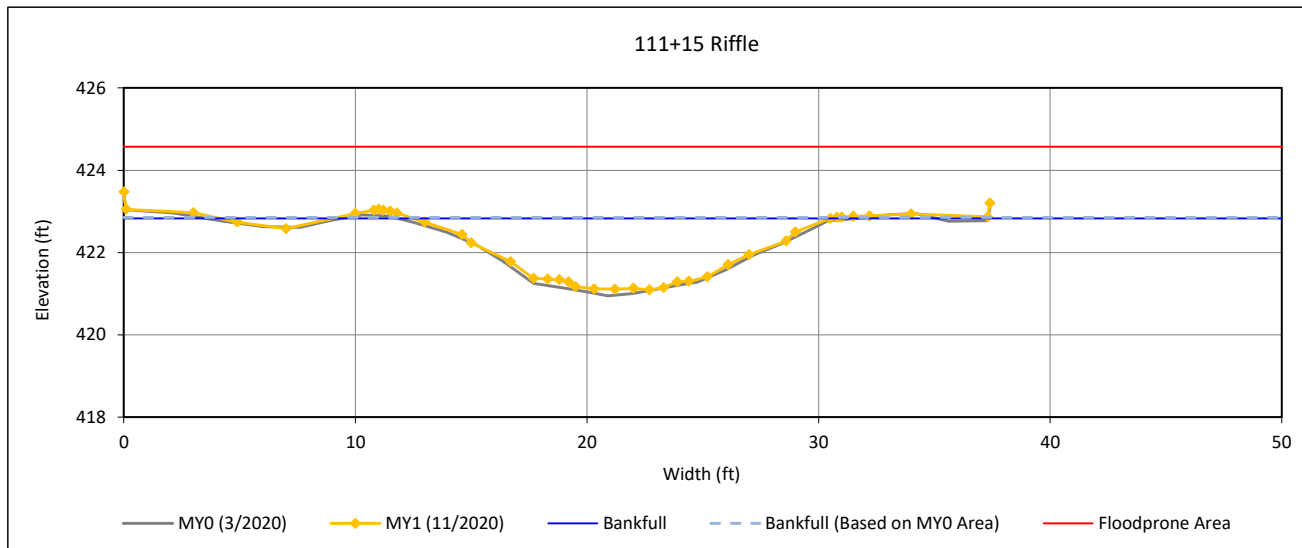


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Cross-Section Plots

Dry Creek Mitigation Site
DMS Project No. 97082
Monitoring Year 1 - 2020

Cross-Section 3 - Dry Creek Reach 1



Bankfull Dimensions

19.0	x-section area (ft.sq.)
18.0	width (ft)
1.1	mean depth (ft)
1.7	max depth (ft)
18.5	wetted perimeter (ft)
1.0	hydraulic radius (ft)
17.1	width-depth ratio
70.0	W flood prone area (ft)
3.9	entrenchment ratio
1.0	low bank height ratio

Survey Date: 11/2020

Field Crew: Wildlands Engineering



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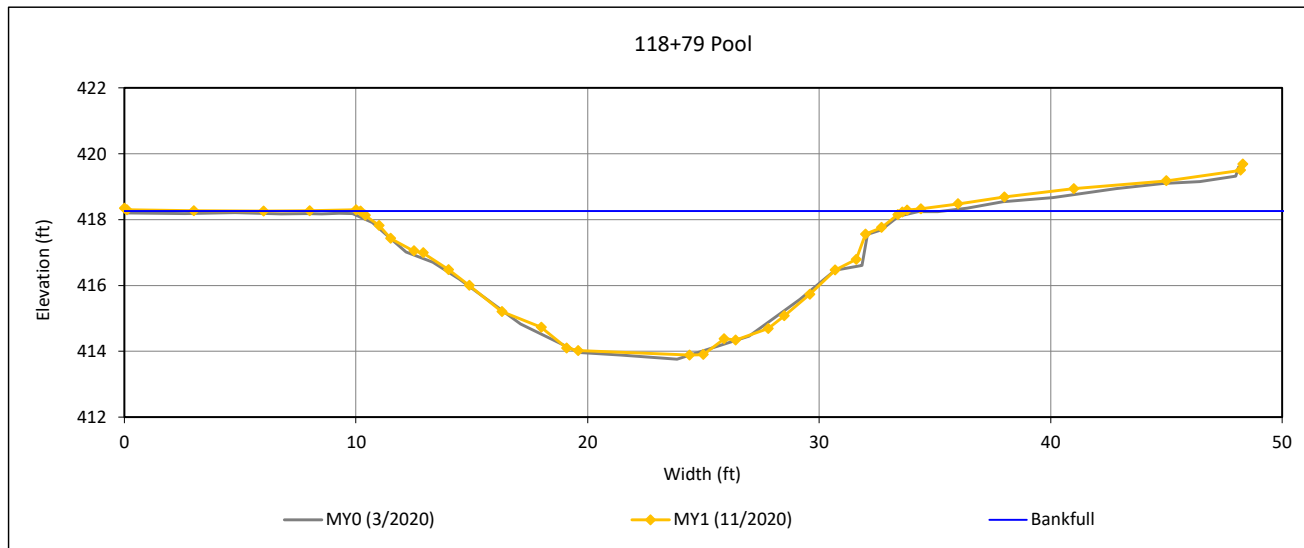
Cross-Section Plots

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Cross-Section 4 - Dry Creek Reach 2



Bankfull Dimensions

65.8	x-section area (ft.sq.)
23.5	width (ft)
2.8	mean depth (ft)
4.4	max depth (ft)
25.8	wetted perimeter (ft)
2.5	hydraulic radius (ft)
8.4	width-depth ratio

Survey Date: 11/2020
Field Crew: Wildlands Engineering

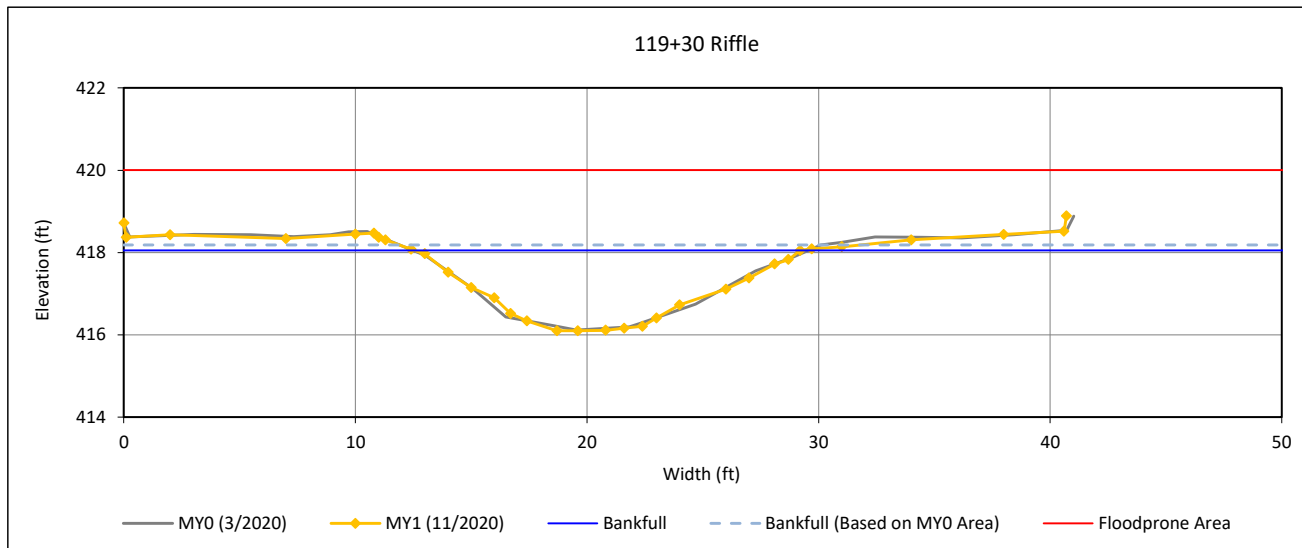


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Cross-Section Plots

Dry Creek Mitigation Site
DMS Project No. 97082
Monitoring Year 1 - 2020

Cross-Section 5 - Dry Creek Reach 2



Bankfull Dimensions

20.0	x-section area (ft.sq.)
16.6	width (ft)
1.2	mean depth (ft)
1.9	max depth (ft)
17.2	wetted perimeter (ft)
1.2	hydraulic radius (ft)
13.8	width-depth ratio
155.0	W flood prone area (ft)
9.3	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 11/2020
Field Crew: Wildlands Engineering

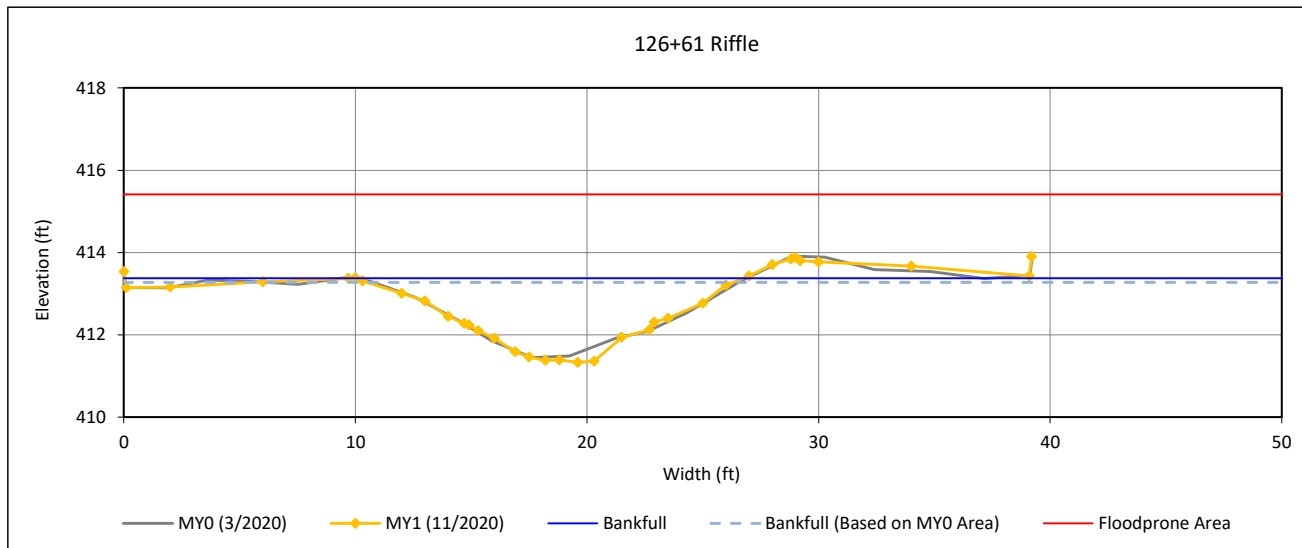


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Cross-Section Plots

Dry Creek Mitigation Site
DMS Project No. 97082
Monitoring Year 1 - 2020

Cross-Section 6 - Dry Creek Reach 2



Bankfull Dimensions

18.2	x-section area (ft.sq.)
16.7	width (ft)
1.1	mean depth (ft)
2.0	max depth (ft)
17.3	wetted perimeter (ft)
1.1	hydraulic radius (ft)
15.3	width-depth ratio
126.0	W flood prone area (ft)
7.6	entrenchment ratio
1.1	low bank height ratio

Survey Date: 11/2020

Field Crew: Wildlands Engineering



View Downstream

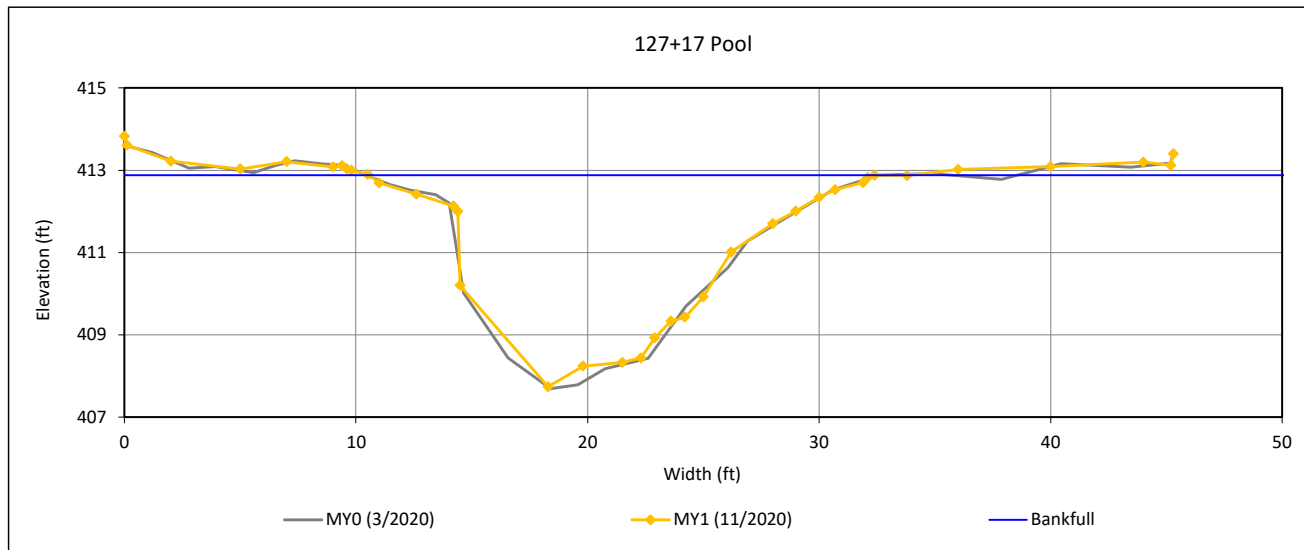
Cross-Section Plots

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Cross-Section 7 - Dry Creek Reach 2



Bankfull Dimensions

53.3	x-section area (ft.sq.)
21.9	width (ft)
2.4	mean depth (ft)
5.1	max depth (ft)
25.7	wetted perimeter (ft)
2.1	hydraulic radius (ft)
9.0	width-depth ratio

Survey Date: 11/2020
Field Crew: Wildlands Engineering



View Downstream

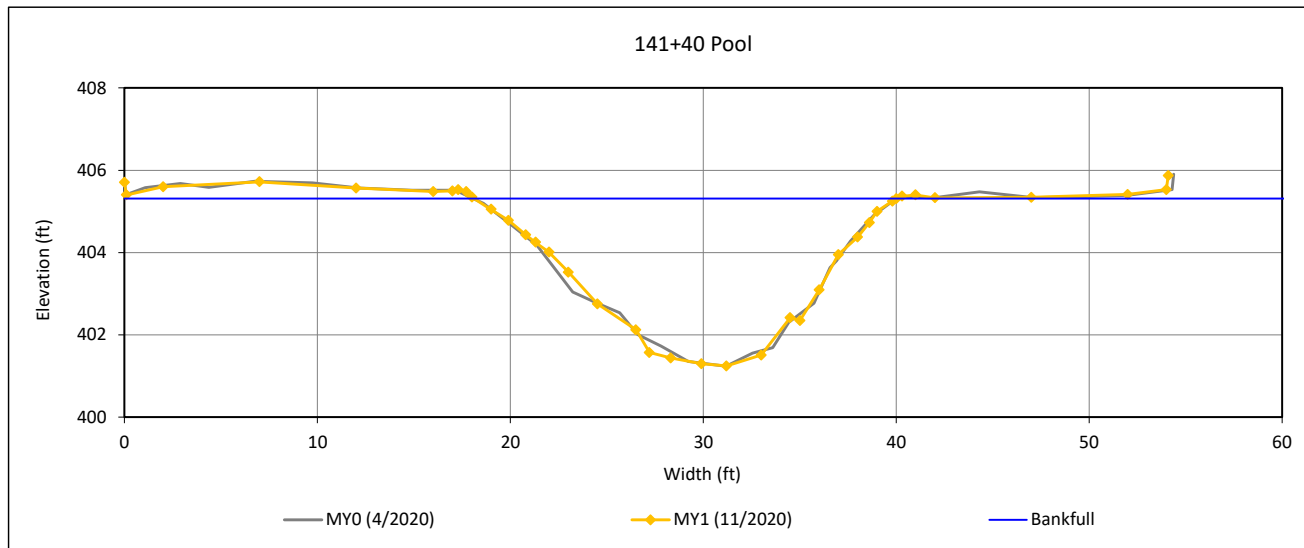
Cross-Section Plots

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Cross-Section 8 - Dry Creek Reach 3



Bankfull Dimensions

51.0	x-section area (ft.sq.)
21.9	width (ft)
2.3	mean depth (ft)
4.1	max depth (ft)
23.8	wetted perimeter (ft)
2.1	hydraulic radius (ft)
9.4	width-depth ratio

