



**MONITORING YEAR 1
ANNUAL REPORT**
Final

January 2022

PERRY HILL MITIGATION SITE

Orange County, NC
Neuse River Basin
HUC 03020201

DMS Project No. 100093
DMS Contract No. 7744
DMS RFP No. 16-007576
USACE Action ID No. 2019-00125
DWR Project No. 2019-0157

Data Collection Dates: March-November 2021

PREPARED FOR:



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



January 25, 2022

Jeremiah Dow

NC DEQ Division of Mitigation Services
217 West Jones Street
Raleigh, NC 27603

Subject: DMS Comments on Perry Hill Mitigation Site Monitoring Year 1 Report
DMS Project Number 100093

Dear Mr. Dow,

We have reviewed the comments on the MY1 Report for the above referenced project dated January 13, 2022. Below are responses to each of the comments. For your convenience, the comments are reprinted with responses in italics.

1. The comment response to the IRT MY0 comments mention installing an additional flow gauge on UT1, which based on the MY1 report data certainly appears to be warranted. Has Wildlands installed the new gauge? If so, can you please show it on the CCPV? Also, can flow data be measured on the UT1 crest gauge, and would there be any value in doing so.

Wildlands installed another flow gauge near the upstream end of UT1 in December 2021. The CCPV map has been updated to show the additional flow gauge.

The crest gauge at the lower end of UT1 was installed such that it is able to measure both surface flow and bankfull events. The graph showing flow is now included in Appendix D – Hydrology Data.

2. The Perry Hill buffer report states an interim success criteria of 320 stems/acre. This interim criteria only applies to the stream and wetland portion of the project and should be removed from the buffer report.

The interim success criteria has been removed from the buffer report.

3. Figure 1 includes 14 fixed veg plots, but data for only 12 fixed plots were submitted. The submitted MY0 spatial data also included 14 fixed plots. Please clarify.

The two fixed buffer plots were mistakenly left on Figure 1 - Overview Map in the Stream Report. Figures 1a and 1b show the vegetation plots correctly. Figure 1 has been corrected.

There are 12 fixed plots and 2 random plots for the Stream Report. There are 14 fixed plots for the Buffer Report. Plots 1-12 are the same fixed plots in both the Stream and Buffer Reports. Because of the overlap, fixed plots for both projects were put in the same



layer to avoid submitting redundant information. This means there are 14 fixed vegetation plots in the spatial data but only 12 of those belong to the Stream Report. The attribute table differentiates which plots belong to each project in the column labeled "Project". For those fixed plots that overlap, this column reads "DMS Stream and Buffer". For those that belong to the Buffer Report, it reads "DMS Buffer".

This also applies to the MYO spatial data. All vegetation plots are included in the same layer. There are 14 total fixed and 2 random plots when both buffer and stream plots are included. As noted above, the attribute table differentiates which plots belong to which project in the "Project" column.

4. If possible, please include features characterizing the invasive treatment areas.

Most invasive vegetation was treated before construction in November 2020. Follow up treatments for scattered resprouts are scheduled for this winter. However, Tree-of-Heaven was treated in October 2021. There were only a few stems treated and the area was below the mapping threshold so they were not added to the CCPV maps.

5. Please include figures that display the data for the gauges used to create Table 10.

Appendix D – Hydrology Data has been updated to include crest gauge figures.

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", written over a white rectangular background.

Jason Lorch, Monitoring Coordinator

PREPARED BY:



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PERRY HILL MITIGATION SITE
Monitoring Year 1 Annual Report

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Section 1: PROJECT OVERVIEW

The Perry Hill Mitigation Site (Site) is located in Orange County, approximately three miles northwest of Hillsborough, NC. The Site drains to Corporation Lake on the Eno River, which then flows to Falls Lake. Corporation Lake is a water supply reservoir on the Eno River, which is classified as Water Supply Waters (WS-II) and Nutrient Sensitive Waters (NSW). Falls Lake is classified as Water Supply Waters (WS-IV), as well as Nutrient Sensitive Waters (NSW). Table 3 presents information related to the project attributes.

1.1 Project Quantities and Credits

The Site is located on one parcel and a conservation easement was recorded on 26.88 acres. Mitigation work within the Site included restoration and enhancement I and II of perennial and intermittent stream channels (Figures 1-1b). Table 1 below shows stream credits by reach and the total amount of stream credits expected at closeout.

Table 1: Project Quantities and Credits

PROJECT MITIGATION QUANTITIES							
Project Segment	Mitigation Plan Footage	As-Built Footage	Mitigation Category	Restoration Level	Mitigation Ratio (X:1)	Credits	Comments
Stream							
Perry Branch Reach 1	321	323	Warm	R	1.0	321.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
Perry Branch Reach 2	364	362	Warm	EII	3.5	104.000	Grade Control Structures, Invasive Control, Planted Buffer, Livestock Exclusion
	60	60	N/A	N/A	0.0	N/A	Culvert Crossing
Perry Branch Reach 3	691	694	Warm	R	1.0	691.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
Perry Branch Reach 4	654	662	Warm	R	1.0	654.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
	60	60	N/A	N/A	0.0	N/A	Culvert Crossing
	1,284	1,297	Warm	R	1.0	1,284.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
UT1 Reach 1	285	285	Warm	R	1.5	190.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
UT1 Reach 2	291	293	Warm	R	1.5	194.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
UT2 Reach 1	221	223	Warm	EII	2.5	88.400	Bank Stabilization, Planted Buffer, Livestock Exclusion

PROJECT MITIGATION QUANTITIES							
Project Segment	Mitigation Plan Footage	As-Built Footage	Mitigation Category	Restoration Level	Mitigation Ratio (X:1)	Credits	Comments
Stream							
UT2 Reach 2	947	941	Warm	EI	2.5	378.800	Grade Control Structures, Bank Stabilization, Planted Buffer, Livestock Exclusion
UT3	343	319	Warm	EII	2.5	137.200	Grade Control Structures, Bank Stabilization, Planted Buffer, Livestock Exclusion
Total:						4,042.400	

Restoration Level	Stream		
	Warm	Cool	Cold
Restoration	3,334.000		
Enhancement I	378.800		
Enhancement II	329.600		
Preservation	--		
Totals	4,042.400		
Total Stream Credit	4,042.400		

1.2 Project Goals and Objectives

The project is intended to provide numerous ecological benefits. Table 2 below describes the project goals and objectives along with the expected outcomes to water quality and ecological processes. Additionally, performance criteria for project objectives and a summary of the related monitoring data results for Monitoring Year 1 (MY1) are included.

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Exclude livestock (i.e. cattle) from project streams and adjacent riparian areas.	Exclude livestock from streams and riparian areas by installing fencing around project area and/or removing livestock from the Site.	Reduce and control sediment inputs; reduce and manage nutrient inputs; contribute to protection of or improvement to a Water Supply Waterbody.	Exclusion fencing is installed and maintained. Livestock remain excluded from the project area.	Visually inspect the perimeter, as well as interior, of the Site to ensure there are no signs of livestock entering the Site.	Cattle are excluded from project streams.

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Improve the stability of stream channels.	Construct and enhance 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 sediment inputs; contribute to protection of or improvement to a Water Supply Waterbody.	Entrenchment ratio over 2.2 and bank height ratios below 1.2 with visual assessments showing stability.	Cross-section monitoring will be assessed during MY1, MY2, MY3, MY5, and MY7 and visual inspections will be assessed annually.	Minor deviations from design.
Improve instream habitat.	Install habitat features such as constructed riffles, cover logs, and brush toes on restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	Improve aquatic communities in project streams.	There is no performance standard for this metric.	N/A	N/A
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.	Four bankfull events in separate years within monitoring period. 30-days of continuous surface water flow will be documented annually along intermittent restoration or enhancement reaches.	Pressure transducers recording flow elevations.	Bankfull events were documented on UT1 and UT2. Greater than 30 days of consecutive flow was recorded on UT2 but not UT1.
Restore and enhance native floodplain vegetation.	Convert active livestock pasture to forested riparian buffers along all Site streams. Protect and enhance existing forested riparian buffers. Treat invasive species during monitoring period to permit establishment of native plantings.	Reduce sediment inputs; provide a canopy to shade streams and reduce thermal loadings; contribute to protection of or improvement to a Water Supply Waterbody.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7. Vegetation plots will average 7-ft in height in MY5 and 10-ft in height in MY7.	One hundred square meter vegetation plots are placed on 2% of the planted area of the Site and monitored annually.	All 14 vegetation plots have a planted stem density greater than 320 stems per acre.



Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Permanently protect the Site from harmful uses.	Establish a conservation easement on the Site.	Ensure that development and agricultural uses that would damage the Site or reduce the benefits of the project are prevented.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	Two easement encroachments were observed in October 2021. Wildlands is currently investigating and will work with the landowner and tenant farmer to rectify the situation.

1.3 Project Attributes

The project includes one parcel that has been managed as pasture and/or crop production, as indicated by aerial photographs from 1938 to 2017. Portions of the upper watershed historically have been forested. The stream crossings which existed prior to construction on Perry Branch were installed before 1938. Forested areas within the headwaters of UT2 and UT3 were cleared between 1938 and 1950. The high-voltage utility transmission line that crosses the downstream extent of Perry Branch was constructed between 1938 and 1950. Between 1950 and 1955, two ponds were constructed on the project parcel, including one within the headwaters of Perry Branch Reach 1 and the other an offline pond adjacent to Perry Branch Reach 4 within the lower portion of the watershed. Table 3 below and Table 8 in Appendix C present additional information on pre-restoration conditions. Project Activity and Reporting History, as well as the Project Contact Table are included in Appendix E.

Table 3: Project Attributes

PROJECT INFORMATION									
Project Name	Perry Hill Mitigation Site	County	Orange County						
Project Area (acres)	26.88	Project Coordinates	36° 06' 25.81" N, 79° 07' 46.66" W						
PROJECT WATERSHED SUMMARY INFORMATION									
Physiographic Province	Carolina Slate Belt of the Piedmont	River Basin	Neuse River						
USGS HUC 8-digit	03020201	USGS HUC 14-digit	03020201030020						
DWR Sub-basin	03-04-01	Land Use Classification	68% managed herbaceous cover/pasture; 22% forested; 5% shrub; 3% grassland/herbaceous; 2% residential area; <1% impervious						
Project Drainage Area (acres)	174	Percentage of Impervious Area	<1%						
RESTORATION TRIBUTARY SUMMARY INFORMATION									
Parameters	Perry Branch				UT1		UT2		UT3
	Reach 1	Reach 2	Reach 3	Reach 4	Reach 1	Reach 2	Reach 1	Reach 2	
Pre-project length (feet)	326	417	732	2,061	388	213	266	974	357
Post-project length (feet)*	323	422	694	2,166	285	293	223	941	319
Valley confinement (Confined, moderately confined, unconfined)	Unconfined		Moderately Confined		Confined to Moderately Confined	Moderately Confined	Confined	Moderately Confined	Unconfined
Drainage area (acres)	58	66	117	175	9	10	15	23	20
Perennial, Intermittent, Ephemeral	Perennial				Intermittent				
DWR Water Quality Classification	WS-II/HQW/NSW								
Dominant Stream Classification (existing)	G4c	C4	G4c	F4	E6b	F4b	C6	E4	C4

*Includes No Credit Project Stream lengths in crossings and the downstream end of Perry Branch Reach 4.

RESTORATION TRIBUTARY SUMMARY INFORMATION									
Parameters	Perry Branch				UT1		UT2		UT3
	Reach 1	Reach 2	Reach 3	Reach 4	Reach 1	Reach 2	Reach 1	Reach 2	
Dominant Stream Classification (proposed)	C4	C4	C4	C4	B4	C4b	C6	C4	C4
Dominant Evolutionary class (Simon) if applicable	III	V	IV	III/IV	III/IV	III/IV	V	III/IV	III/IV
REGULATORY CONSIDERATIONS									
Parameters	Applicable?	Resolved?	Supporting Documentation						
Water of the United States - Section 404	Yes	Yes	USACE Nationwide Permit No. 27 and DWQ 401 Water Quality Certification No. 4134.						
Water of the United States - Section 401	Yes	Yes							
Endangered Species Act	Yes	Yes	Categorical Exclusion in Mitigation Plan (Wildlands, 2020)						
Historic Preservation Act	Yes	Yes							
Coastal Zone Management Act (CZMA or CAMA)	N/A	N/A	N/A						
Essential Fisheries Habitat	N/A	N/A	N/A						

Section 2: Monitoring Year 1 Data Assessment

Annual monitoring and site visits were conducted during MY1 to assess the condition of the project. The vegetation and stream success criteria for the Site follow the approved performance standards presented in the Mitigation Plan (Wildlands Engineering, 2020). Performance criteria for vegetation, stream, and hydrologic assessment are located above in Section 1.2 Table 3: Goals, Performance Criteria, and Functional Improvements. Methodology for annual monitoring is described in the MY0 As-Built Baseline Report (Wildlands, 2021).

2.1 Vegetative Assessment

The MY1 vegetative survey was completed in October 2021. Vegetation monitoring resulted in an average stem density of 531 planted stems per acre across all vegetation plots, which is well above the interim success criteria of 320 stems per acre required at MY3. All fourteen vegetation plots individually met the interim success criteria and stem densities for each plot range from 364 to 728 planted stems per acre. Herbaceous vegetation is growing well and volunteer tree species are already starting to establish themselves. Refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table and Appendix B for Vegetation Plot Data.

2.2 Vegetation Areas of Concern

Invasive species at Perry Hill have been greatly reduced by pre-construction treatments throughout the existing forested areas. This included treatment of Chinese privet (*Ligustrum sinense*) and Japanese honeysuckle (*Lonicera japonica*) in November 2020. Additionally, scattered stems of tree-of-heaven (*Ailanthus altissima*) were treated in October 2021. However, Wildlands recognizes that multiple treatments are typically needed for effective invasive plant control. Sporadic areas of re-sprouting multiflora rose (*Rosa multiflora*), Chinese privet, and Japanese honeysuckle will be addressed in winter 2021/2022 using a combination of methods including mechanical removal as well as foliar and cut stump applications. These areas will be monitored and retreated as necessary.

During construction, Wildlands ran conduit through the project crossings to allow the landowner to route waterlines at a later date without disturbing the stream. In October 2021, the landowner installed the water lines without contacting Wildlands staff which resulted in ground disturbance and tree mortality impacts to the easement outside of the internal crossings (see Figures 1-1b and Vegetation Areas of Concern Photographs – Conservation Easement Encroachment in Appendix A). The encroachment area covers approximately 0.13 acres. Wildlands has discussed the impact with DMS staff including the need to allow for future maintenance of the water lines. Wildlands is currently investigating the proper methods to address the encroachment but most likely there will be some form of documentation widening the internal crossing to encompass the impacted areas and allow for future maintenance of the water lines while avoiding future easement encroachments.

2.3 Stream Assessment

Morphological surveys for MY1 were conducted in October 2021. All streams within the Site are stable and functioning as designed. Cross-sections show minimal change in the bankfull cross-sectional area and width-to-depth ratio. Bank height ratios are less than 1.2 and entrenchment ratios are over 2.2. Cross-sections show slight deviations from as-built due to sediment deposition and establishment of vegetation. Some sediment deposition in pools is natural and expected. Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table, Current Condition Plan View map, Stream Photographs, and Culvert Crossing Photographs. Refer to Appendix C for the morphological data and plots.



2.4 Stream Areas of Concern

No stream areas of concern were identified during MY1.

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 UT1 and UT2 on July 19, 2021. Perry Branch had a significant spike in flow but did not reach bankfull at the crest gauge locations. Bankfull events are anticipated to occur in future years.