Survey Date: 11/2020

Field Crew: Wildlands Engineering

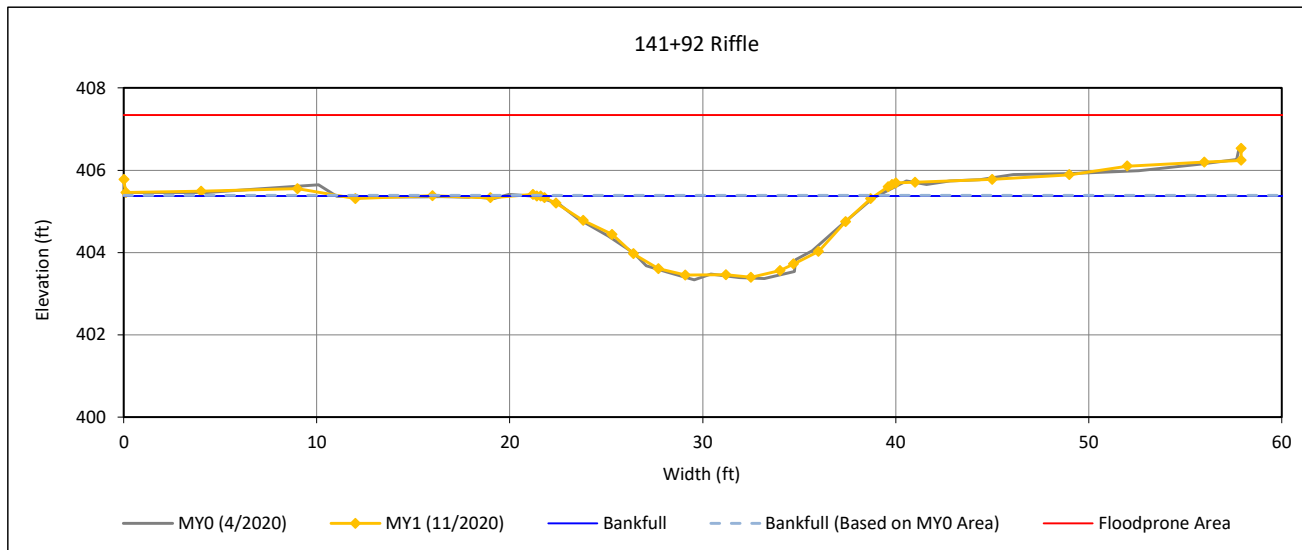


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Cross-Section Plots

Dry Creek Mitigation Site
DMS Project No. 97082
Monitoring Year 1 - 2020

Cross-Section 9 - Dry Creek Reach 3



Bankfull Dimensions

22.0	x-section area (ft.sq.)
17.3	width (ft)
1.3	mean depth (ft)
2.0	max depth (ft)
17.9	wetted perimeter (ft)
1.2	hydraulic radius (ft)
13.6	width-depth ratio
175.0	W flood prone area (ft)
10.1	entrenchment ratio
1.0	low bank height ratio

Survey Date: 11/2020
Field Crew: Wildlands Engineering

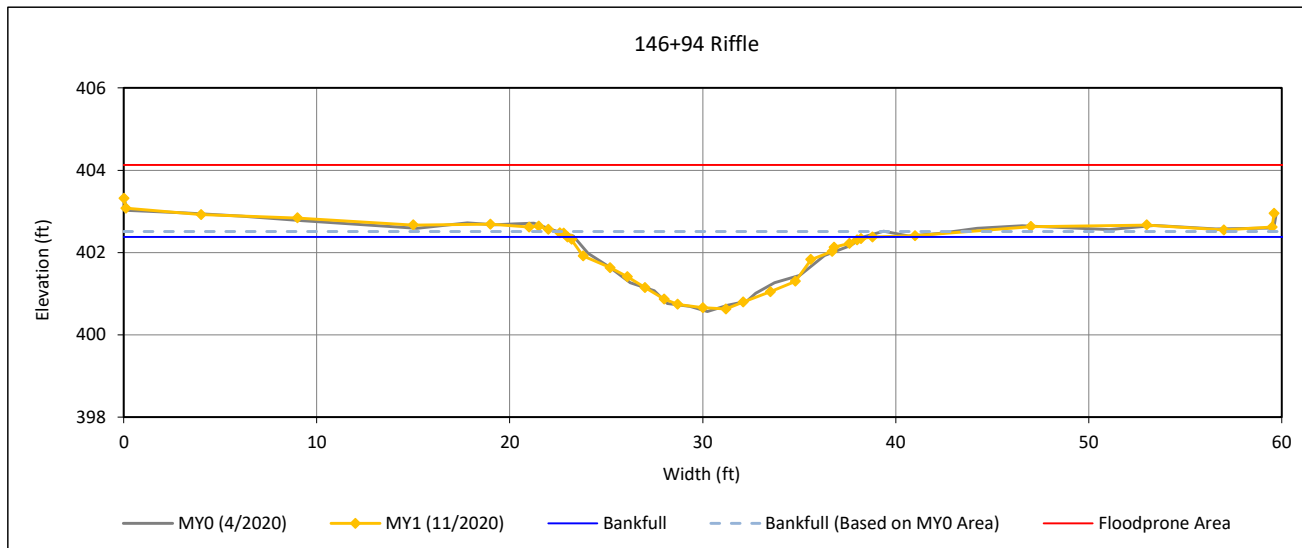


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Cross-Section Plots

Dry Creek Mitigation Site
DMS Project No. 97082
Monitoring Year 1 - 2020

Cross-Section 10 - Dry Creek Reach 3



Bankfull Dimensions

16.0	x-section area (ft.sq.)
15.8	width (ft)
1.0	mean depth (ft)
1.8	max depth (ft)
16.4	wetted perimeter (ft)
1.0	hydraulic radius (ft)
15.6	width-depth ratio
219.0	W flood prone area (ft)
13.9	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 11/2020
Field Crew: Wildlands Engineering



View Downstream

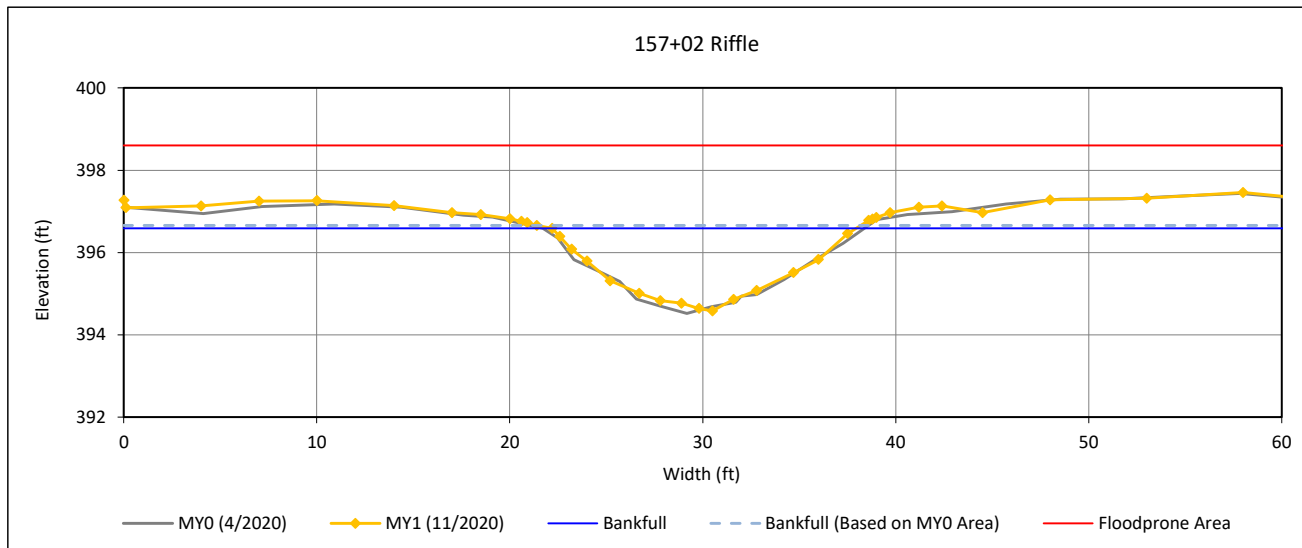
Cross-Section Plots

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Cross-Section 11 - Dry Creek Reach 4



Bankfull Dimensions

19.4	x-section area (ft.sq.)
15.7	width (ft)
1.2	mean depth (ft)
2.0	max depth (ft)
16.4	wetted perimeter (ft)
1.2	hydraulic radius (ft)
12.8	width-depth ratio
190.0	W flood prone area (ft)
12.1	entrenchment ratio
1.0	low bank height ratio

Survey Date: 11/2020

Field Crew: Wildlands Engineering

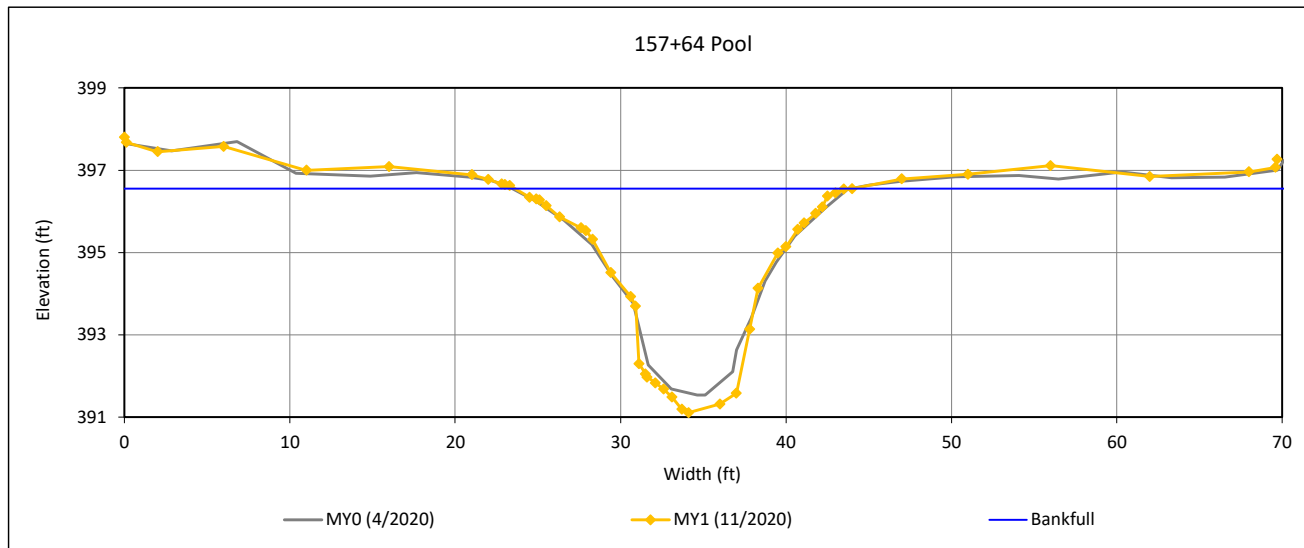


View Downstream

Cross-Section Plots

Dry Creek Mitigation Site
DMS Project No. 97082
Monitoring Year 1 - 2020

Cross-Section 12 - Dry Creek Reach 4



Bankfull Dimensions

48.7	x-section area (ft.sq.)
20.4	width (ft)
2.4	mean depth (ft)
5.4	max depth (ft)
24.7	wetted perimeter (ft)
2.0	hydraulic radius (ft)
8.5	width-depth ratio

Survey Date: 11/2020
Field Crew: Wildlands Engineering



View Downstream

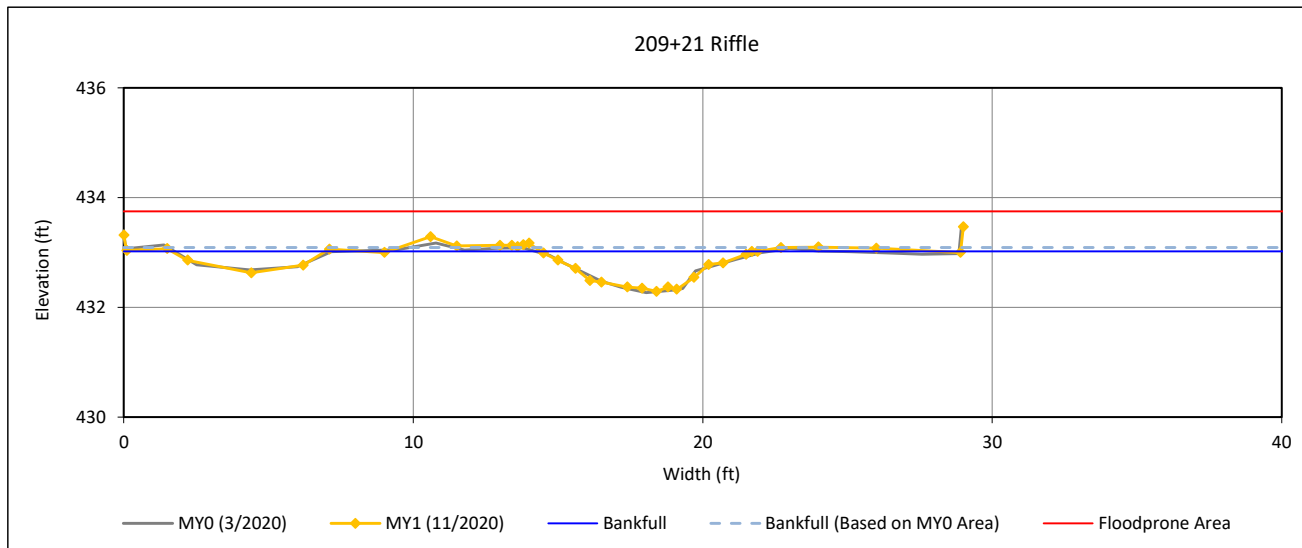
Cross-Section Plots

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Cross-Section 13 - UT1 Reach 2



Bankfull Dimensions

3.1	x-section area (ft.sq.)
7.3	width (ft)
0.4	mean depth (ft)
0.7	max depth (ft)
7.5	wetted perimeter (ft)
0.4	hydraulic radius (ft)
17.3	width-depth ratio
116.0	W flood prone area (ft)
15.9	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 11/2020

Field Crew: Wildlands Engineering



View Downstream

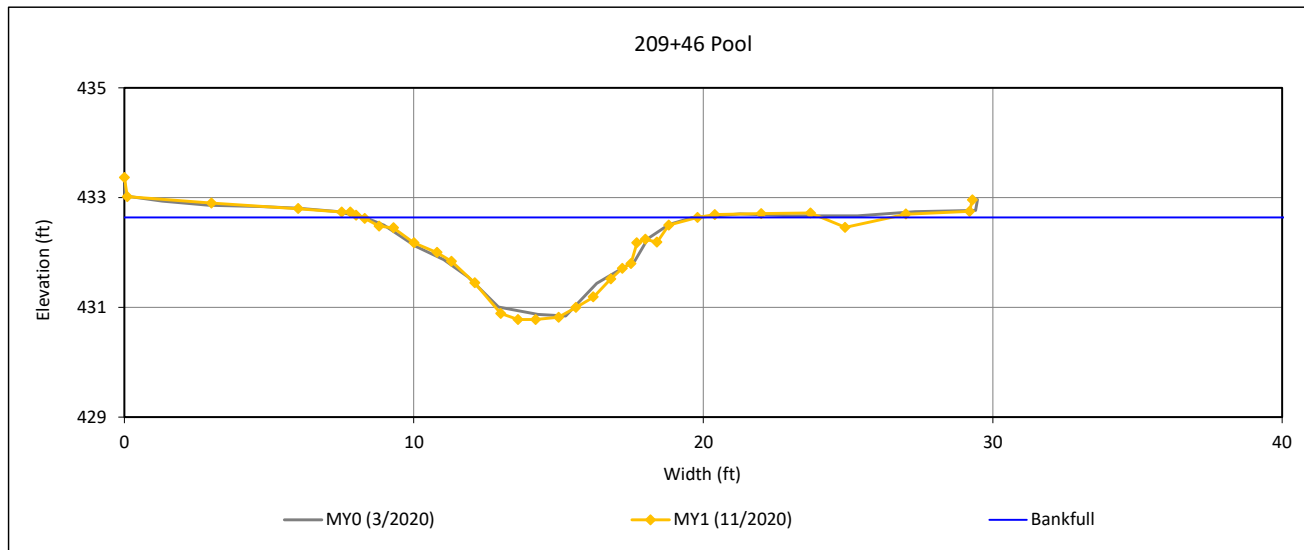
Cross-Section Plots

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Cross-Section 14 - UT1 Reach 2



Bankfull Dimensions

11.0	x-section area (ft.sq.)
11.6	width (ft)
0.9	mean depth (ft)
1.9	max depth (ft)
12.5	wetted perimeter (ft)
0.9	hydraulic radius (ft)
12.3	width-depth ratio

Survey Date: 11/2020

Field Crew: Wildlands Engineering

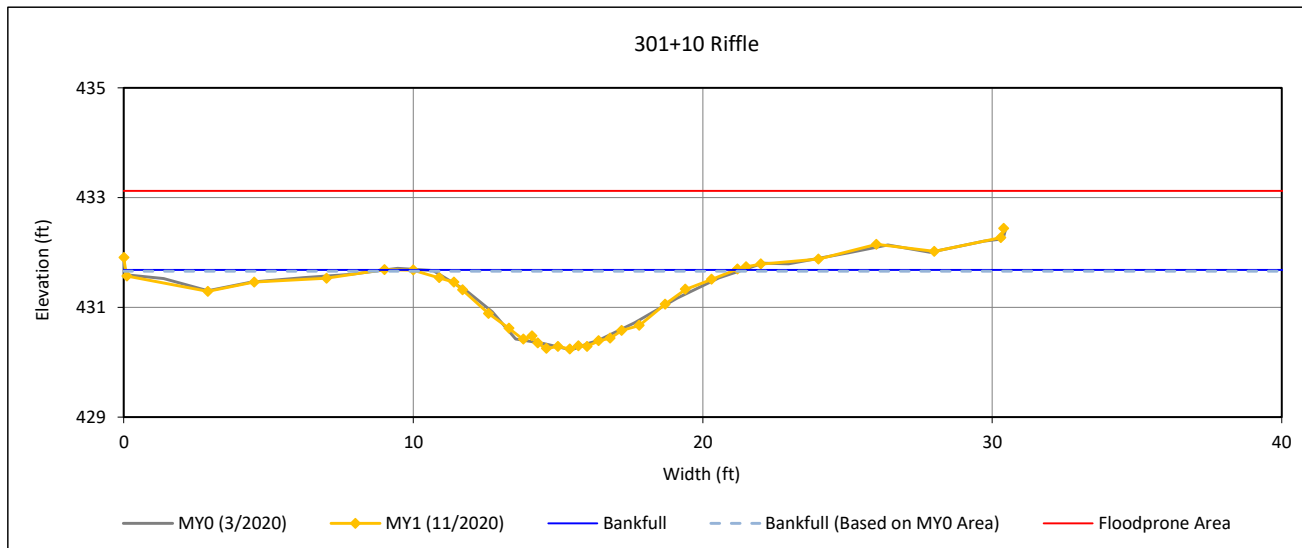


View Downstream

Cross-Section Plots

Dry Creek Mitigation Site
DMS Project No. 97082
Monitoring Year 1 - 2020

Cross-Section 15 - UT1A



Bankfull Dimensions

8.5	x-section area (ft.sq.)
11.1	width (ft)
0.8	mean depth (ft)
1.4	max depth (ft)
11.6	wetted perimeter (ft)
0.7	hydraulic radius (ft)
14.5	width-depth ratio
78.0	W flood prone area (ft)
7.0	entrenchment ratio
1.0	low bank height ratio