In addition, the presence of baseflow must be documented on restored or enhanced intermittent reaches (UT1 Reach 1 and UT2 Reach 2) for a minimum of 30 consecutive days during a normal precipitation year. UT2 Reach 2 exceeded baseflow criterion with 98 days of consecutive baseflow. UT1 Reach 1 did not meet baseflow criteria this year. However, construction was not complete and gauges were not installed until March. March, April, May, and June received below average rainfall (see Rainfall Data in Appendix D). Wildlands believes under normal rainfall conditions the groundwater table along UT1 Reach 1 will likely recharge and the stream will achieve baseflow. This area will continue to be monitored for the presence of baseflow. Refer to Appendix D for Hydrology Summary Data.

2.6 Adaptive Management Plan

Follow up treatments for the scattered Chinese privet, multiflora rose, and Japanese honeysuckle are scheduled for MY2. Wildlands will continue to monitor and control invasive species at the Site during subsequent monitoring years.

Trees planted in areas of competition with pasture grasses are being monitored closely. Trees planted in these areas received herbicide ring sprays around the base of their stems after planting and appear to be thriving and competing well with the pasture grasses. For the trees to continue to outcompete the remaining pasture grasses in some areas, additional 18"-30" herbicide ring sprays will be applied around the base of planted stems where necessary at the beginning of the MY2 growing season.

Wildlands is currently investigating the proper methods to address the easement encroachment but most likely there will be some form of documentation widening the internal crossing to encompass the impacted areas and allow for future maintenance of the water lines while avoiding future easement encroachments.

2.7 Monitoring Year 1 Summary

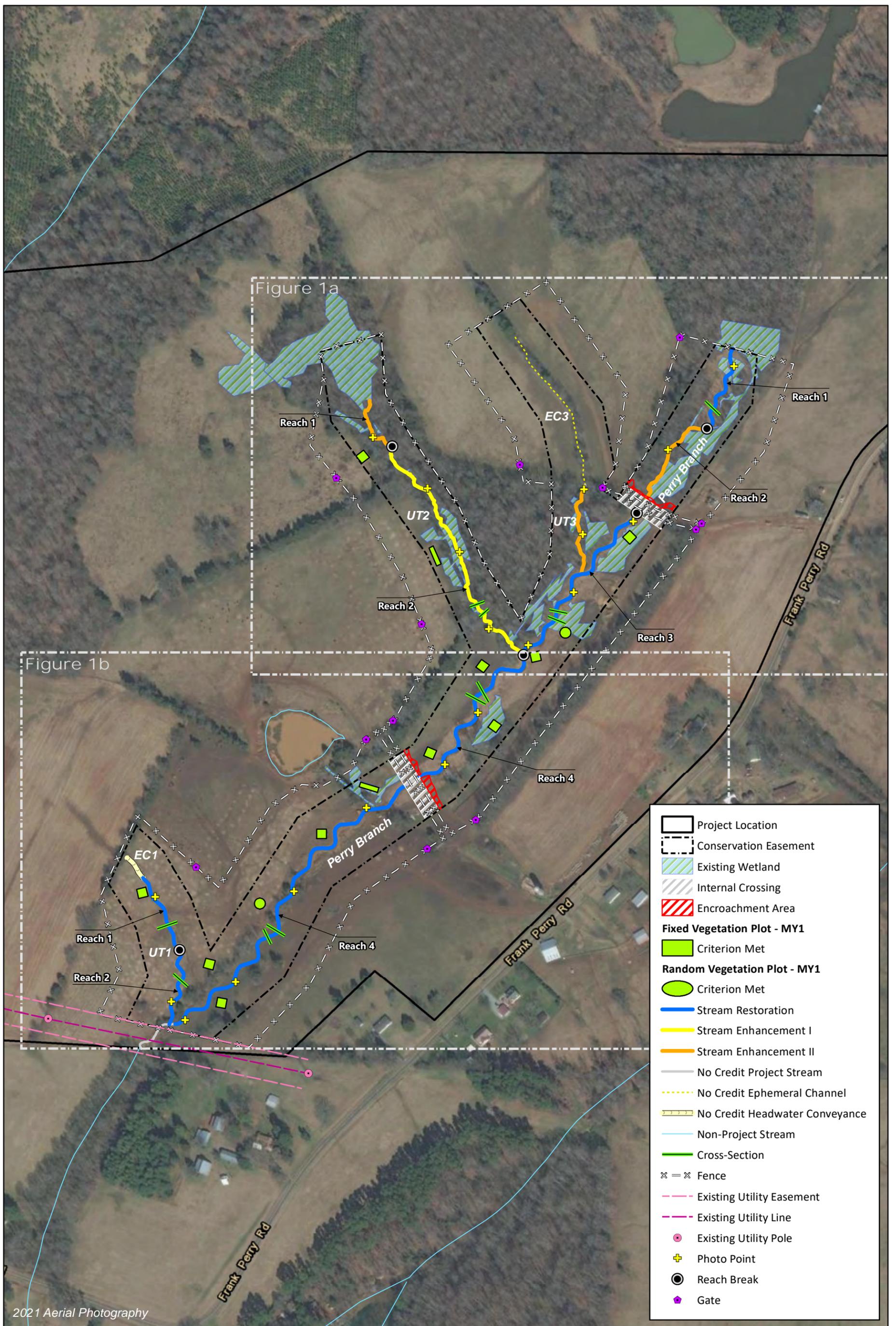
Vegetation across the Site is exceeding performance standards and is on track to achieve the MY3 interim requirement of 320 planted stems per acre. Monitoring Year 1 data shows an average density of 531 planted stems per acre across vegetation plots. Sporadic invasive vegetation was treated in MY1 and follow up treatments are scheduled for winter 2021/2022. To build on the success of previous herbicide ring sprays, additional ring sprays will be applied around the base of trees in areas of high competition with herbaceous vegetation in spring 2022. Wildlands is investigating the proper methods to address the easement encroachment. Project streams are stable and functioning. Cross-sections show limited deviations from as-built due to sediment deposition and vegetation establishment. A bankfull event was documented on both UT1 and UT2. No bankfull events were recorded on Perry Branch. UT2 achieved more than 30 consecutive days of baseflow, while UT1 did not.

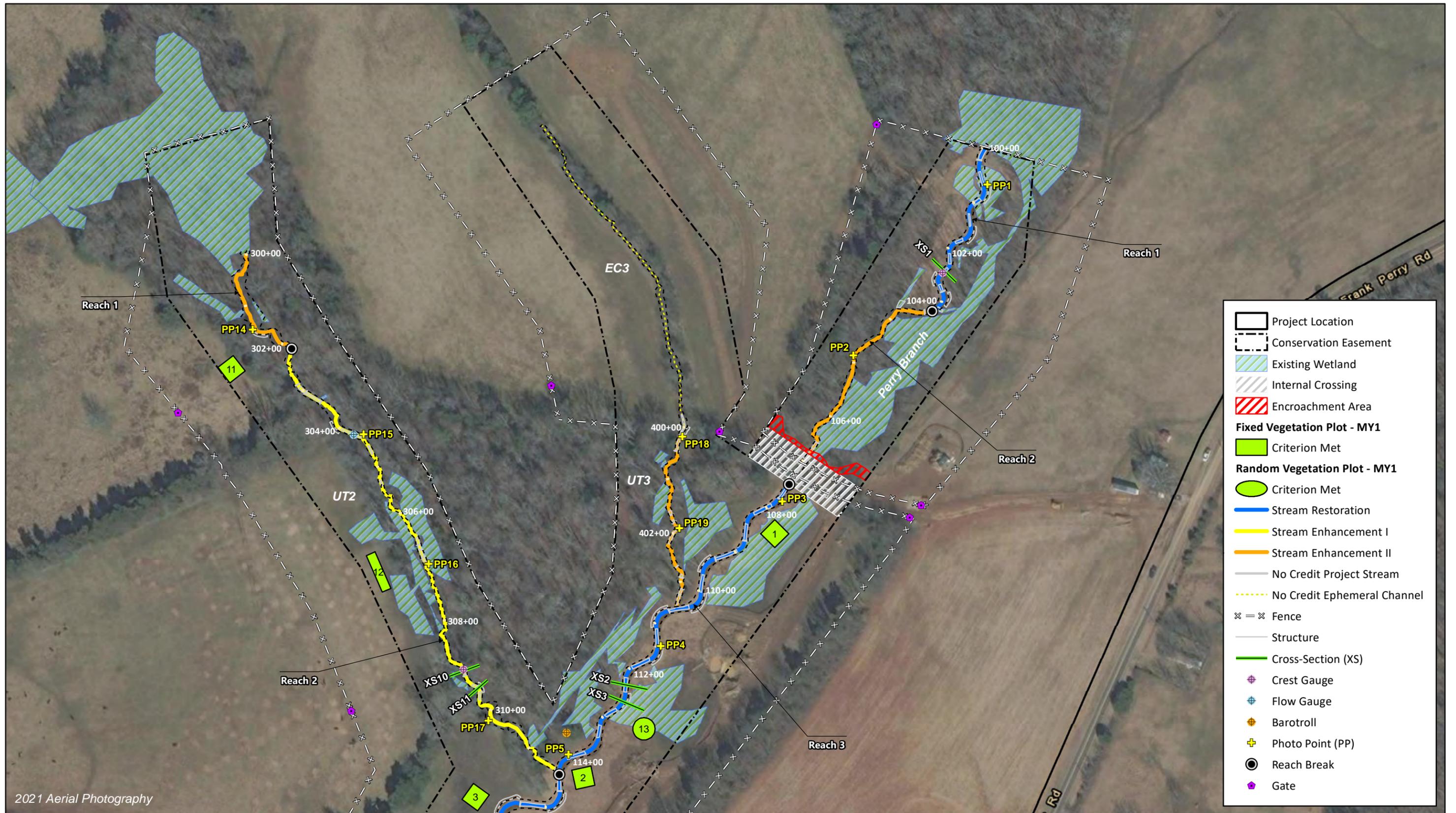
Summary information and data related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