Survey Date: 11/2020
Field Crew: Wildlands Engineering



View Downstream

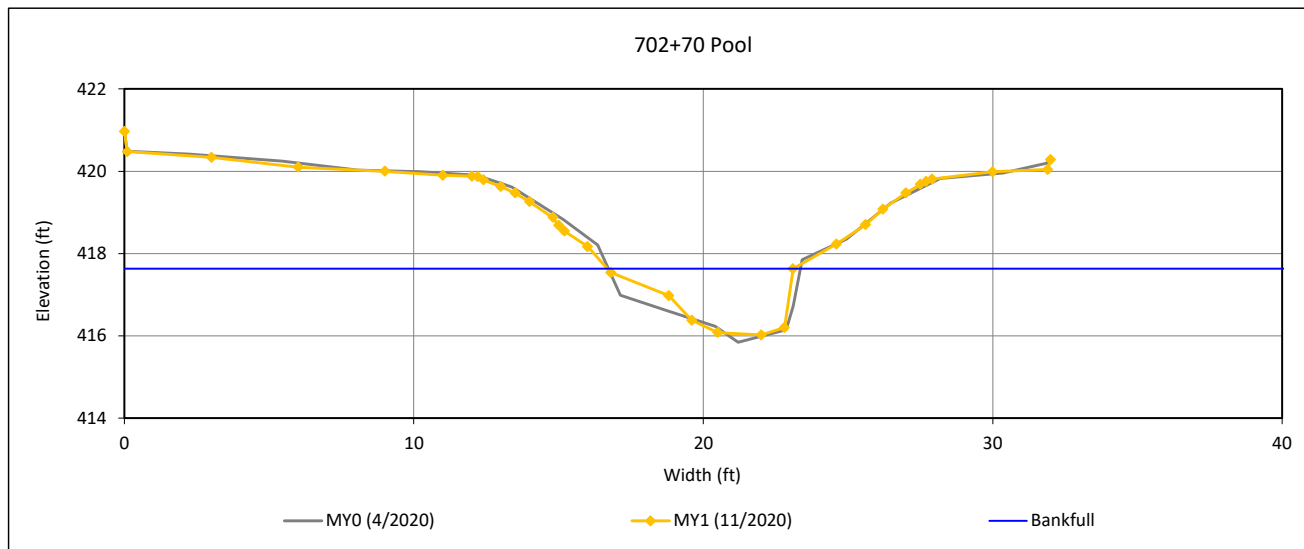
Cross-Section Plots

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Cross-Section 16 - UT5 Reach 1



Bankfull Dimensions

6.6	x-section area (ft.sq.)
6.4	width (ft)
1.0	mean depth (ft)
1.6	max depth (ft)
8.0	wetted perimeter (ft)
0.8	hydraulic radius (ft)
6.3	width-depth ratio

Survey Date: 11/2020

Field Crew: Wildlands Engineering

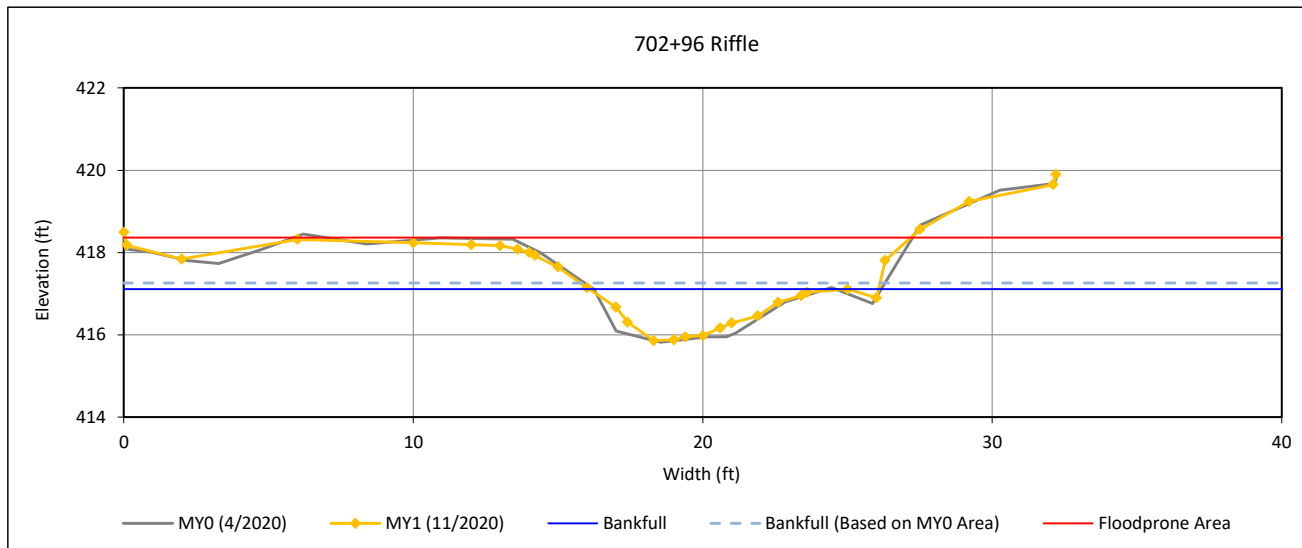


View Downstream

Cross-Section Plots

Dry Creek Mitigation Site
DMS Project No. 97082
Monitoring Year 1 - 2020

Cross-Section 17 - UT5 Reach 1



Bankfull Dimensions

5.7	x-section area (ft.sq.)
8.9	width (ft)
0.6	mean depth (ft)
1.3	max depth (ft)
9.4	wetted perimeter (ft)
0.6	hydraulic radius (ft)
14.1	width-depth ratio
20.0	W flood prone area (ft)
2.2	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 11/2020
Field Crew: Wildlands Engineering



View Downstream

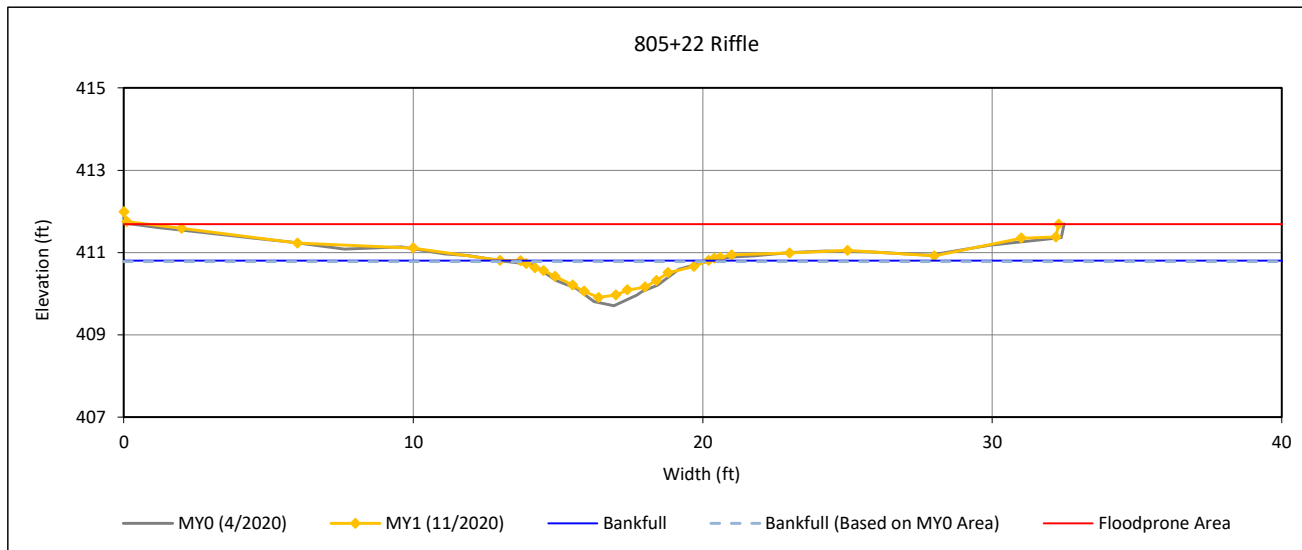
Cross-Section Plots

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Cross-Section 18 - UT6 Reach 1



Bankfull Dimensions

3.0	x-section area (ft.sq.)
6.5	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
6.7	wetted perimeter (ft)
0.4	hydraulic radius (ft)
13.8	width-depth ratio
55.0	W flood prone area (ft)
8.5	entrenchment ratio
1.0	low bank height ratio

Survey Date: 11/2020

Field Crew: Wildlands Engineering



View Downstream

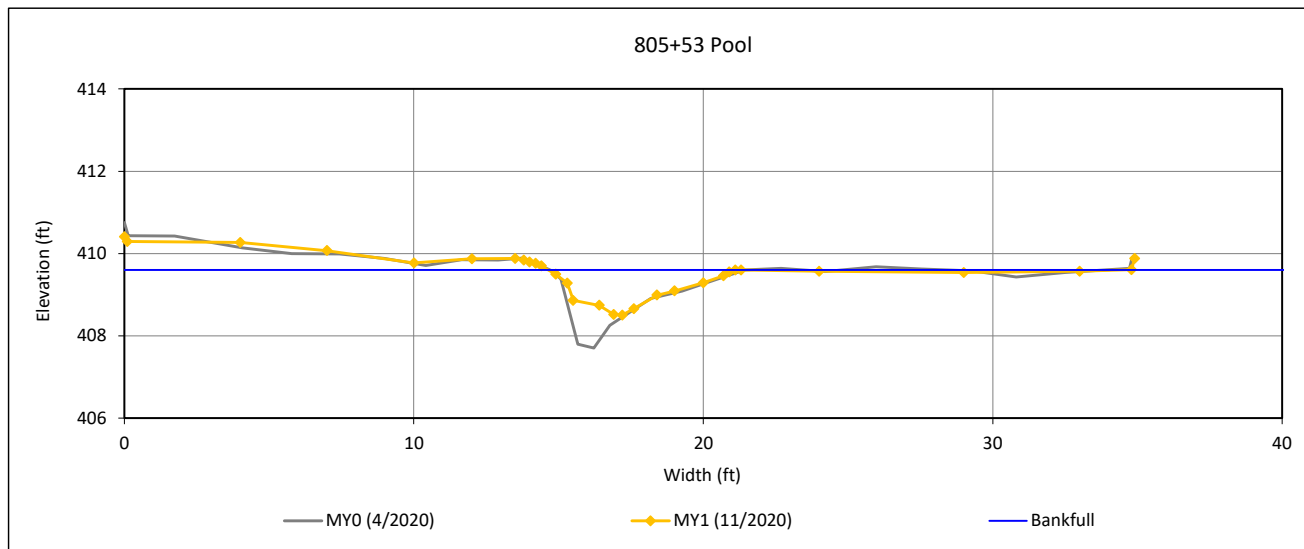
Cross-Section Plots

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Cross-Section 19 - UT6 Reach 1



Bankfull Dimensions

3.7	x-section area (ft.sq.)
6.5	width (ft)
0.6	mean depth (ft)
1.1	max depth (ft)
7.0	wetted perimeter (ft)
0.5	hydraulic radius (ft)
11.3	width-depth ratio

Survey Date: 11/2020

Field Crew: Wildlands Engineering



View Downstream

Reachwide Pebble Count Plots

Dry Creek Mitigation Site

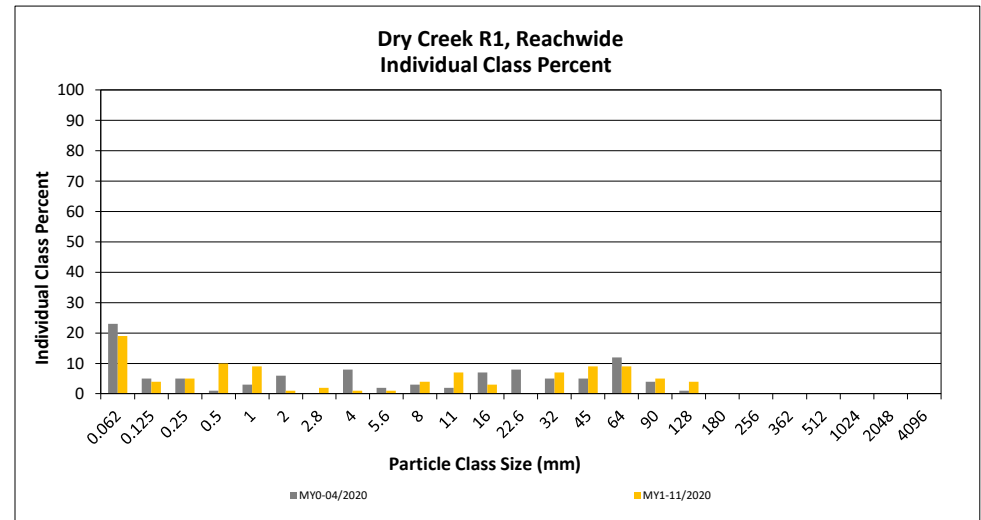
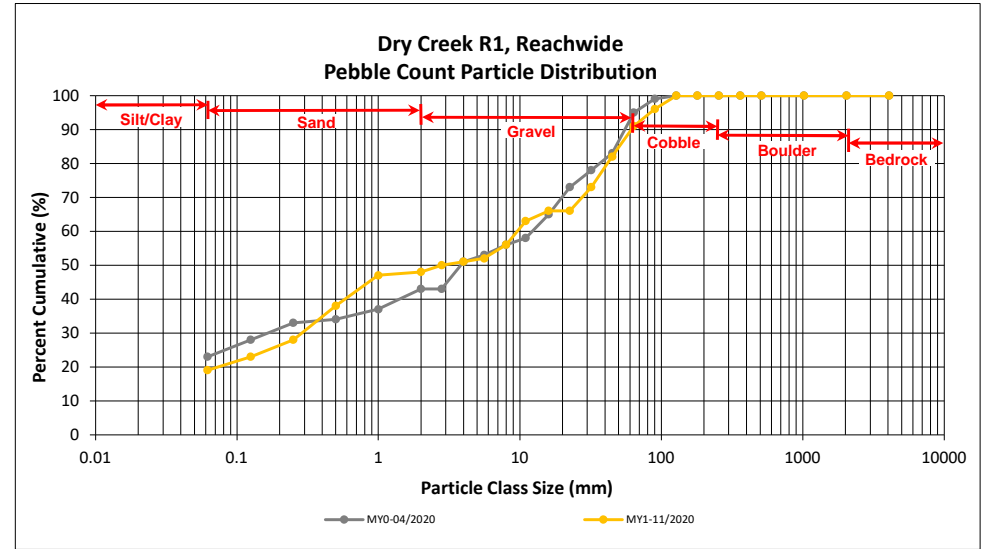
DMS Project No. 97082

Monitoring Year 1 - 2020

Dry Creek R1, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	18	19	19	19
SAND	Very fine	0.062	0.125		4	4	4	23
	Fine	0.125	0.250		5	5	5	28
	Medium	0.25	0.50	1	9	10	10	38
	Coarse	0.5	1.0	1	8	9	9	47
	Very Coarse	1.0	2.0	1		1	1	48
GRAVEL	Very Fine	2.0	2.8		2	2	2	50
	Very Fine	2.8	4.0		1	1	1	51
	Fine	4.0	5.6	1		1	1	52
	Fine	5.6	8.0	2	2	4	4	56
	Medium	8.0	11.0	2	5	7	7	63
	Medium	11.0	16.0	1	2	3	3	66
	Coarse	16.0	22.6					66
	Coarse	22.6	32	7		7	7	73
	Very Coarse	32	45	6	3	9	9	82
	Very Coarse	45	64	8	1	9	9	91
COBBLE	Small	64	90	5		5	5	96
	Small	90	128	4		4	4	100
	Large	128	180					100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				40	60	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	0.41
D ₅₀ =	2.8
D ₈₄ =	48.7
D ₉₅ =	84.1
D ₁₀₀ =	128.0



Reachwide Pebble Count Plots

Dry Creek Mitigation Site

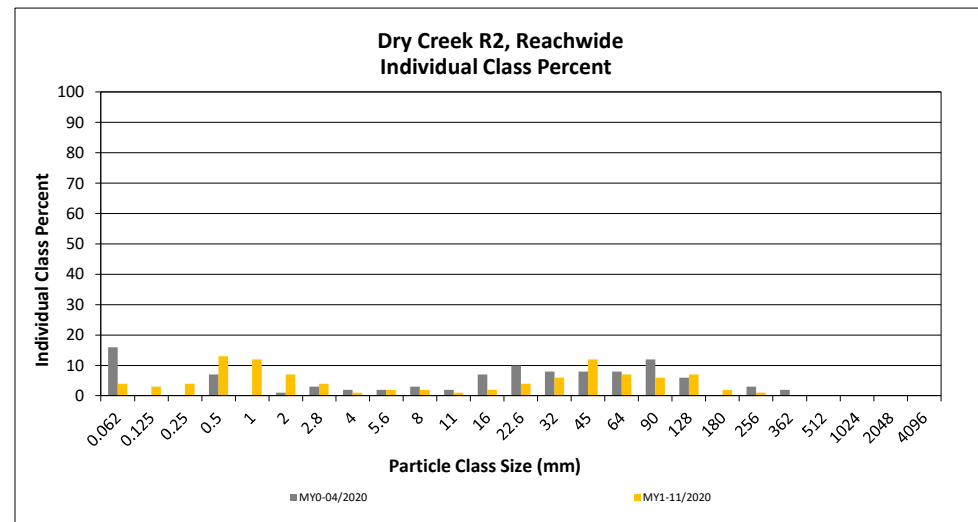
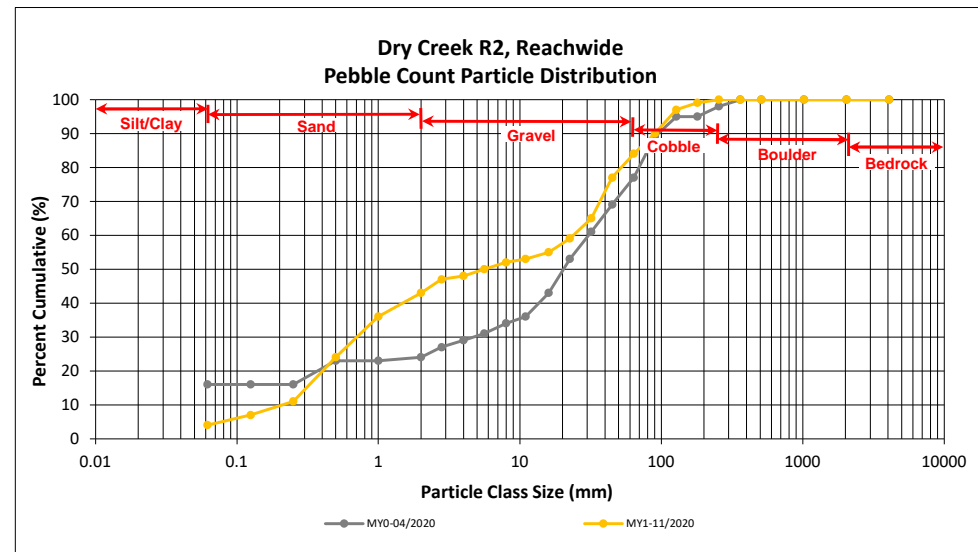
DMS Project No. 97082

Monitoring Year 1 - 2020

Dry Creek R2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	19	21	21	21
SAND	Very fine	0.062	0.125					21
	Fine	0.125	0.250		2	2	2	23
	Medium	0.25	0.50	1	7	8	8	31
	Coarse	0.5	1.0		3	3	3	34
	Very Coarse	1.0	2.0	1	4	5	5	39
GRAVEL	Very Fine	2.0	2.8		1	1	1	40
	Very Fine	2.8	4.0	1	3	4	4	44
	Fine	4.0	5.6	3	3	6	6	50
	Fine	5.6	8.0	3	1	4	4	54
	Medium	8.0	11.0	2	2	4	4	58
	Medium	11.0	16.0	6	1	7	7	65
	Coarse	16.0	22.6	10	2	12	12	77
	Coarse	22.6	32	5		5	5	82
	Very Coarse	32	45	8	1	9	9	91
	Very Coarse	45	64	4	1	5	5	96
COBBLE	Small	64	90	4		4	4	100
	Small	90	128					100
	Large	128	180					100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	1.15
D ₅₀ =	5.6
D ₈₄ =	34.5
D ₉₅ =	59.6
D ₁₀₀ =	90.0



Reachwide Pebble Count Plots

Dry Creek Mitigation Site

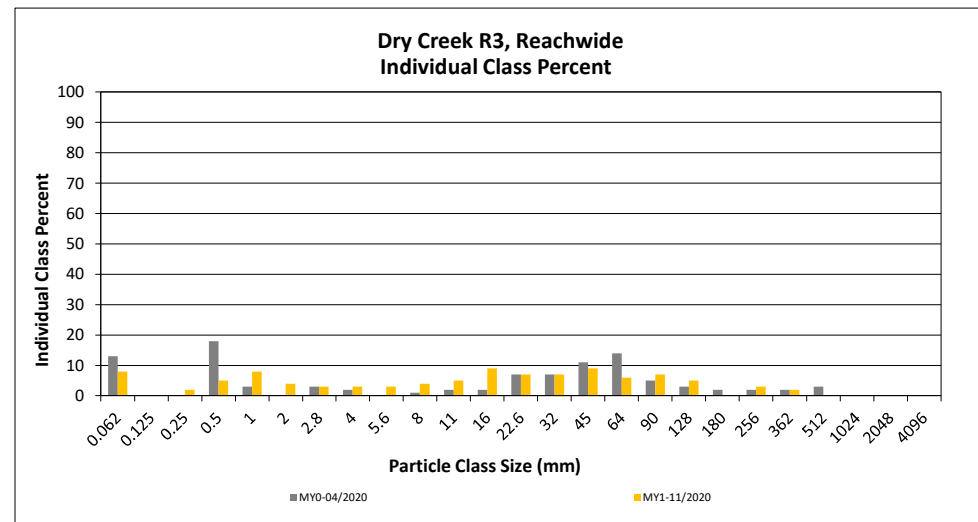
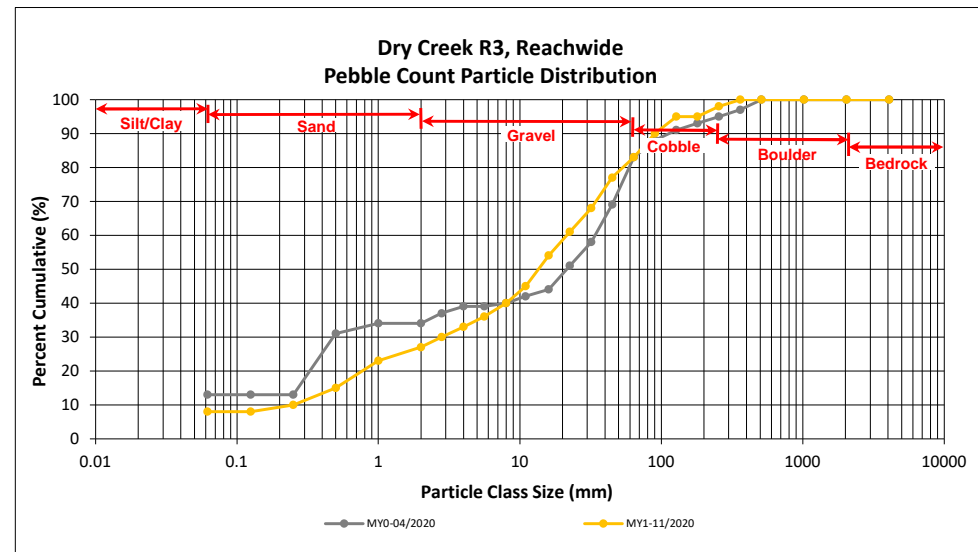
DMS Project No. 97082

Monitoring Year 1 - 2020

Dry Creek R3, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		8	8	8	8
SAND	Very fine	0.062	0.125					8
	Fine	0.125	0.250		2	2	2	10
	Medium	0.25	0.50		5	5	5	15
	Coarse	0.5	1.0		8	8	8	23
	Very Coarse	1.0	2.0		4	4	4	27
GRAVEL	Very Fine	2.0	2.8	1	2	3	3	30
	Very Fine	2.8	4.0		3	3	3	33
	Fine	4.0	5.6		3	3	3	36
	Fine	5.6	8.0	2	2	4	4	40
	Medium	8.0	11.0	1	4	5	5	45
	Medium	11.0	16.0	3	6	9	9	54
	Coarse	16.0	22.6	4	3	7	7	61
	Coarse	22.6	32	7		7	7	68
	Very Coarse	32	45	9		9	9	77
	Very Coarse	45	64	6		6	6	83
COBBLE	Small	64	90	7		7	7	90
	Small	90	128	5		5	5	95
	Large	128	180					95
	Large	180	256	3		3	3	98
BOULDER	Small	256	362	2		2	2	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.55
D ₃₅ =	5.01
D ₅₀ =	13.5
D ₈₄ =	67.2
D ₉₅ =	128.0
D ₁₀₀ =	362.0



Reachwide Pebble Count Plots

Dry Creek Mitigation Site

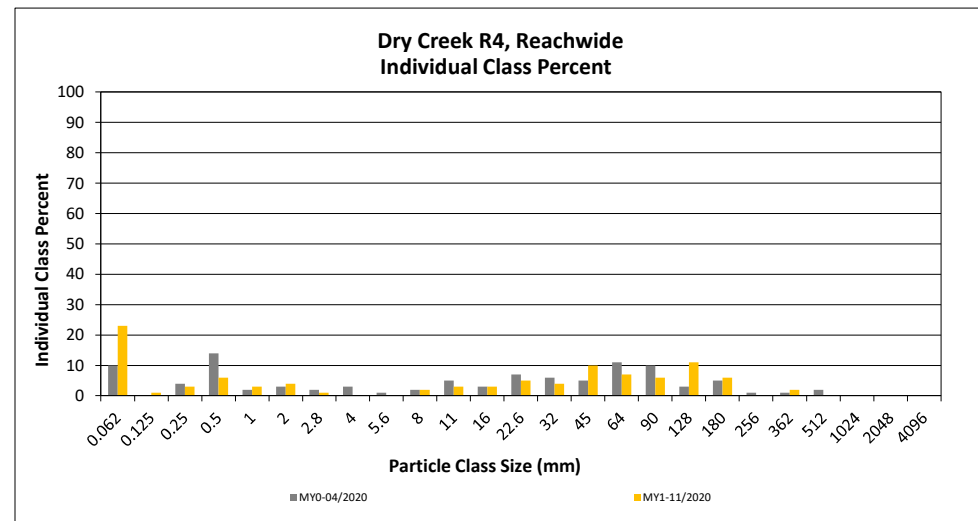
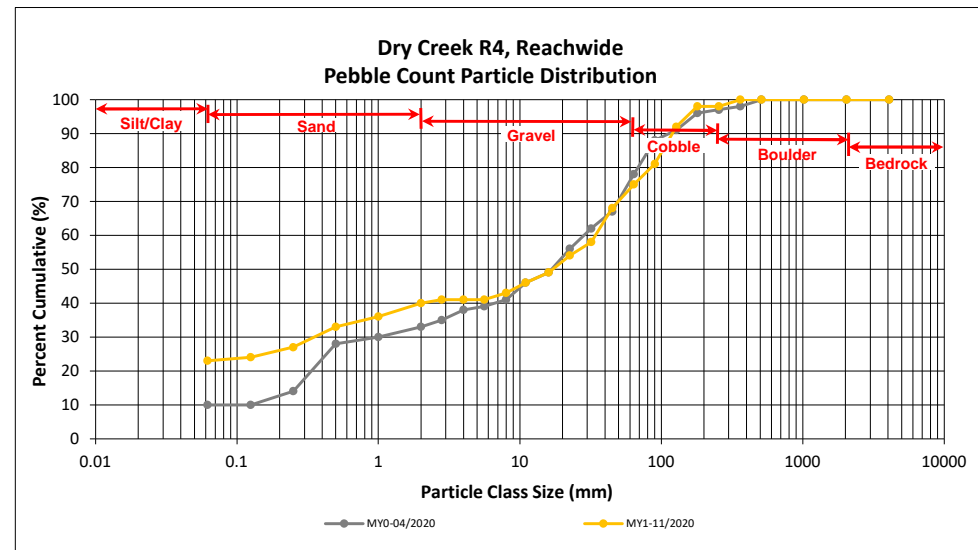
DMS Project No. 97082

Monitoring Year 1 - 2020

Dry Creek R4, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		23	23	23	23
SAND	Very fine	0.062	0.125		1	1	1	24
	Fine	0.125	0.250		3	3	3	27
	Medium	0.25	0.50	3	3	6	6	33
	Coarse	0.5	1.0		3	3	3	36
	Very Coarse	1.0	2.0		4	4	4	40
GRAVEL	Very Fine	2.0	2.8		1	1	1	41
	Very Fine	2.8	4.0					41
	Fine	4.0	5.6					41
	Fine	5.6	8.0		2	2	2	43
	Medium	8.0	11.0	1	2	3	3	46
	Medium	11.0	16.0	1	2	3	3	49
	Coarse	16.0	22.6	3	2	5	5	54
	Coarse	22.6	32	3	1	4	4	58
	Very Coarse	32	45	8	2	10	10	68
	Very Coarse	45	64	6	1	7	7	75
COBBLE	Small	64	90	6		6	6	81
	Small	90	128	11		11	11	92
	Large	128	180	6		6	6	98
	Large	180	256					98
BOULDER	Small	256	362	2		2	2	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	0.79
D ₅₀ =	17.1
D ₈₄ =	99.1
D ₉₅ =	151.8
D ₁₀₀ =	362.0



Reachwide Pebble Count Plots

Dry Creek Mitigation Site

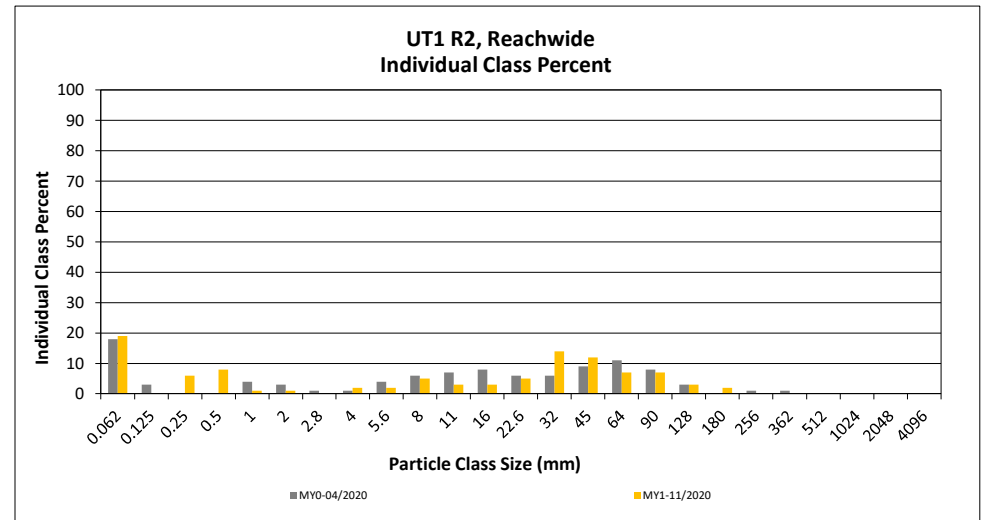
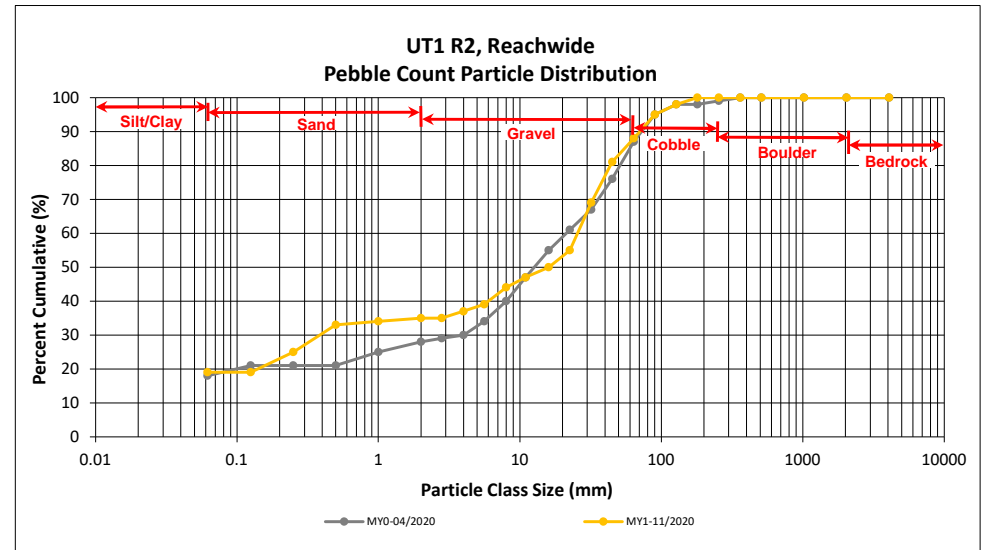
DMS Project No. 97082

Monitoring Year 1 - 2020

UT1 R2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			19	19	19
SAND	Very fine	0.062	0.125					19
	Fine	0.125	0.250		6	6	6	25
	Medium	0.25	0.50	1	7	8	8	33
	Coarse	0.5	1.0		1	1	1	34
	Very Coarse	1.0	2.0	1		1	1	35
GRAVEL	Very Fine	2.0	2.8					35
	Very Fine	2.8	4.0	2		2	2	37
	Fine	4.0	5.6	1	1	2	2	39
	Fine	5.6	8.0	1	4	5	5	44
	Medium	8.0	11.0	2	1	3	3	47
	Medium	11.0	16.0	1	2	3	3	50
	Coarse	16.0	22.6	3	2	5	5	55
	Coarse	22.6	32	9	5	14	14	69
	Very Coarse	32	45	11	1	12	12	81
	Very Coarse	45	64	6	1	7	7	88
COBBLE	Small	64	90	7		7	7	95
	Small	90	128	3		3	3	98
	Large	128	180	2		2	2	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	2.00
D ₅₀ =	16.0
D ₈₄ =	52.3
D ₉₅ =	90.0
D ₁₀₀ =	180.0