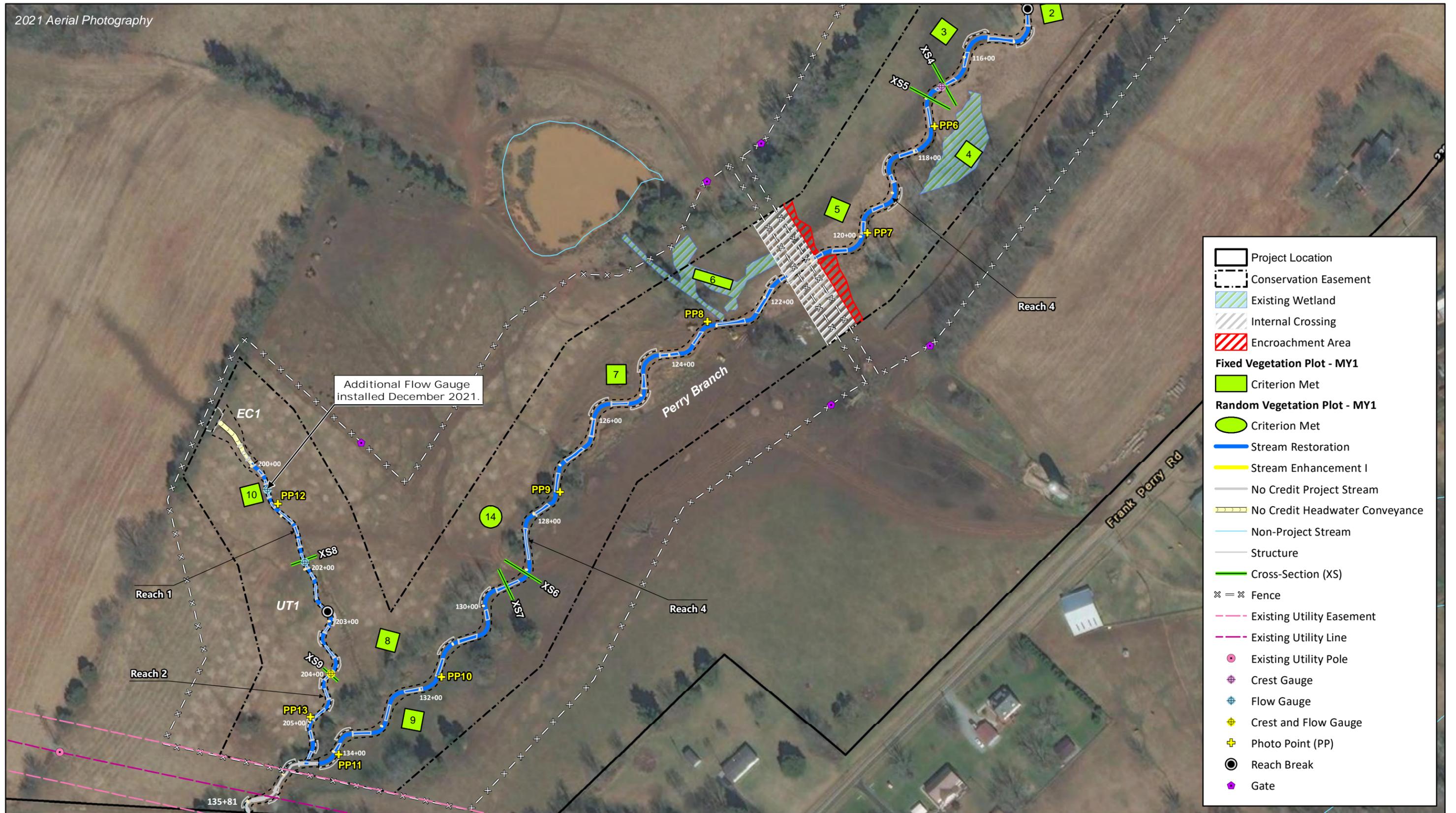


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APPENDIX A. VISUAL ASSESSMENT DATA

Table 4. Visual Stream Morphology Stability Assessment Table

Perry Hill Mitigation Site
 DMS Project No. 100093
 Monitoring Year 1 - 2021

Perry Branch Reach 1

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
Assessed Stream Length						323
Assessed Bank Length						646
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
Totals:					0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	2	2		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	4	4		100%

Perry Branch Reach 3 and Reach 4

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
Assessed Stream Length						2,653
Assessed Bank Length						5,306
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
Totals:					0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	18	18		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	17	17		100%

Table 4. Visual Stream Morphology Stability Assessment Table

Perry Hill Mitigation Site
 DMS Project No. 100093
 Monitoring Year 1 - 2021

UT1 Reach 1 and Reach 2

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
Assessed Stream Length						578
Assessed Bank Length						1,156
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
Totals:					0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	18	18		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	7	7		100%

UT2 Reach 2

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
Assessed Stream Length						941
Assessed Bank Length						1,882
Bank	Surface Scour/ Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
Totals:					0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%.	2	2		100%

Table 5. Vegetation Condition Assessment Table

Perry Hill Mitigation Site
 DMS Project No. 100093
 Monitoring Year 1 - 2021

Planted Acreage 20.53

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

Easement Acreage 26.88

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Invasive species included in summation above should be identified in report summary.	0.10	0	0%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	none	2 Encroachments Noted / 0.13 ac	

STREAM PHOTOGRAPHS



PHOTO POINT 1 Perry Branch R1 – upstream (10/21/2021)



PHOTO POINT 1 Perry Branch R1 – downstream (10/21/2021)



PHOTO POINT 2 Perry Branch R2 – upstream (10/21/2021)



PHOTO POINT 2 Perry Branch R2 – downstream (10/21/2021)



PHOTO POINT 3 Perry Branch R3 – upstream (10/21/2021)



PHOTO POINT 3 Perry Branch R3 – downstream (10/21/2021)





PHOTO POINT 4 Perry Branch R3 – upstream (10/21/2021)



PHOTO POINT 4 Perry Branch R3 – downstream (10/21/2021)



PHOTO POINT 5 Perry Branch R3 – upstream (10/21/2021)



PHOTO POINT 5 Perry Branch R3 – downstream (10/21/2021)



PHOTO POINT 6 Perry Branch R4 – upstream (10/21/2021)