Reachwide Pebble Count Plots

Dry Creek Mitigation Site

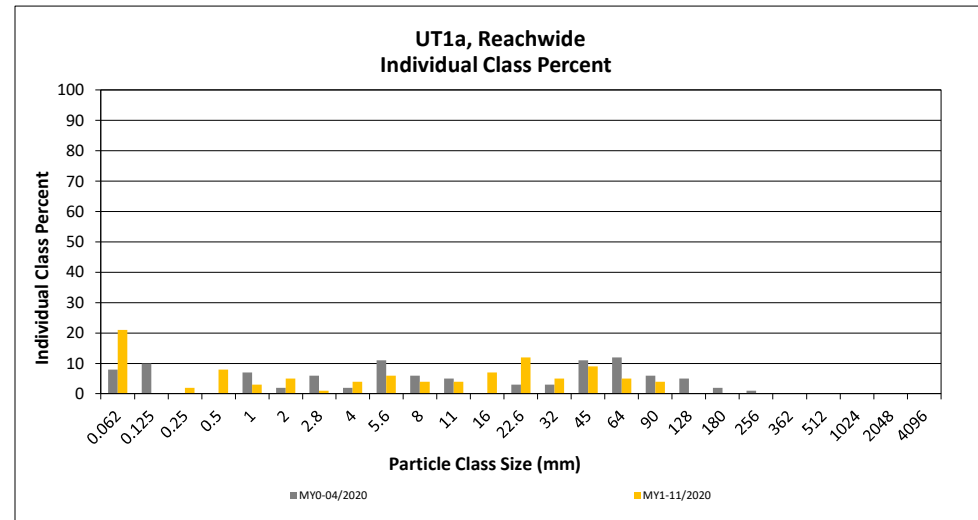
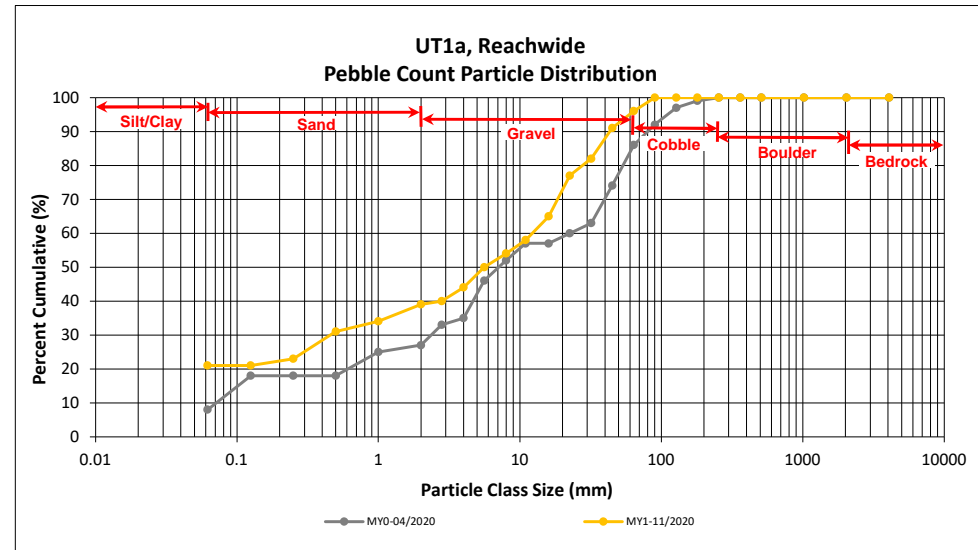
DMS Project No. 97082

Monitoring Year 1 - 2020

UT1a, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	19	21	21	21
SAND	Very fine	0.062	0.125					21
	Fine	0.125	0.250		2	2	2	23
	Medium	0.25	0.50	1	7	8	8	31
	Coarse	0.5	1.0		3	3	3	34
	Very Coarse	1.0	2.0	1	4	5	5	39
GRAVEL	Very Fine	2.0	2.8		1	1	1	40
	Very Fine	2.8	4.0	1	3	4	4	44
	Fine	4.0	5.6	3	3	6	6	50
	Fine	5.6	8.0	3	1	4	4	54
	Medium	8.0	11.0	2	2	4	4	58
	Medium	11.0	16.0	6	1	7	7	65
	Coarse	16.0	22.6	10	2	12	12	77
	Coarse	22.6	32	5		5	5	82
	Very Coarse	32	45	8	1	9	9	91
	Very Coarse	45	64	4	1	5	5	96
COBBLE	Small	64	90	4		4	4	100
	Small	90	128					100
	Large	128	180					100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	1.15
D ₅₀ =	5.6
D ₈₄ =	34.5
D ₉₅ =	59.6
D ₁₀₀ =	90.0



Reachwide Pebble Count Plots

Dry Creek Mitigation Site

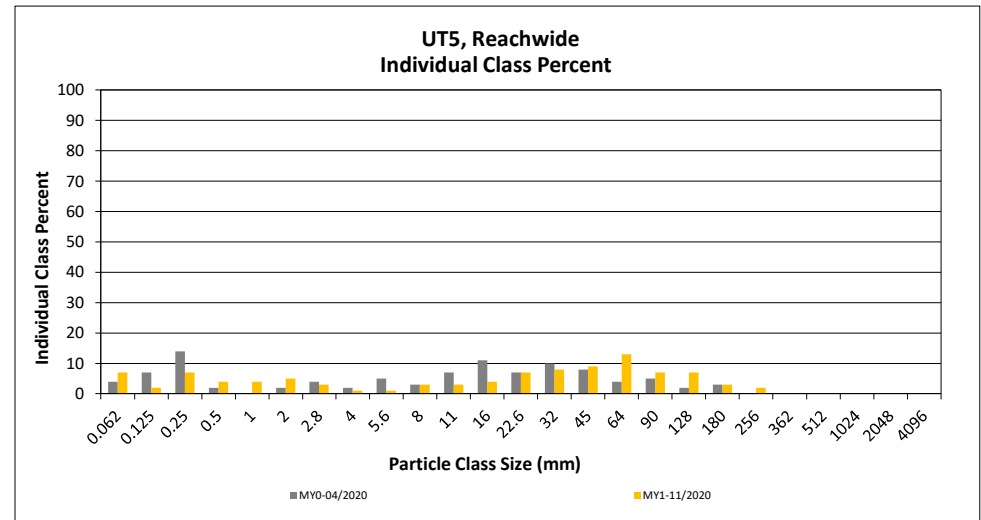
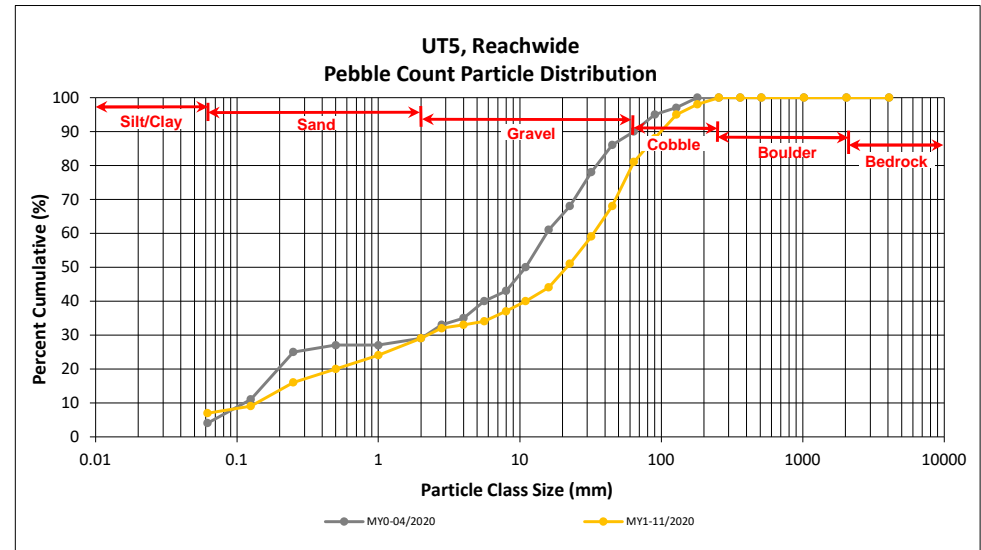
DMS Project No. 97082

Monitoring Year 1 - 2020

UT5, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		7	7	7	7
SAND	Very fine	0.062	0.125		2	2	2	9
	Fine	0.125	0.250		7	7	7	16
	Medium	0.25	0.50		4	4	4	20
	Coarse	0.5	1.0		4	4	4	24
	Very Coarse	1.0	2.0		5	5	5	29
GRAVEL	Very Fine	2.0	2.8		3	3	3	32
	Very Fine	2.8	4.0	1		1	1	33
	Fine	4.0	5.6		1	1	1	34
	Fine	5.6	8.0	1	2	3	3	37
	Medium	8.0	11.0	2	1	3	3	40
	Medium	11.0	16.0	2	2	4	4	44
	Coarse	16.0	22.6	6	1	7	7	51
	Coarse	22.6	32	3	5	8	8	59
	Very Coarse	32	45	7	2	9	9	68
	Very Coarse	45	64	11	2	13	13	81
COBBLE	Small	64	90	7		7	7	88
	Small	90	128	6	1	7	7	95
	Large	128	180	2	1	3	3	98
	Large	180	256	2		2	2	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.25
D ₃₅ =	6.31
D ₅₀ =	21.5
D ₈₄ =	74.1
D ₉₅ =	128.0
D ₁₀₀ =	256.0



Reachwide Pebble Count Plots

Dry Creek Mitigation Site

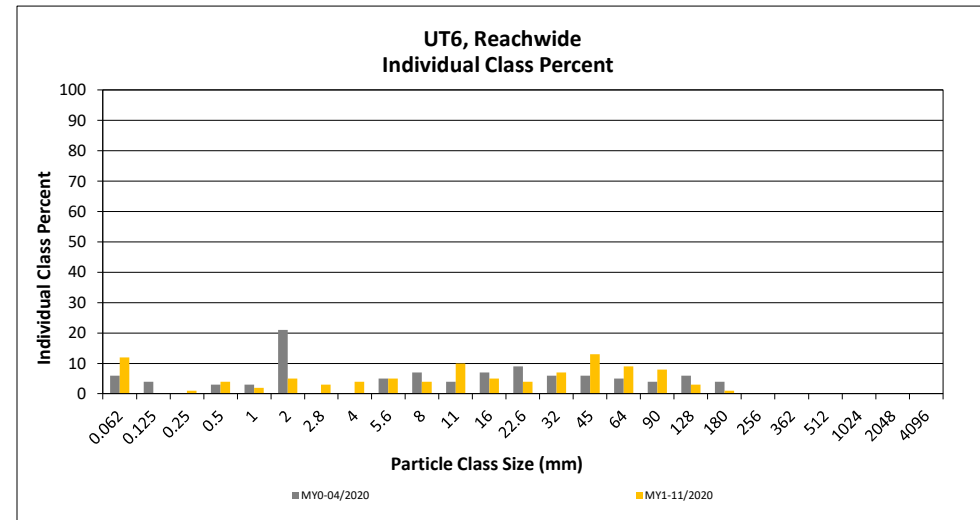
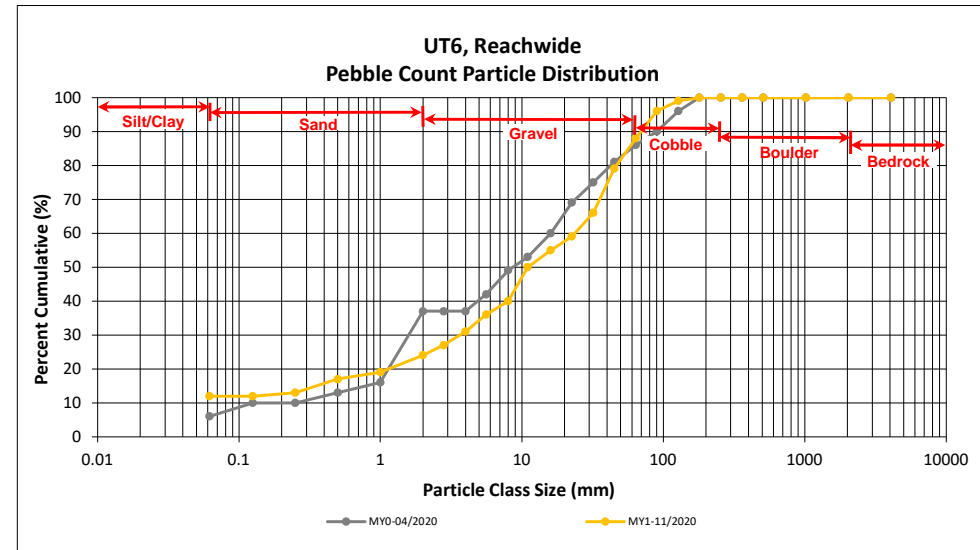
DMS Project No. 97082

Monitoring Year 1 - 2020

UT6, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	10	12	12	12
SAND	Very fine	0.062	0.125					12
	Fine	0.125	0.250		1	1	1	13
	Medium	0.25	0.50	2	2	4	4	17
	Coarse	0.5	1.0		2	2	2	19
	Very Coarse	1.0	2.0		5	5	5	24
GRAVEL	Very Fine	2.0	2.8		3	3	3	27
	Very Fine	2.8	4.0		4	4	4	31
	Fine	4.0	5.6	2	3	5	5	36
	Fine	5.6	8.0	2	2	4	4	40
	Medium	8.0	11.0	7	3	10	10	50
	Medium	11.0	16.0	2	3	5	5	55
	Coarse	16.0	22.6	1	3	4	4	59
	Coarse	22.6	32	5	2	7	7	66
	Very Coarse	32	45	10	3	13	13	79
	Very Coarse	45	64	7	2	9	9	88
	COBBLE	Small	64	90	7	1	8	8
Small		90	128	2	1	3	3	99
Large		128	180	1		1	1	100
Large		180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.42
D ₃₅ =	5.24
D ₅₀ =	11.0
D ₈₄ =	54.7
D ₉₅ =	86.2
D ₁₀₀ =	180.0



APPENDIX 5. Hydrology Summary Data

Table 13. Verification of Bankfull Events

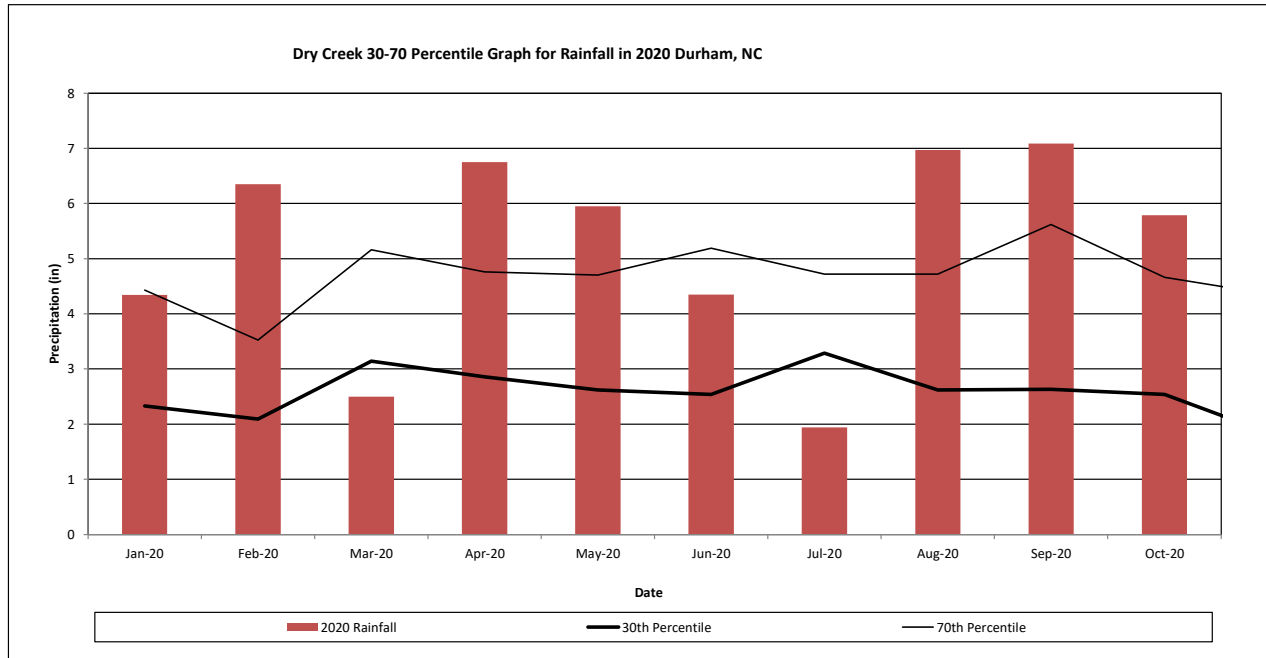
Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

Reach	MY1	Method
	Date of Occurrence	
Dry Creek Reach 2	4/13/2020	Pressure Transducer
	10/11/2020	
Dry Creek Reach 3	5/21/2020	
	10/11/2020	
UT1 Reach 2	4/13/2020	
	10/11/2020	
UT5 Reach 1	10/11/2020	
UT6 Reach 1	*	

*Gage malfunction.

Monthly Rainfall Data

Dry Creek Mitigation Site
 DMS Project No. 97082
 Monitoring Year 1 - 2020

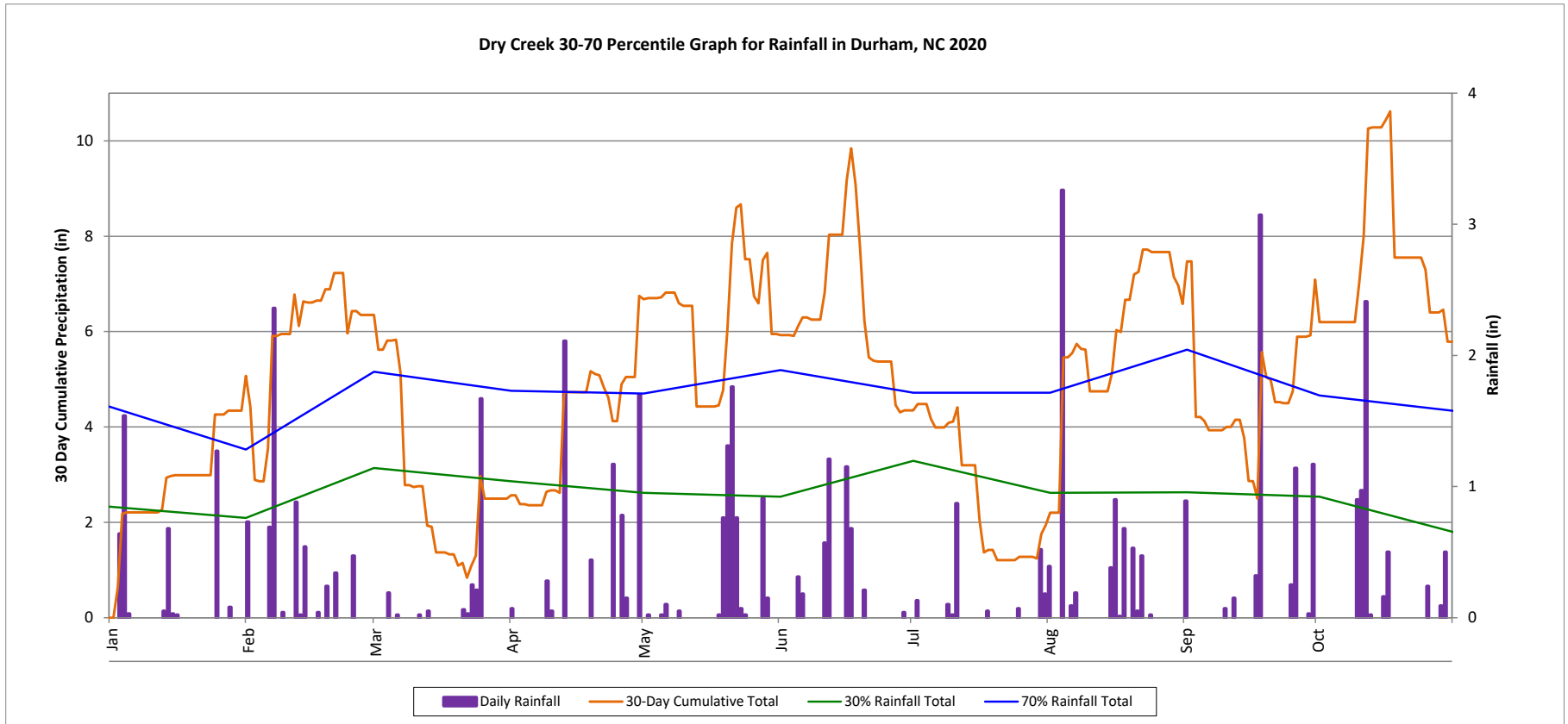


¹ 2020 monthly rainfall from USDA Station Durham 10.7 NNE.

² 30th and 70th percentile rainfall data collected from weather station Roxboro 7 ESE, NC (USDA, 2020).

30-Day Cumulative Total Rainfall Data

Dry Creek Mitigation Site
DMS Project No. 97082
Monitoring Year 1 - 2020



¹ 2020 monthly rainfall from USDA Station Durham 10.7 NNE.

² 30th and 70th percentile rainfall data collected from weather station Roxboro 7 ESE, NC (USDA, 2020).

Groundwater Gage Plot

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

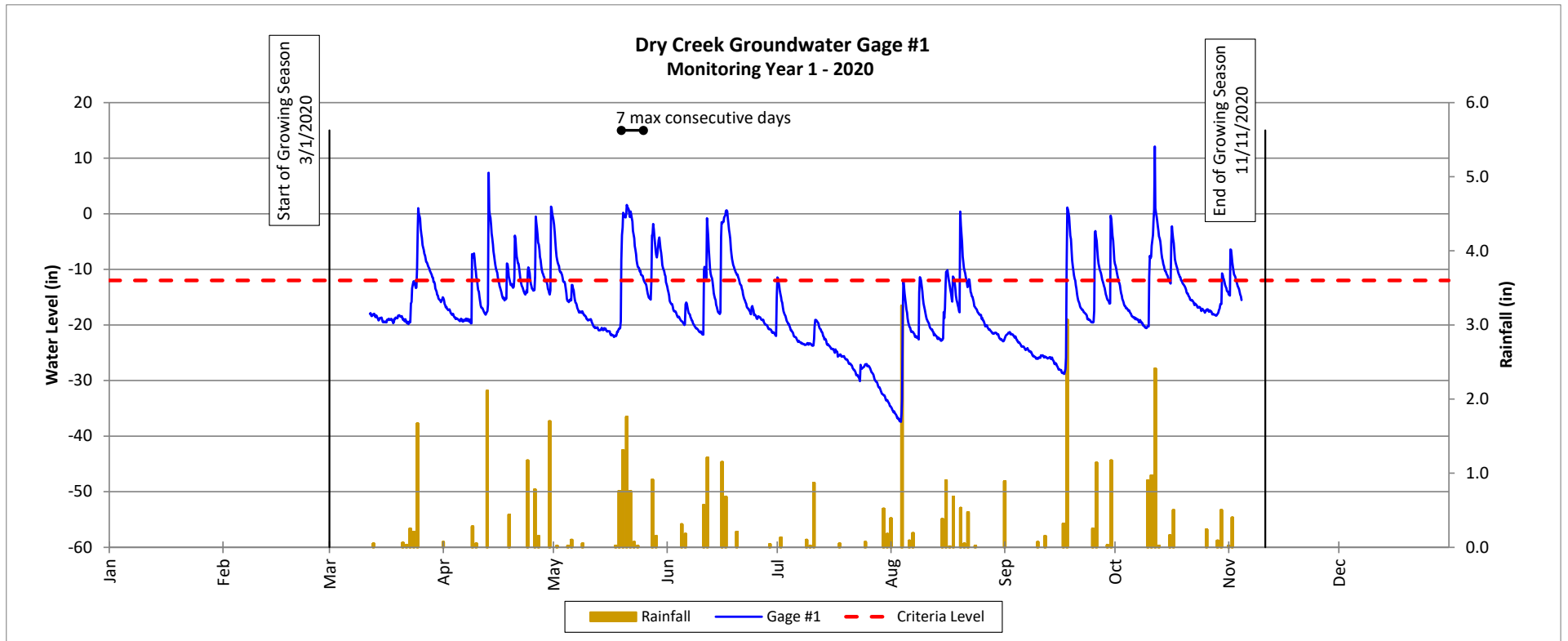


Table 14. Wetland Gage Summary

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Summary of Groundwater Gage Results for Monitoring Years 1 through 7							
Gage	Max Consecutive Days During Growing Season (Percentage)						
	MY1 (2020)	MY2 (2021)	MY3 (2022)	MY5 (2023)	MY5 (2024)	MY6 (2025)	MY7 (2026)
1	7 Days (2.7%)						

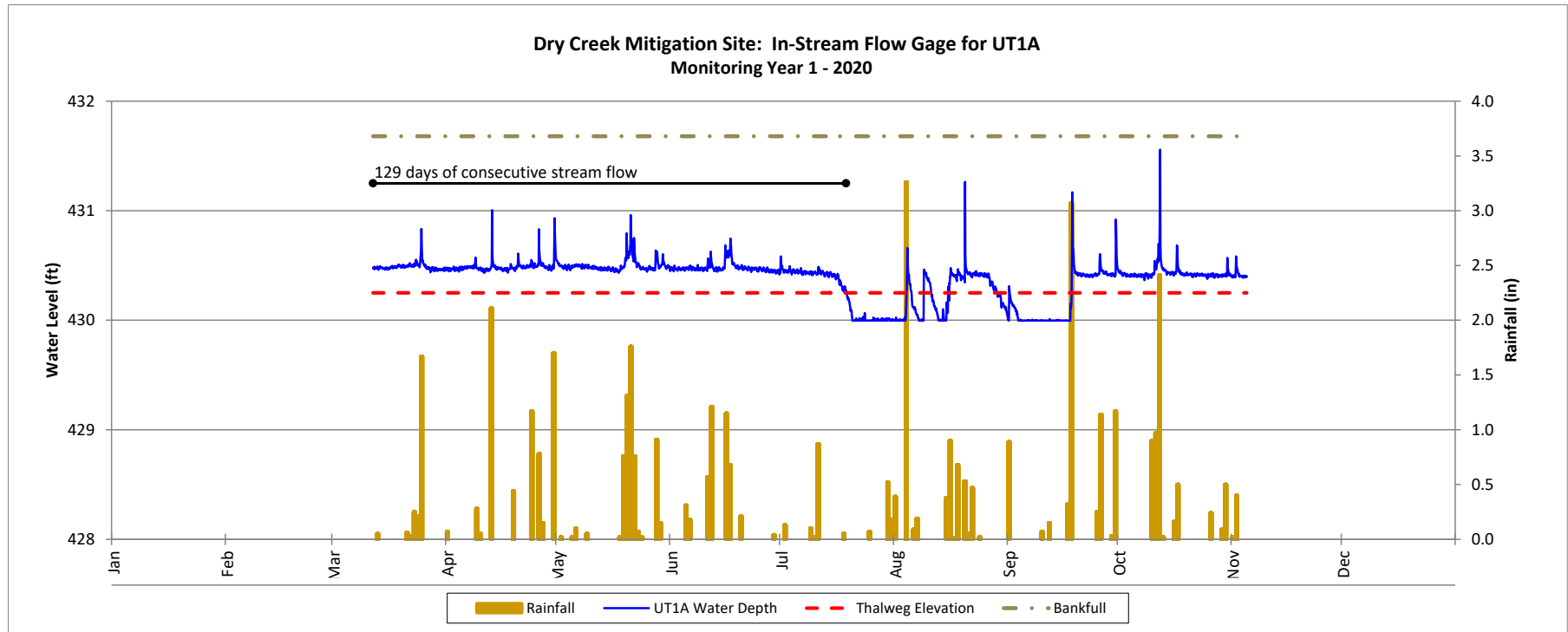
*Gage data is not tied to any success criteria.

Recorded In-Stream Flow Events

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

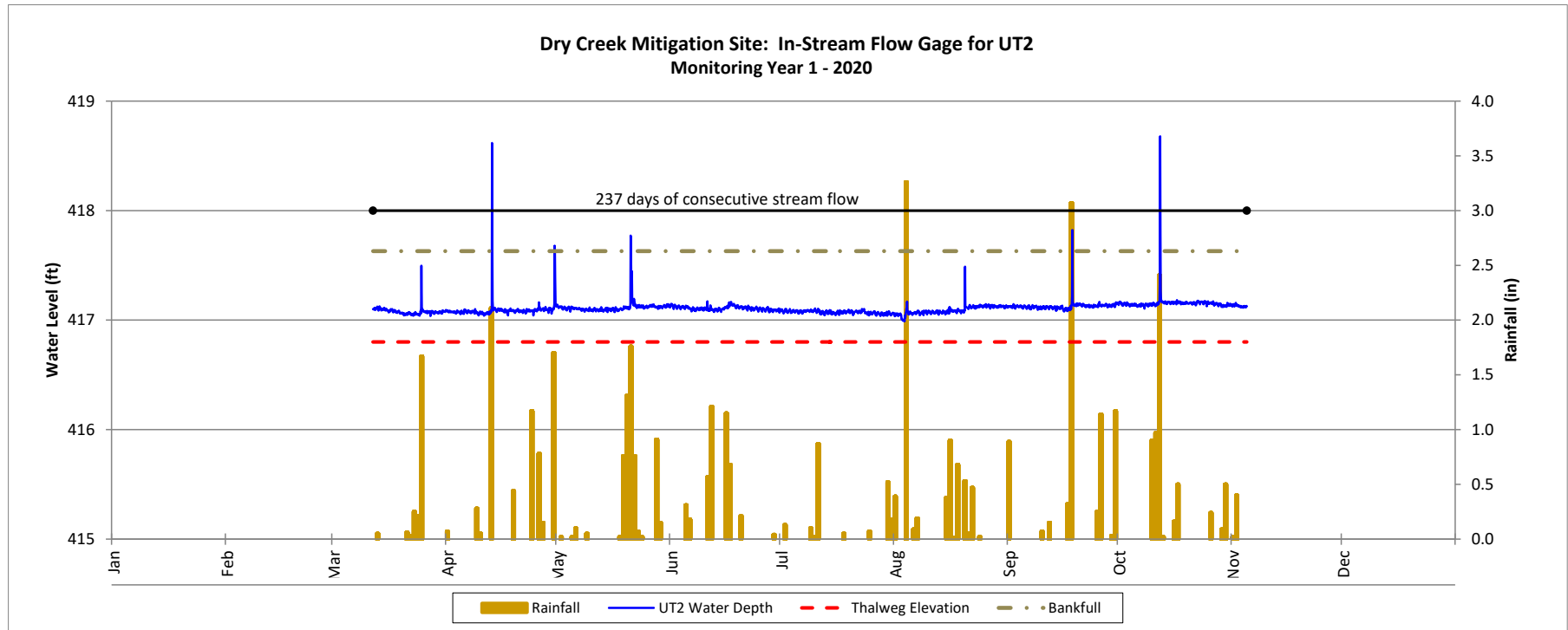


Recorded In-Stream Flow Events

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020



Recorded In-Stream Flow Events

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

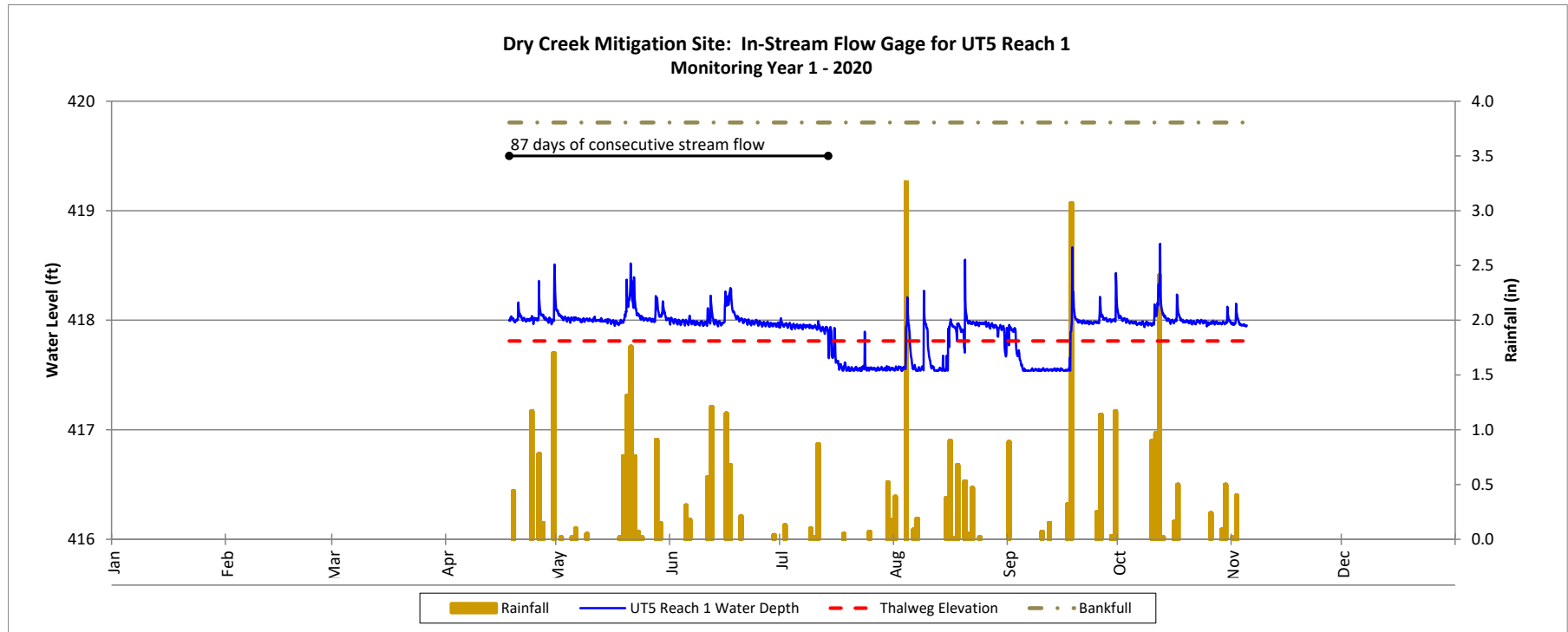


Table 15. Recorded In-Stream Flow Events Attainment Summary

Dry Creek Mitigation Site

DMS Project No. 97082

Monitoring Year 1 - 2020

Summary of In-Stream Flow Gage Results for Monitoring Years 1 through 7							
Reach	Max Consecutive Days/ Total Days Meeting Success Criteria*						
	MY1 (2020)**	MY2 (2021)	MY3 (2022)	MY5 (2023)	MY5 (2024)	MY6 (2025)	MY7 (2026)
UT1A	129 Days/ 193 Days						
UT2	237 Days/ 237 Days						
UT5 Reach 1	87 Days/ 155 Days						

*Success criteria is 30 consecutive days of flow.

**Data collected through November 4, 2020.



**MONITORING YEAR 1
ANNUAL BUFFER REPORT
FINAL**

DRY CREEK MITIGATION SITE

Durham County, NC
NCDEQ Contract No. 6827
DMS ID No. 97082
NCDWR Project No. 2016-0369
RFP No. 16-006477

Neuse River Basin
HUC 03020201

Data Collection Period: November 2020
Draft Submission Date: November 23, 2020
Final Submission Date: December 16, 2020

PREPARED FOR:



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

PREPARED BY:



Wildlands Engineering, Inc.
312 West Millbrook Road, Suite 225
Raleigh, NC 27609

Jason Lorch
jlorch@wildlandseng.com
Phone: (919) 851-9986

DRY CREEK MITIGATION SITE
Monitoring Year 1 Report

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Section 1: PROJECT OVERVIEW

1.1 Project Summary

Wildlands Engineering, Inc. (Wildlands) implemented a full delivery project at the Dry Creek Mitigation Site (Site) for the North Carolina Department of Environmental Quality Division of Mitigation Services (DMS) to restore a total of 9,811 linear feet of perennial and intermittent streams in Durham County, NC. The Site included the restoration of Dry Creek and seven unnamed tributaries. The Site also restored, enhanced, and preserved a total of 29.764 acres (1,209,399.84 ft²) of riparian buffer at the Site, which will provide Riparian Buffer Credits and Nutrient Offset Credits. The Site is located approximately three miles northwest of Butner, NC and approximately 2 miles west of the Granville County/Durham County line (Figure 1) in the Neuse River Basin 8-Digit Hydrologic Unit Code (HUC) 03020201. The Site is located within a DMS targeted watershed for the Neuse River Basin HUC 03020201010050 and NC Division of Water Resources (NCDWR) Subbasin 03-04-01. The Site contains Dry Creek and eight unnamed tributaries (UT1-UT7; UT1a) which flow to Lake Michie on the Flat River and then into Falls Lake. The Flat River is classified as Water Supply Waters (WS-III), Nutrient Sensitive Waters (NSW). The downstream drainage area of the Site is 807 acres.