PHOTO POINT 6 Perry Branch R4 – downstream (10/21/2021)





PHOTO POINT 7 Perry Branch R4 – upstream (10/21/2021)



PHOTO POINT 7 Perry Branch R4 – downstream (10/21/2021)



PHOTO POINT 8 Perry Branch R4 – upstream (10/21/2021)



PHOTO POINT 8 Perry Branch R4 – downstream (10/21/2021)



PHOTO POINT 9 Perry Branch R4 – upstream (11/17/2021)



PHOTO POINT 9 Perry Branch R4 – downstream (11/17/2021)





PHOTO POINT 10 Perry Branch R4 – upstream (10/21/2021)



PHOTO POINT 10 Perry Branch R4 – downstream (10/21/2021)



PHOTO POINT 11 Perry Branch R4 – upstream (10/21/2021)



PHOTO POINT 11 Perry Branch R4 – downstream (10/21/2021)



PHOTO POINT 12 UT1 R1 – upstream (10/21/2021)



PHOTO POINT 12 UT1 R1 – downstream (10/21/2021)





PHOTO POINT 13 UT1 R2 – upstream (11/17/2021)



PHOTO POINT 13 UT1 R2 – downstream (11/17/2021)



PHOTO POINT 14 UT2 R1 – upstream (10/21/2021)



PHOTO POINT 14 UT2 R1 – downstream (10/21/2021)



PHOTO POINT 15 UT2 R2 – upstream (10/21/2021)



PHOTO POINT 15 UT2 R2 – downstream (10/21/2021)





PHOTO POINT 16 UT2 R2 – upstream (11/17/2021)



PHOTO POINT 16 UT2 R2 – downstream (11/17/2021)



PHOTO POINT 17 UT2 R2 – upstream (10/21/2021)



PHOTO POINT 17 UT2 R2 – downstream (10/21/2021)



PHOTO POINT 18 UT3 – upstream (10/21/2021)



PHOTO POINT 18 UT3 – downstream (10/21/2021)





PHOTO POINT 19 UT3 – upstream (10/21/2021)



PHOTO POINT 19 UT3 – downstream (10/21/2021)



CULVERT CROSSING PHOTOGRAPHS



Perry Branch R2 – Looking Upstream (10/21/2021)



Perry Branch R2 – Looking Downstream (10/21/2021)



Perry Branch R4 – Looking Upstream (10/21/2021)



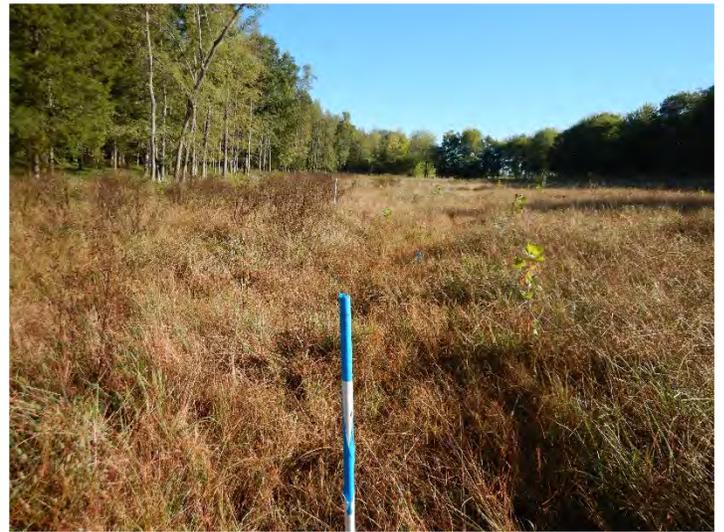
Perry Branch R4 – Looking Downstream (10/21/2021)



VEGETATION PLOT PHOTOGRAPHS



FIXED VEG PLOT 1 (10/20/2021)



FIXED VEG PLOT 2 (10/20/2021)



FIXED VEG PLOT 3 (10/20/2021)



FIXED VEG PLOT 4 (10/20/2021)

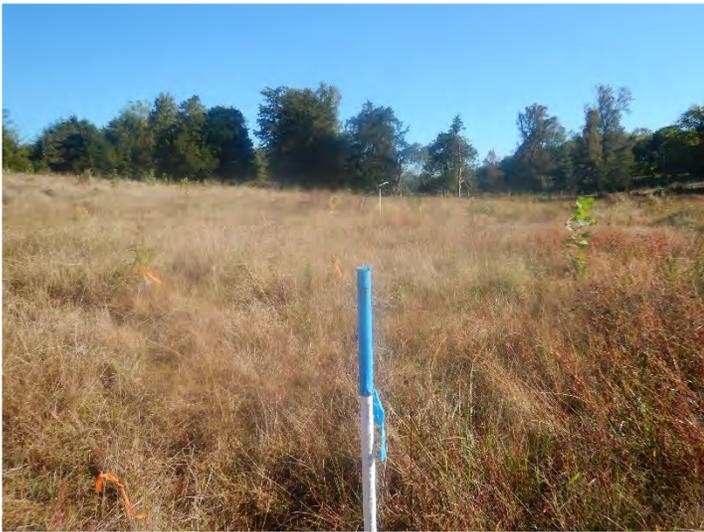


FIXED VEG PLOT 5 (10/20/2021)



FIXED VEG PLOT 6 (10/20/2021)





FIXED VEG PLOT 7 (10/20/2021)



FIXED VEG PLOT 8 (10/20/2021)



FIXED VEG PLOT 9 (10/20/2021)



FIXED VEG PLOT 10 (10/20/2021)



FIXED VEG PLOT 11 (10/20/2021)



FIXED VEG PLOT 12 (10/20/2021)





RANDOM VEG PLOT 13 (10/20/2021)



RANDOM VEG PLOT 14 (10/20/2021)



VEGETATION AREAS OF CONCERN PHOTOGRAPHS
Conservation Easement Encroachment



Perry Branch R2 – CE Encroachment (10/04/2021)



Perry Branch R2 – CE Encroachment (10/04/2021)



Perry Branch R4 – CE Encroachment (10/04/2021)



Perry Branch R4 – CE Encroachment (10/04/2021)



APPENDIX B. VEGETATION PLOT DATA

Table 6. Vegetation Plot Criteria Attainment Table

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

Plot	Success Criteria Met*	Tract Mean
Fixed Veg Plot 1	Yes	100%
Fixed Veg Plot 2	Yes	
Fixed Veg Plot 3	Yes	
Fixed Veg Plot 4	Yes	
Fixed Veg Plot 5	Yes	
Fixed Veg Plot 6	Yes	
Fixed Veg Plot 7	Yes	
Fixed Veg Plot 8	Yes	
Fixed Veg Plot 9	Yes	
Fixed Veg Plot 10	Yes	
Fixed Veg Plot 11	Yes	
Fixed Veg Plot 12	Yes	
Random Veg Plot 13	Yes	
Random Veg Plot 14	Yes	

*Based on the interim target stem density for MY3 of 320 planted stems per acre.

Table 7a. Fixed Plots: Planted and Total Stem Counts

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

		Current Plot Data (MY1 2021)																					
Scientific Name	Common Name	Species Type	VP 1			VP 2			VP 3			VP 4			VP 5			VP 6					
			PnoLS	P-all	T																		
<i>Acer floridanum</i>	Southern Sugar Maple	Tree				1	1	1															
<i>Acer negundo</i>	Boxelder	Tree	2	2	2	1	1	1	1	1	1	2	2	2				1	1	1			
<i>Asimina triloba</i>	Common Pawpaw	Shrub Tree																					
<i>Betula nigra</i>	River Birch	Tree	3	3	3	2	2	2	2	2	2	3	3	3	2	2	2	3	3	3			
<i>Cornus amomum</i>	Silky Dogwood	Shrub Tree	2	2	2																		
<i>Diospyros virginiana</i>	American Persimmon	Tree							2	2	2				1	1	1						
<i>Nyssa sylvatica</i>	Black Gum	Tree																					
<i>Platanus occidentalis</i>	Sycamore	Tree	2	2	2	4	4	4	1	1	1	3	3	3	2	2	2	6	6	6			
<i>Populus deltoides</i>	Eastern Cottonwood	Tree				2	2	2	1	1	1				1	1	1						
<i>Quercus alba</i>	White Oak	Tree																					
<i>Quercus lyrata</i>	Overcup Oak	Tree	2	2	2							2	2	2				3	3	3			
<i>Quercus pagoda</i>	Cherrybark Oak	Tree	4	4	4				1	1	1	2	2	2	2	2	2	1	1	1			
<i>Quercus phellos</i>	Willow Oak	Tree													1	1	1						
<i>Quercus rubra</i>	Northern Red Oak	Tree				2	2	2															
<i>Ulmus alata</i>	Winged Elm	Tree																					
<i>Ulmus americana</i>	American Elm	Tree							2	2	2	2	2	2	1	1	1	2	2	2			
<i>Viburnum prunifolium</i>	Black Haw	Shrub Tree													1	1	1						
		Stem count	15	15	15	12	12	12	10	10	10	14	14	14	11	11	11	16	16	16			
		size (ares)	1			1			1			1			1			1					
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02					
		Species count	6	6	6	6	6	6	7	7	7	6	6	6	8	8	8	6	6	6			
		Stems per ACRE	607	607	607	486	486	486	405	405	405	567	567	567	445	445	445	647	647	647			

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 - Planted Stems Excluding Live Stakes

P-all - All Planted Stems

T - All Woody Stems

Table 7a. Fixed Plots: Planted and Total Stem Counts

Perry Hill Mitigation Site
 DMS Project No. 100093
 Monitoring Year 1 - 2021

		Current Plot Data (MY1 2021)																		
Scientific Name	Common Name	Species Type	VP 7			VP 8			VP 9			VP 10			VP 11			VP 12		
			PnoLS	P-all	T															
<i>Acer floridanum</i>	Southern Sugar Maple	Tree																		
<i>Acer negundo</i>	Boxelder	Tree	1	1	1	1	1	1	3	3	3	1	1	1				1	1	1
<i>Asimina triloba</i>	Common Pawpaw	Shrub Tree				1	1	1				1	1	1				2	2	2
<i>Betula nigra</i>	River Birch	Tree	1	1	1	3	3	3	2	2	2	3	3	3	2	2	2	3	3	3
<i>Cornus amomum</i>	Silky Dogwood	Shrub Tree																		
<i>Diospyros virginiana</i>	American Persimmon	Tree	1	1	1	3	3	3	1	1	1	2	2	2	3	3	3	2	2	2
<i>Nyssa sylvatica</i>	Black Gum	Tree													1	1	1			
<i>Platanus occidentalis</i>	Sycamore	Tree	3	3	3	2	2	2	3	3	3	2	2	2	4	4	4	4	4	4
<i>Populus deltoides</i>	Eastern Cottonwood	Tree	1	1	1	2	2	2	1	1	1	1	1	1				1	1	1
<i>Quercus alba</i>	White Oak	Tree													2	2	2			
<i>Quercus lyrata</i>	Overcup Oak	Tree																		
<i>Quercus pagoda</i>	Cherrybark Oak	Tree	1	1	1	3	3	3	1	1	1	2	2	2				1	1	1
<i>Quercus phellos</i>	Willow Oak	Tree	1	1	1							2	2	2						
<i>Quercus rubra</i>	Northern Red Oak	Tree	2	2	2										1	1	1	1	1	1
<i>Ulmus alata</i>	Winged Elm	Tree													1	1	1			
<i>Ulmus americana</i>	American Elm	Tree				3	3	3	1	1	1									
<i>Viburnum prunifolium</i>	Black Haw	Shrub Tree	1	1	1				1	1	1									
		Stem count	12	12	12	18	18	18	13	13	13	14	14	14	14	14	14	15	15	15
		size (ares)	1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	9	9	9	8	8	8	8	8	8	8	8	8	7	7	7	8	8	8
		Stems per ACRE	486	486	486	728	728	728	526	526	526	567	567	567	567	567	567	607	607	607

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 - Planted Stems Excluding Live Stakes

P-all - All Planted Stems

T - All Woody Stems

Table 7a. Fixed Plots: Planted and Total Stem Counts

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

Scientific Name	Common Name	Species Type	Annual Means					
			MY1 (2021)			MY0 (2021)		
			PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer floridanum</i>	Southern Sugar Maple	Tree	1	1	1	1	1	1
<i>Acer negundo</i>	Boxelder	Tree	14	14	14	16	16	16
<i>Asimina triloba</i>	Common Pawpaw	Shrub Tree	4	4	4	8	8	8
<i>Betula nigra</i>	River Birch	Tree	29	29	29	30	30	30
<i>Cornus amomum</i>	Silky Dogwood	Shrub Tree	2	2	2	2	2	2
<i>Diospyros virginiana</i>	American Persimmon	Tree	15	15	15	16	16	16
<i>Nyssa sylvatica</i>	Black Gum	Tree	1	1	1	1	1	1
<i>Platanus occidentalis</i>	Sycamore	Tree	36	36	36	36	36	36
<i>Populus deltoides</i>	Eastern Cottonwood	Tree	10	10	10	10	10	10
<i>Quercus alba</i>	White Oak	Tree	2	2	2	2	2	2
<i>Quercus lyrata</i>	Overcup Oak	Tree	7	7	7	7	7	7
<i>Quercus pagoda</i>	Cherrybark Oak	Tree	18	18	18	17	17	17
<i>Quercus phellos</i>	Willow Oak	Tree	4	4	4	4	4	4
<i>Quercus rubra</i>	Northern Red Oak	Tree	6	6	6	6	6	6
<i>Ulmus alata</i>	Winged Elm	Tree	1	1	1	1	1	1
<i>Ulmus americana</i>	American Elm	Tree	11	11	11	12	12	12
<i>Viburnum prunifolium</i>	Black Haw	Shrub Tree	3	3	3	3	3	3
Stem count			164	164	164	172	172	172
size (ares)			12			12		
size (ACRES)			0.30			0.30		
Species count			17	17	17	17	17	17
Stems per ACRE			553	553	553	580	580	580

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 - Planted Stems Excluding Live Stakes

P-all - All Planted Stems

T - All Woody Stems

Table 7b. Random Plots: Planted and Total Stem Counts

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

Scientific Name	Common Name	Species Type	Current Plot Data (MY1 2021)				Annual Means			
			VP 13		VP 14		MY1 (2021)		MY0 (2021)	
			Te	Total	Te	Total	Te	Total	Te	Total
<i>Acer negundo</i>	Boxelder	Tree	3	3	2	2	5	5	2	2
<i>Betula nigra</i>	River Birch	Tree	1	1	1	1	2	2	4	4
<i>Cornus amomum</i>	Silky Dogwood	Shrub Tree							2	2
<i>Diospyros virginiana</i>	American Persimmon	Tree							2	2
<i>Platanus occidentalis</i>	Sycamore	Tree	4	4	2	2	6	6	4	4
<i>Populus deltoides</i>	Eastern Cottonwood	Tree			3	3	3	3	1	1
<i>Quercus lyrata</i>	Overcup Oak	Tree							2	2
<i>Quercus pagoda</i>	Cherrybark Oak	Tree	1	1			1	1	3	3
<i>Quercus phellos</i>	Willow Oak	Tree			1	1	1	1		
<i>Quercus rubra</i>	Northern Red Oak	Tree			2	2	2	2	1	1
<i>Ulmus americana</i>	American Elm	Tree							4	4
Stem count			9	9	11	11	20	20	25	25
size (ares)			1		1		2		2	
size (ACRES)			0.02		0.02		0.05		0.05	
Species count			4	4	6	6	7	7	10	10
Stems per ACRE			364	364	445	445	405	405	506	506

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 C. STREAM GEOMORPHOLOGY DATA