Prior to stream construction, the Site was a mix of active pastures, fields, and woodlands. Two in-line ponds were removed as part of the stream restoration, one on UT1 Reach 2 and one on Dry Creek Reach 1. Additionally, two other off-line ponds near UT1 were removed.

Work at the Site was planned, designed, and constructed per the Dry Creek Mitigation Plan (Wildlands, 2018) and the Consolidated Buffer Mitigation Rule (15A NCAC 02B .0295). The purpose of the riparian buffer restoration is to provide riparian buffer credits to compensate for buffer impacts within the HUC 03020201 and the Falls Lake Watershed. The service area for the Riparian Buffer Credits is depicted in Figure 2. The mitigation credits generated from the Site are listed in Tables 1a and 1b and shown in Figure 3.

1.2 Project Goals and Objectives

The major goals of the buffer restoration project are to provide ecological and water quality enhancements to the Neuse River Basin within the Falls Lake Water Supply Watershed by creating a functional riparian corridor and restoring the riparian buffer. This project supports specific goals identified in the 2010 Neuse River Basin Restoration Priorities Plan (RBRP) for the Neuse River Targeted Local Watershed. This document highlights the importance of riparian buffers for stream restoration projects. Riparian buffers immobilize and retain nutrients and suspended sediment. The RBRP also supports the Falls Lake Watershed Plan. Specific enhancements to water quality and ecological processes are outlined below:

- Decrease nutrient levels - Nutrient input will be decreased by filtering runoff from the agricultural fields through restored native buffer zones. The off-site nutrient input will also be absorbed on-site by dispersing flood flows through native vegetation, thereby reducing nutrient inputs to waters of the Neuse River Basin.
- Exclude cattle from project streams - Install fencing around project areas adjacent to cattle pastures.
- Decrease water temperature and increase dissolved oxygen concentrations - Establishment and maintenance of riparian buffers will create additional long-term shading of the channel reducing thermal pollution.
- Restore and enhance native floodplain vegetation - Plant native tree species in riparian zone where currently insufficient.



- Permanently protect the Site from harmful uses - Establish a conservation easement on the Site to protect aquatic habitat and the receiving Water Supply Waters.

The 29.764-acre Site is protected with a permanent conservation easement. Of the protected area, Neuse Riparian Buffer Credits were generated by restoring 8.02 acres; preserving 14.28 acres; and enhancing 3.57 acres. The remaining protected 3.89 acres will not generate buffer mitigation credit. In general, riparian buffer restoration area widths on streams extend out to 200 feet from top of bank for Neuse River Riparian Buffer Credits. There is also potential to convert some buffer credits to nutrient offset credits, dependent on the need. Figure 3 details the buffer credit generation.

1.3 Monitoring Year 1 Data Assessment

The Mitigation Plan (Wildlands, 2018) was submitted and accepted by DMS in October 2018. Construction activities by Land Mechanic Designs, Inc. and planting by Bruton Natural Systems, Inc. were completed in April 2020. The baseline as-built survey (MY0) was completed by Kee Mapping and Surveying in July 2020. Monitoring during Monitoring Year 1 (MY1) was conducted to assess the condition of the vegetation in November 2020. Refer to Appendix 1 for detailed Project Activity and Reporting History, Project Contact Table, and Project Information and Attributes.

Vegetative performance for buffer restoration areas will be in accordance with 15A NCAC 02B .0295(n)(2)(B) and (n)(4) (effective November 1, 2015). To meet success criteria, areas generating Neuse River Riparian Buffer Credits shall include a minimum of four native hardwood tree species, where no one species comprises greater than 50 percent of the stems, and shall have a survival of at least 260 planted stems per acre at the end of the required five-year monitoring period . For the monitoring to be complete and buffer credits to be awarded, NCDWR must provide written approval of successful revegetation of buffer restoration areas.

1.3.1 Vegetative Assessment

The quantity of monitoring vegetation plots was determined in accordance with the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008) such that at least 2 percent of the Site is encompassed in monitoring plots. A total of seven vegetation plots were established within the conservation easement boundaries which were at least five feet from the tops of stream banks. The plot corners have been marked and are recoverable either through field identification or with the use of a GPS unit. Reference photographs are taken at the origin looking diagonally across the plot to the opposite corner on an annual basis. Trees will be marked annually with flagging tape. Species composition, vigor, height, density, and survival rates will be evaluated by plot on an annual basis. The extent of invasive species coverage will also be monitored and controlled, as necessary.

The 2020 annual vegetation monitoring resulted in an average survivability of 434 planted stems per acre. This is greater than the final requirement of 260 stems per acre, but approximately 19% less than the MY0 density recorded (538 planted stems per acre) in April 2020. The average number of stems per plot for MY1 was 11, compared to 13 stems per plots from MY0. The Site is on track to meet its final success criteria. Refer to Appendix 3 for Vegetation Plot Criteria Attainment Data, CVS Vegetation Plot Metadata, and Planted and Total Stem Counts and Appendix 2 for Vegetation Plot Photographs, Vegetation Condition Assessment Table, and Monitoring Plan View Map.

1.3.2 Vegetation Areas of Concern

No vegetation areas of concern were identified during MY1.



1.4 Monitoring Year 1 Summary

Overall, the Site has met the required vegetation success criteria for MY1, and no remedial action is proposed. Summary information/data related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information, formerly found in these reports, can be found in the Mitigation Plan (Wildlands, 2018) available on DMS's website. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

Section 2: METHODOLOGY

Planted woody vegetation was monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008). A total of seven 100 square meter vegetation plots were established within the Site conservation easement area.

Section 3: REFERENCES

- Breeding, R. 2010. Neuse River Basin Restoration Priorities. North Carolina Ecosystem Enhancement Program.
- Lee, Michael T. Peet, Robert K., Steven D. Wentworth, Thomas R. 2008. CVS-EEP Protocol for Recording Vegetation Version 4.2.
- North Carolina Department of Environmental Quality, Division of Mitigation Services (NCDMS), 2017. Riparian Buffer and Nutrient Offset Buffer Baseline and Annual Monitoring Report Template version 2.0
- Wildlands Engineering, Inc. (2018). Dry Creek Mitigation Site – Riparian Buffer Mitigation Plan. North Carolina Department of Environmental Quality, Division of Mitigation Services (NCDMS), Raleigh, NC.



APPENDIX 1. General Figures and Tables

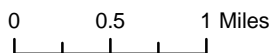
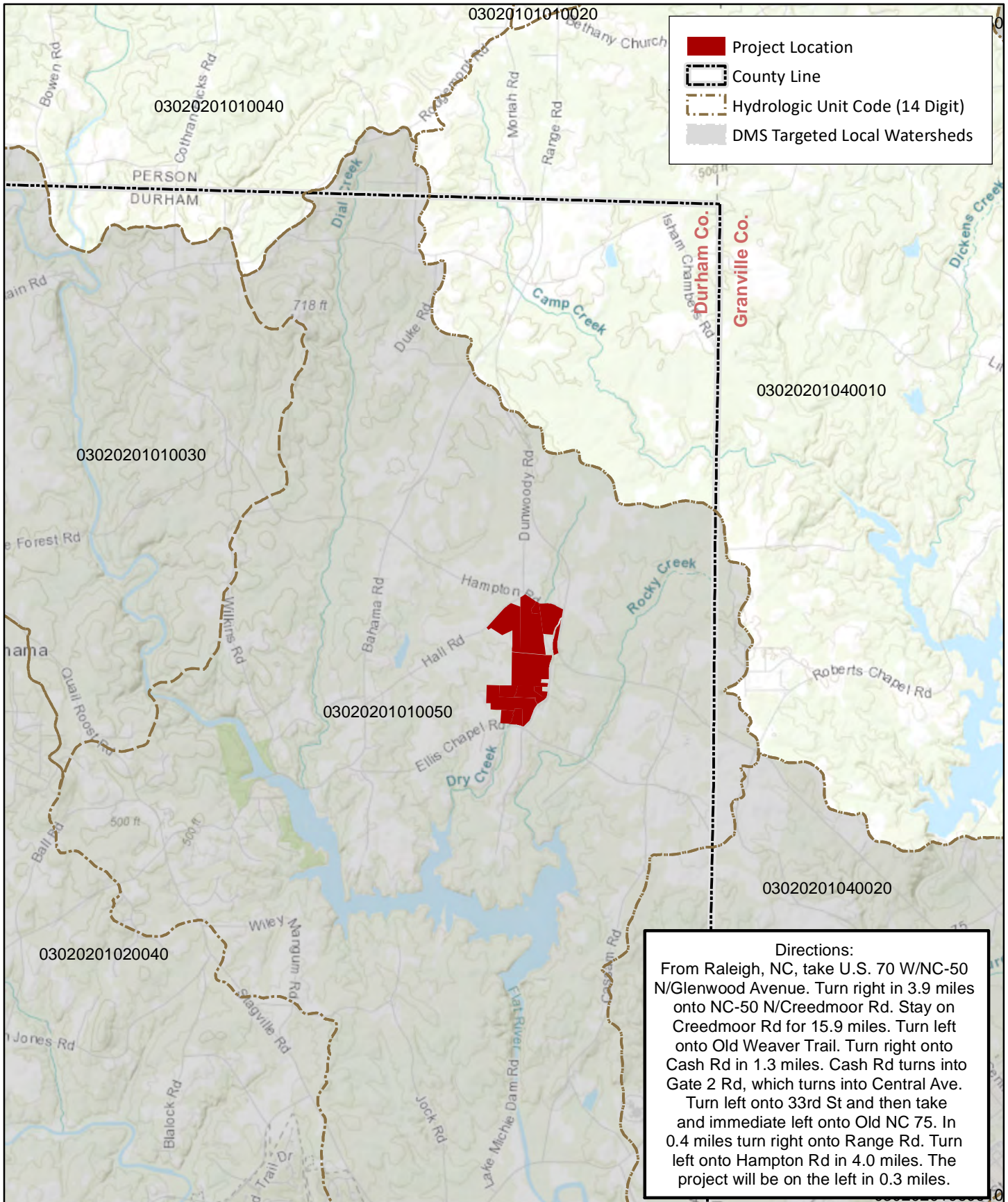


Figure 1. Project Vicinity Map
 Dry Creek Mitigation Site
 Monitoring Year 1 Report (MY1)
 Neuse River Basin (03020201)

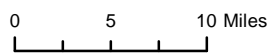
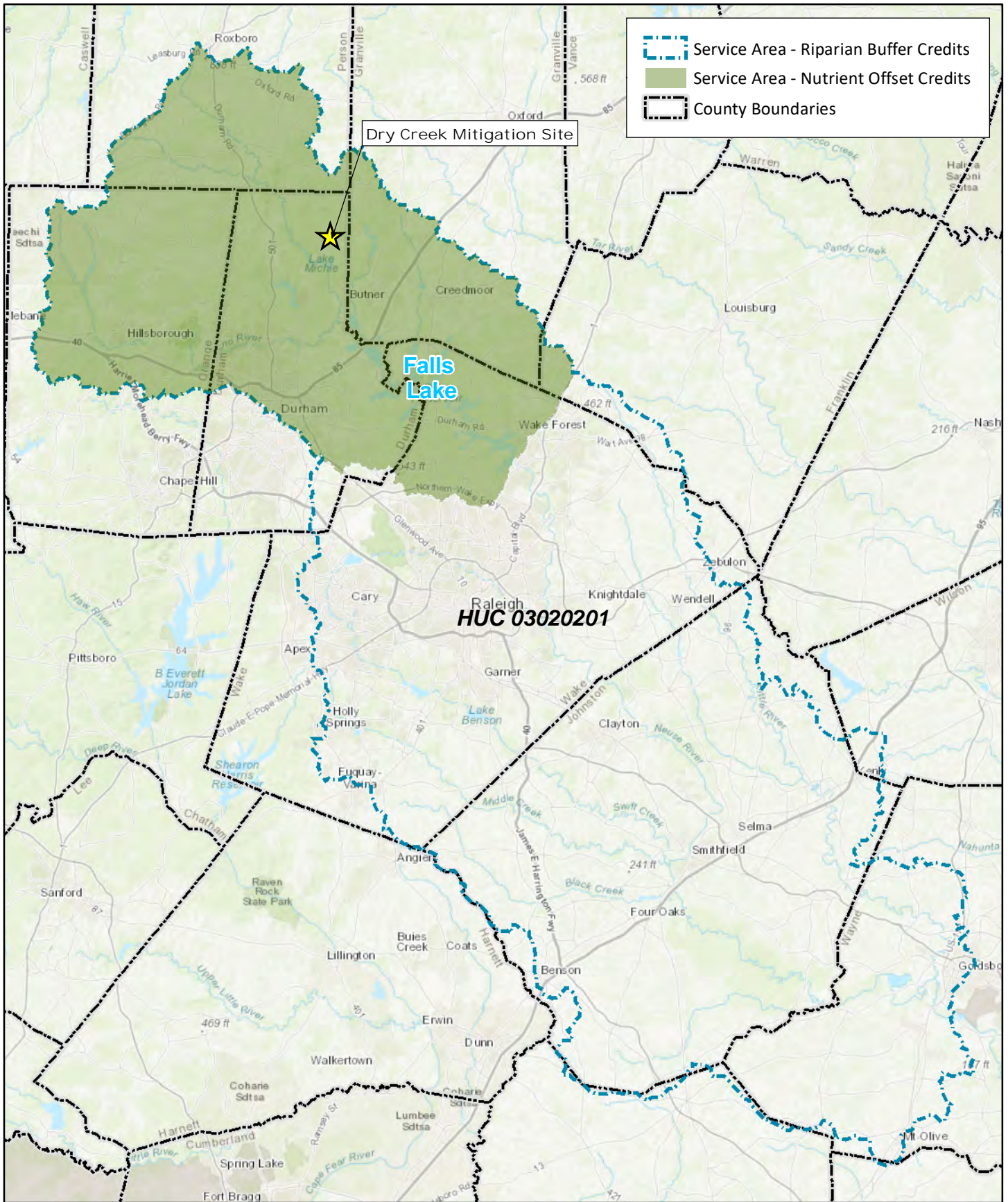


Figure 2. Service Area Map
 Dry Creek Mitigation Site
 Monitoring Year 1 Report (MY1)
 Neuse River Basin (03020201)

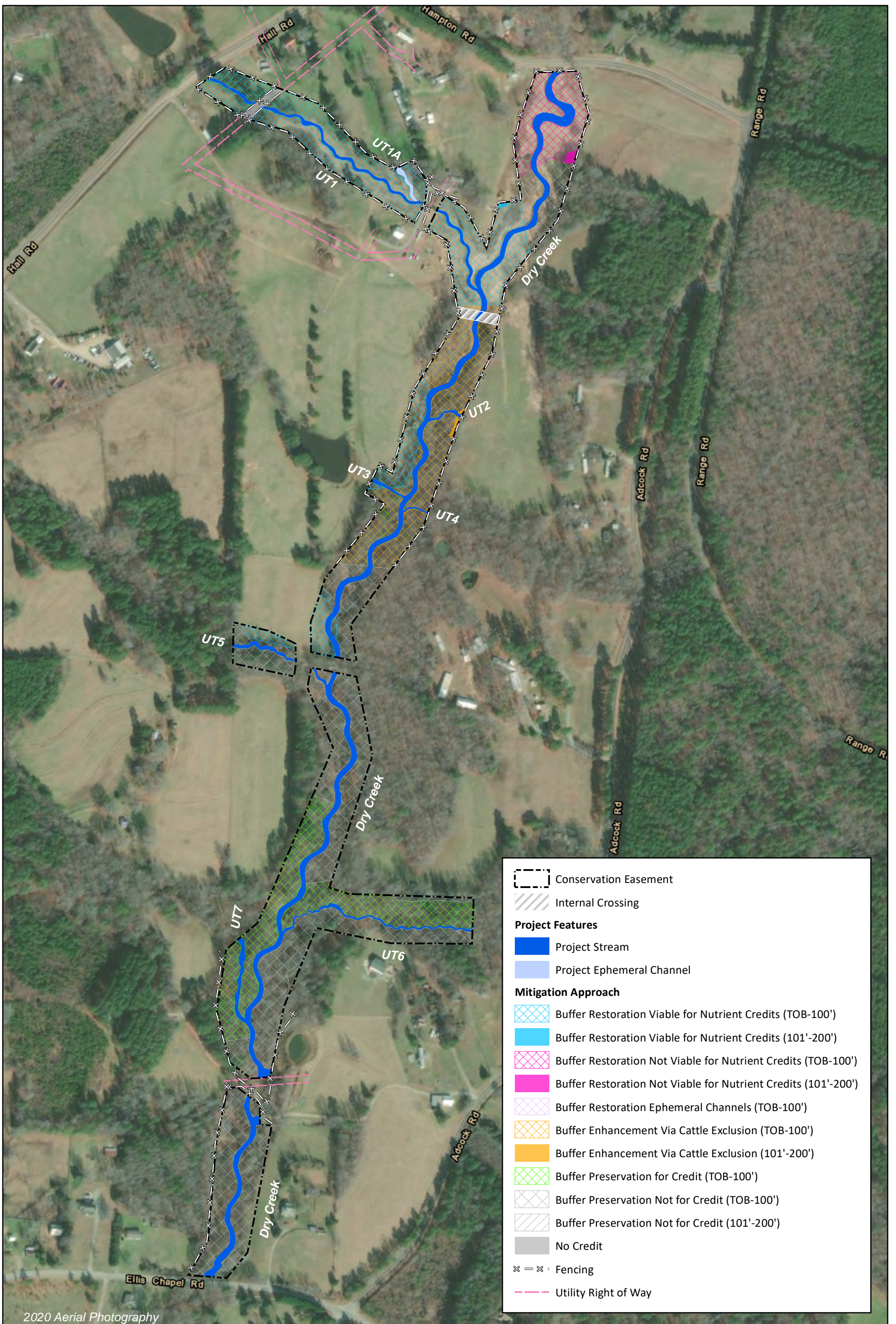


Table 1a. Buffer Project Area and Assets: Riparian Buffer Credits

Dry Creek Mitigation Site

Monitoring Year 1 - 2020

Location	Jurisdictional Streams	Restoration Type	Feature Type	Reach ID / Component	Buffer Width (ft)	Creditable Area (ac)*	Creditable Area (sf)*	Eligible Credit Area (ac)**	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits (BMU)	Riparian Buffer Credits (ac)
Rural	Subject	Restoration	I/P	Dry Creek, UT1, UT3, UT5	0-100	7.93	345,454.00	7.93	1	1	1	345,454.00	7.93
	Subject		I/P	Dry Creek, UT1, UT3, UT5	101-200	0.06	2,516.00	0.06	1	0.33	3.03	830.36	0.02
	Not Subject		Ephemeral Channel	UT1a	0-100	0.03	1,489.00	0.03	1	1	1	1,489.00	0.03
	Subject		Ephemeral Channel	UT1a	101-201	0	0.00	0.00	1	0.33	3.03	0.00	0.00
Rural	Subject	Enhancement via Cattle Exclusion	I/P	Dry Creek, UT3, UT4	0-100	3.53	153,970.00	3.53	2	0.75	2	76,985.00	1.77
				Dry Creek, UT3, UT4	101-200	0.04	1,692.00	0.04	2	0.33	6.06	279.21	0.01
Rural	Subject	Preservation	I/P	Dry Creek	0-100	14.04	611,691.00	3.87	10	1	10	16,837.37	0.39
Rural	Subject	Preservation		Dry Creek	101-200	0.24	10,342.00	0.00	10	0.33	30.3	0.00	0.00
Total:												441,874.94	10.15

* Preservation creditable area is over 25% of the total mitigation area, therefore the eligible creditable area has been reduced to 25% of the total creditable mitigation area. With that adjustment, the Site is in compliance with 15A NCAC 02B 0.0295(o)(5) which limits preservation mitigation area to no more than 25% of total mitigated area.