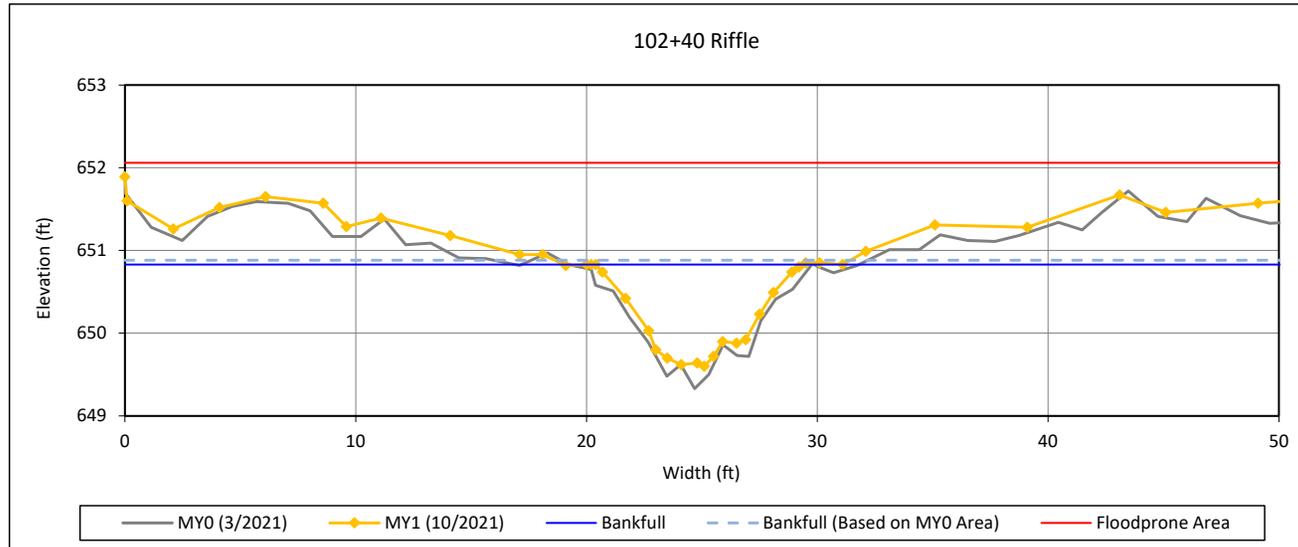
Cross-Section Plots

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

Cross-Section 1 - Perry Branch Reach 1



Bankfull Dimensions

6.3	x-section area (ft.sq.)
9.0	width (ft)
0.7	mean depth (ft)
1.2	max depth (ft)
9.4	wetted perimeter (ft)
0.7	hydraulic radius (ft)
12.7	width-depth ratio
80.0	W flood prone area (ft)
8.9	entrenchment ratio
1.0	low bank height ratio

Survey Date: 10/2021

Field Crew: Wildlands Engineering



View Downstream

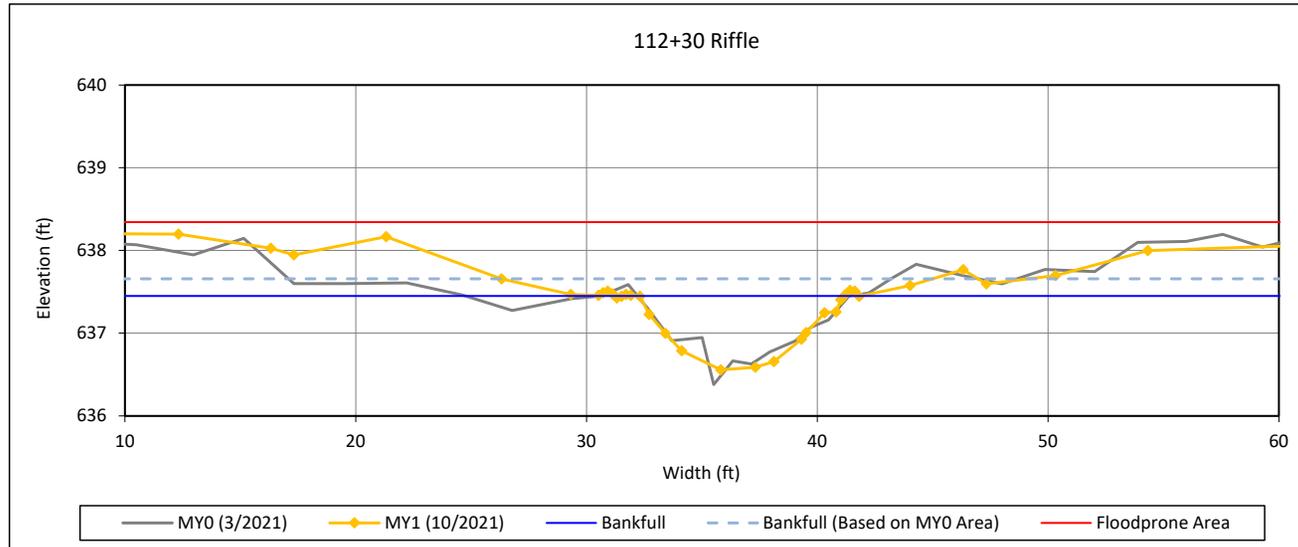
Cross-Section Plots

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

Cross-Section 2 - Perry Branch Reach 3



Bankfull Dimensions

5.2	x-section area (ft.sq.)
8.8	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
9.1	wetted perimeter (ft)
0.6	hydraulic radius (ft)
14.9	width-depth ratio
100.0	W flood prone area (ft)
11.3	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 10/2021

Field Crew: Wildlands Engineering



View Downstream

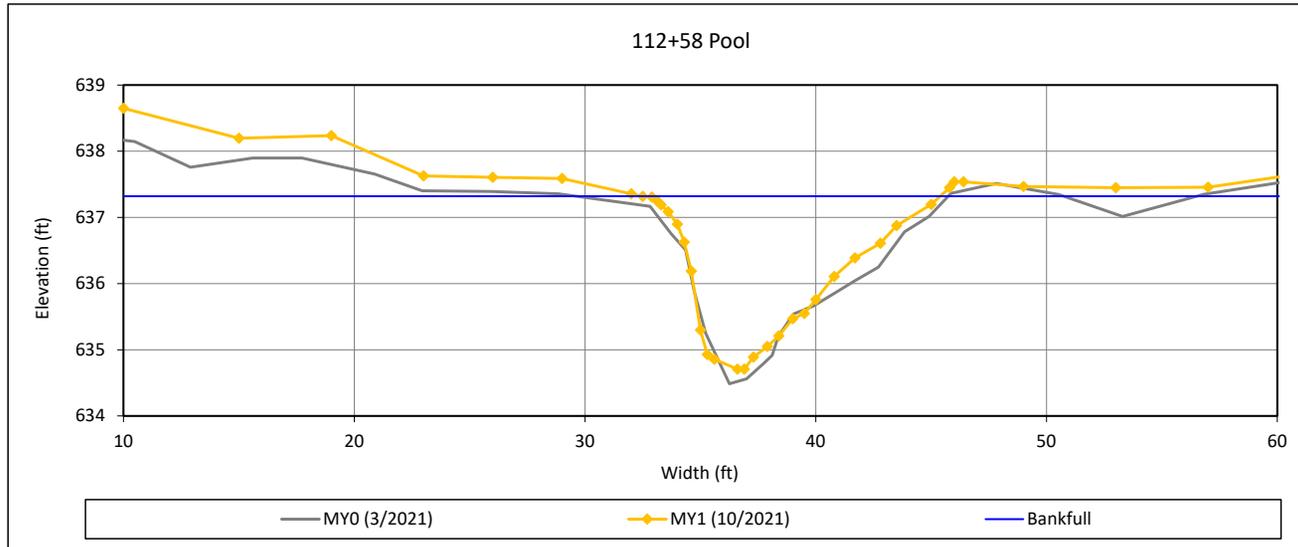
Cross-Section Plots

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

Cross-Section 3 - Perry Branch Reach 3



Bankfull Dimensions

16.3	x-section area (ft.sq.)
12.9	width (ft)
1.3	mean depth (ft)
2.6	max depth (ft)
14.5	wetted perimeter (ft)
1.1	hydraulic radius (ft)
10.2	width-depth ratio