** Creditable area on ephemeral channels is <1% of the total eligible mitigation area and is therefore in compliance with 15A NCAC 02B 0.0295(o)(7) without any adjustments.

Table 1b. Buffer Project Area and Assets: Nutrient Offset Credits

Dry Creek Mitigation Site

Monitoring Year 1 - 2020

Location	Jurisdictional Streams	Restoration Type	Reach ID / Component	Buffer Width (ft)	Creditable Area (ac)*	Creditable Area (sf)*	Eligible Credit Area (ac)**	Convertible to Nutrient offset (Yes or No)	Nutrient Offset: N (lbs)	Nutrient Offset: P (lbs)
Rural or Urban	Subject or Nonsubject	Restoration	Dry Creek, UT1, UT3, UT5	0-100	6.36	277,068.00	6.36	Yes	14460.75	932.89
				101-200	0.01	647.00	0.01	Yes	33.77	2.18
			Dry Creek Fescue Lawn	0-100	1.57	68,386.00	1.57	No	0.00	0.00
				101-200	0.04	1,869.00	0.04	No	0.00	0.00
			UT1a	0-100	0.03	1,489.00	0.03	Yes	93.37	5.01
				101-200	0	0.00	0	Yes	0.00	0.00
Rural or Urban	Subject or Nonsubject	Enhancement via Cattle Exclusion	Dry Creek, UT3, UT4	0-100	3.53	153,970.00	3.53	No	0.00	0.00
				101-200	0.04	1,692.00	0.04	No	0.00	0.00
Rural	Subject	Preservation	Dry Creek	0-100	14.04	611,691.00	3.87	No	0.00	0.00
				101-200	0.024	10,342.00	0	No	0.00	0.00
				Total:		14,587.89	940.08			

*The above creditable areas all meet the 50-foot minimum width for buffer or nutrient credit sales.

** Impacts that occur in the watershed of Falls Lake in the upper Neuse River Basin may be offset only by load reductions in the same watershed; 15A NCAC 02B .0282 (2) (Figure 2).

Table 2. Project Activity and Reporting History

Dry Creek Mitigation Site
Monitoring Year 1 - 2020

Activity or Report	Data Collection Complete	Completion or Scheduled Delivery
Mitigation Plan	October 2018	October 2018
Final Design - Construction Plans	November 2019	April 2019
Construction	October 2019-April 2020	April 2020
Temporary S&E mix applied to entire project area ¹	October 2019-April 2020	April 2020
Permanent seed mix applied to reach/segments ¹	October 2019-April 2020	April 2020
Bare root and live stake plantings for reach/segments	April 2020	April 24, 2020
Baseline Monitoring Document (Year 0)	April 27, 2020	August 2020
Year 1 Monitoring	November 4, 2020	December 2020
Year 2 Monitoring	2021	December 2021
Year 3 Monitoring	2022	December 2022
Year 4 Monitoring	2023	December 2023
Year 5 Monitoring	2024	December 2024

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

Table 3. Project Contact Table

Dry Creek Mitigation Site
Monitoring Year 1 - 2020

Designer Nicole Macaluso, PE	Wildlands Engineering, Inc. 312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986
Planting Contractor	Bruton Natural Systems, Inc P.O. Box 1197 Fremont, NC 27830
Seeding Contractor	Land Mechanic Designs, Inc. 126 Circle G Lane Willow Spring, NC 27592
Seed Mix Sources	Garrett Wildflower Seed Company
Nursery Stock Suppliers Bare Roots	Dykes and Sons Nursery and Greenhouse
Live Stakes	Bruton Natural Systems, Inc
Monitoring Performers Monitoring POC	Wildlands Engineering, Inc. Jason Lorch 919.851.9986, ext. 107

Table 4. Project Information and Attributes

Dry Creek Mitigation Site
Monitoring Year 1 - 2020

PROJECT INFORMATION	
Project Name	Dry Creek Mitigation Site
County	Durham County
Project Area (acres)	29.764
Planted Area (acres)	14.04
Project Coordinates (latitude and longitude)	36° 11' 07.92" N, 78° 49' 39.00" W
PROJECT WATERSHED SUMMARY INFORMATION	
Physiographic Province	Carolina Slate Belt of the Piedmont Physiographic Province
River Basin	Neuse River
USGS Hydrologic Unit 8-digit	03020201
USGS Hydrologic Unit 14-digit	3020201010050
DWR Sub-basin	03-04-01
Project Drainage Area (acres)	807
Project Drainage Area Percentage of Impervious Area	<1%
CGIA Land Use Classification	50% Forested, 40% Cultivated, 9% Residential Area

Table 5. Adjacent Forested Areas Existing Tree and Shrub Species

Dry Creek Mitigation Site

Monitoring Year 1 - 2020

Common Name	Scientific Name	Wetland Indicator Status
Red Maple	<i>Acer rubrum</i>	FAC
Green Ash	<i>Fraxinus pennsylvanica</i>	FACW
Sweet Gum	<i>Liquidambar styraciflua</i>	FAC
River Birch	<i>Betula nigra</i>	FACW
Northern Red Oak	<i>Quercus rubra</i>	FACU
White Oak	<i>Quercus alba</i>	FACU

Table 6. Planted Tree Species

Dry Creek Mitigation Site

Monitoring Year 1 - 2020

Common Name	Scientific Name	Number Planted	% of Total
Willow Oak	<i>Quercus phellos</i>	1,049	10%
Sycamore	<i>Platanus occidentalis</i>	2,098	19%
River Birch	<i>Betula nigra</i>	2,098	19%
Cherrybark Oak	<i>Quercus pagoda</i>	1,049	10%
Swamp Chestnut Oak	<i>Quercus michauxii</i>	1,049	10%
Tulip Poplar	<i>Liriodendron tulipifera</i>	1,049	10%
Eastern Cottonwood	<i>Populus deltoides</i>	630	6%
Black Willow	<i>Salix nigra</i>	920	9%
Green Ash	<i>Fraxinus pennsylvanica</i>	735	7%

APPENDIX 2. Visual Assessment Data

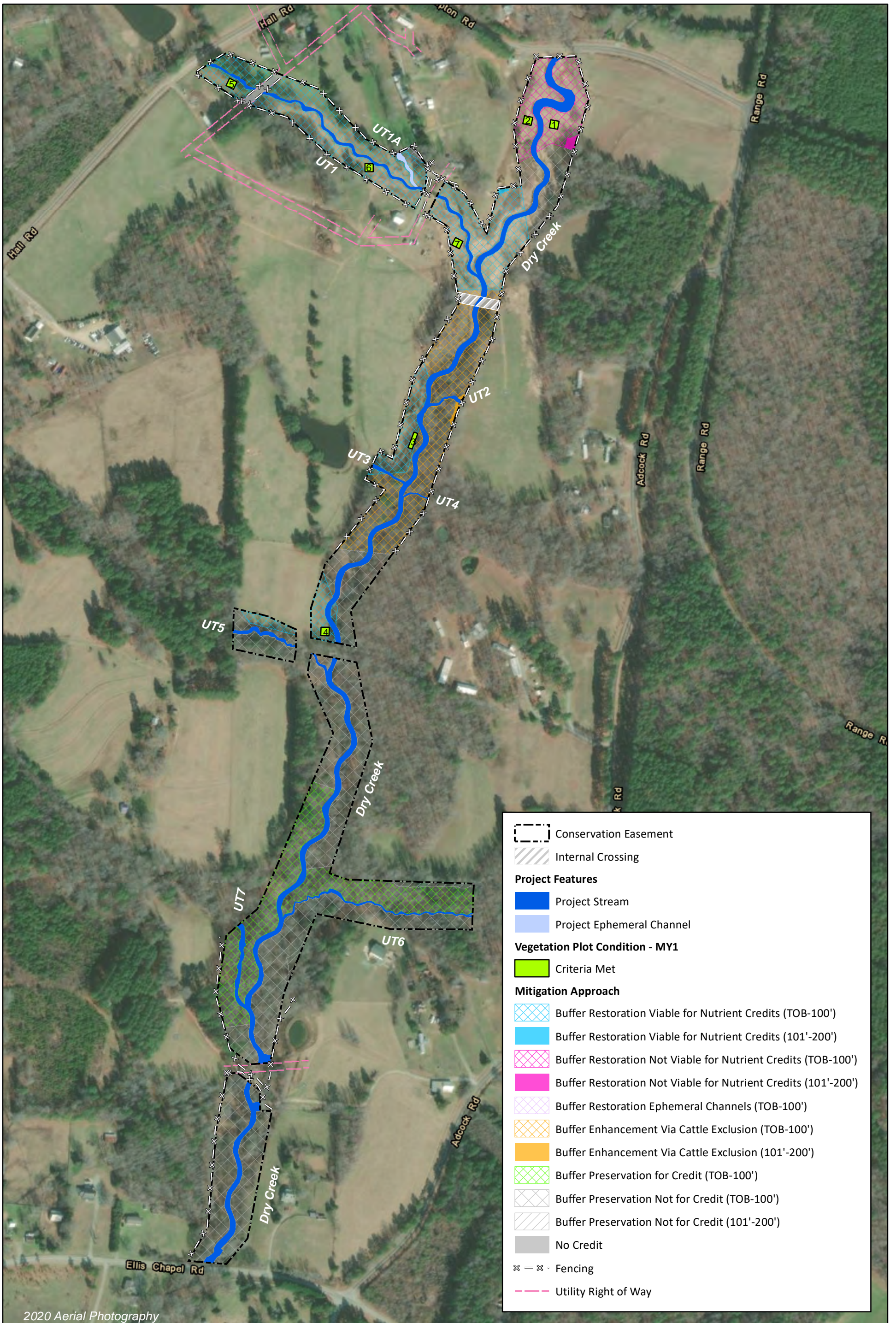


Table 7. Vegetation Condition Assessment Table

Dry Creek Mitigation Site
Monitoring Year 1 - 2020

Planted Acreage 14.04

Vegetation Category	Definitions	Mapping Threshold (Ac)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.1	0	0	0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1	0	0	0%
Total			0	0	0%
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 Ac	0	0	0%
Cumulative Total			0	0.0	0%

Easement Acreage 29.76

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Areas of points (if too small to render as polygons at map scale).	1,000	0	0	0%
Easement Encroachment Areas	Areas of points (if too small to render as polygons at map scale).	none	0	0	0%

VEGETATION PLOT PHOTOGRAPHS



VEG PLOT 1 (11/4/2020)



VEG PLOT 2 (11/4/2020)



VEG PLOT 3 (11/4/2020)



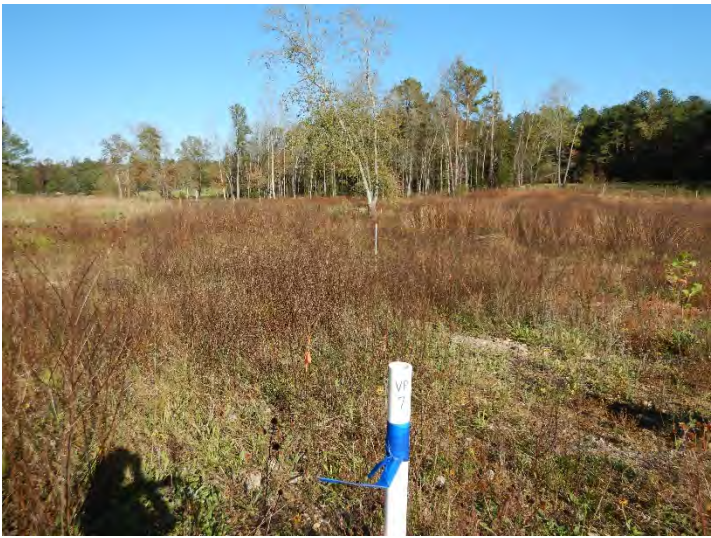
VEG PLOT 4 (11/4/2020)



VEG PLOT 5 (11/4/2020)



VEG PLOT 6 (11/4/2020)



VEG PLOT 7 (11/4/2020)

APPENDIX 3. Vegetation Plot Data

Table 8. Vegetation Plot Criteria Attainment Table

Dry Creek Mitigation Site

Monitoring Year 1 - 2020

Plot	Success Criteria Met *	Tract Mean
Vegetation Plot 1	Yes	100%
Vegetation Plot 2	Yes	
Vegetation Plot 3	Yes	
Vegetation Plot 4	Yes	
Vegetation Plot 5	Yes	
Vegetation Plot 6	Yes	
Vegetation Plot 7	Yes	

*Success Criteria Met is based on the final success criteria for MY5 of 260 planted stems per acre.

Table 9. CVS Vegetation Tables - Metadata

Dry Creek Mitigation Site
Monitoring Year 1 - 2020

Report Prepared By	Kaitlyn Hogarth
Date Prepared	11/9/2020 12:07
Database Name	Dry Creek MY1.mdb
Database Location	F:\Monitoring\Dry Creek\MY1
Computer Name	KAITLYN2020
File Size	74514432
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Project Planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Project Total Stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and Spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY-----	
Project Code	97082
Project Name	Dry Creek
Description	
Sampled Plots	8

Table 10. Planted and Total Stem Counts

Dry Creek Mitigation Site
Monitoring Year 1 - 2020

Scientific Name	Common Name	Species Type	Current Plot Data (MY1 2020)														
			VP 1			VP 2			VP 3			VP 4			VP 5		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Betula nigra</i>	River Birch	Tree	6	6	6	2	2	2				1	1	1	4	4	4
<i>Fraxinus pennsylvanica</i>	Green Ash	Tree							3	3	3	1	1	1	1	1	1
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree	1	1	1				1	1	1				1	1	1
<i>Platanus occidentalis</i>	Sycamore	Tree	2	2	2	6	6	6	6	6	6	2	2	2			
<i>Populus deltoides</i>	Eastern Cottonwood	Tree	2	2	2												
<i>Quercus michauxii</i>	Swamp Chestnut Oak	Tree	1	1	1				2	2	2	5	5	5			
<i>Quercus pagoda</i>	Cherrybark Oak	Tree				2	2	2	3	3	3	1	1	1	2	2	2
<i>Quercus phellos</i>	Willow Oak	Tree				2	2	2				1	1	1	1	1	1
		Stem count	12	12	12	12	12	12	15	15	15	11	11	11	9	9	9
		size (ares)	1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02		
		Species count	5	5	5	4	4	4	5	5	5	6	6	6	5	5	5
		Stems per ACRE	486	486	486	486	486	486	607	607	607	445	445	445	364	364	364

Color for Density

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

PnoLS: Number of planted stems excluding live stakes

P-all: Number of planted stems including live stakes

T: Total stems

Table 10. Planted and Total Stem Counts

Dry Creek Mitigation Site
Monitoring Year 1 - 2020

Scientific Name	Common Name	Species Type	Current Plot Data (MY1 2020)						Annual Means					
			VP 6			VP 7			MY1 (2020)			MY0 (2020)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Betula nigra</i>	River Birch	Tree	2	2	2	1	1	1	16	16	16	23	23	23
<i>Fraxinus pennsylvanica</i>	Green Ash	Tree	1	1	1				6	6	6	6	6	6
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree							3	3	3	10	10	10
<i>Platanus occidentalis</i>	Sycamore	Tree	2	2	2	4	4	4	22	22	22	22	22	22
<i>Populus deltoides</i>	Eastern Cottonwood	Tree	2	2	2	1	1	1	5	5	5	9	9	9
<i>Quercus michauxii</i>	Swamp Chestnut Oak	Tree				2	2	2	10	10	10	8	8	8
<i>Quercus pagoda</i>	Cherrybark Oak	Tree							8	8	8	9	9	9
<i>Quercus phellos</i>	Willow Oak	Tree				1	1	1	5	5	5	6	6	6
Stem count			7	7	7	9	9	9	75	75	75	93	93	93
size (ares)			1			1			7			7		
size (ACRES)			0.02			0.02			0.17			0.17		
Species count			4	4	4	5	5	5	8	8	8	8	8	8
Stems per ACRE			283	283	283	364	364	364	434	434	434	538	538	538

Color for Density

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

PnoLS: Number of planted stems excluding live stakes

P-all: Number of planted stems including live stakes

T: Total stems

APPENDIX 4. Overview Photographs