Survey Date: 10/2021

Field Crew: Wildlands Engineering



View Downstream

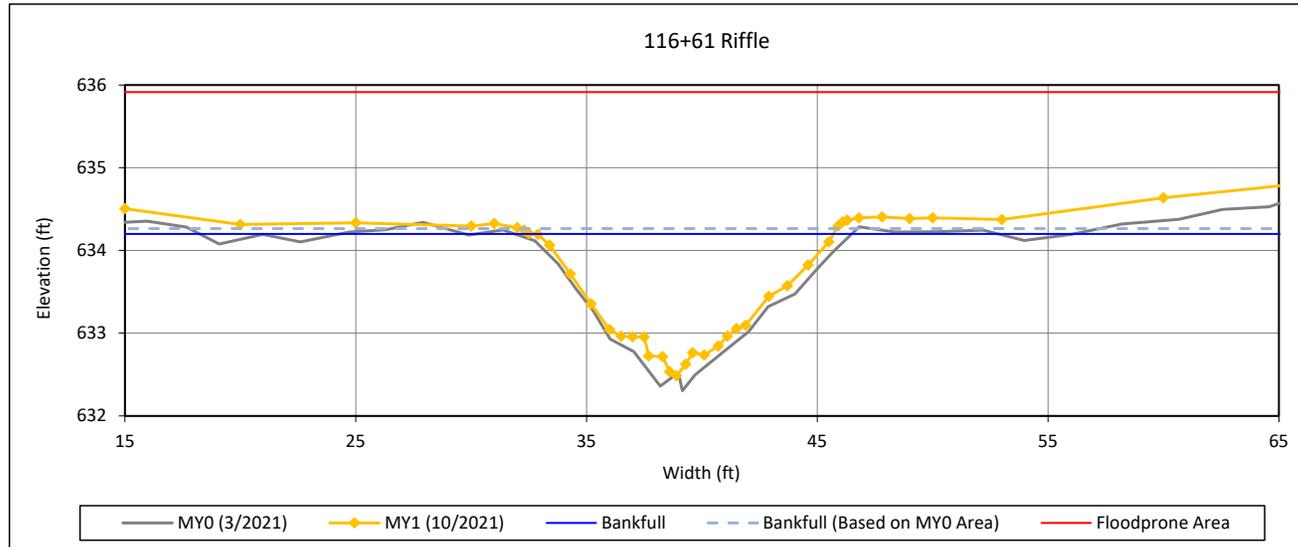
Cross-Section Plots

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

Cross-Section 4 - Perry Branch Reach 4



Bankfull Dimensions

12.0	x-section area (ft.sq.)
12.8	width (ft)
0.9	mean depth (ft)
1.7	max depth (ft)
13.4	wetted perimeter (ft)
0.9	hydraulic radius (ft)
13.7	width-depth ratio
175.0	W flood prone area (ft)
13.7	entrenchment ratio
1.0	low bank height ratio

Survey Date: 10/2021

Field Crew: Wildlands Engineering



View Downstream

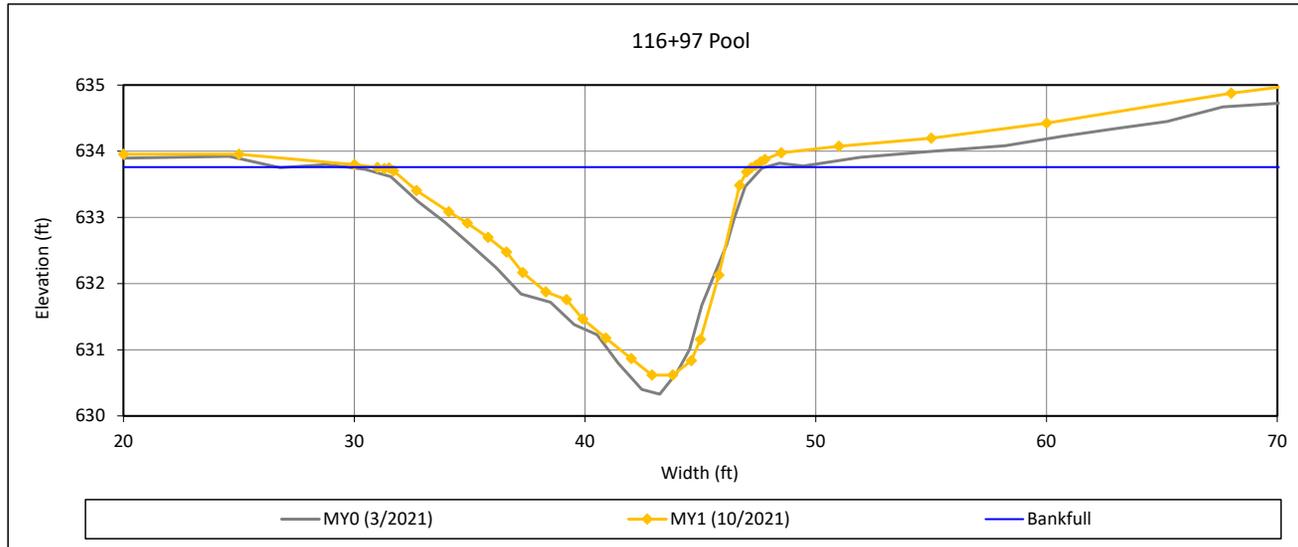
Cross-Section Plots

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

Cross-Section 5 - Perry Branch Reach 4



Bankfull Dimensions

26.5	x-section area (ft.sq.)
15.6	width (ft)
1.7	mean depth (ft)
3.1	max depth (ft)
17.4	wetted perimeter (ft)
1.5	hydraulic radius (ft)
9.2	width-depth ratio

Survey Date: 10/2021

Field Crew: Wildlands Engineering



View Downstream

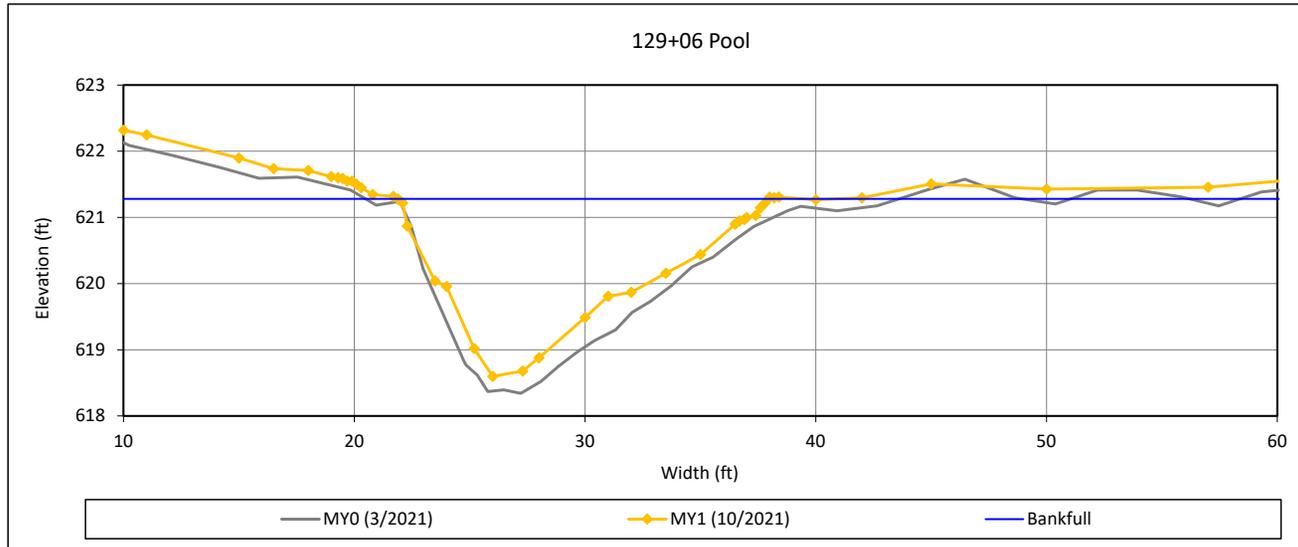
Cross-Section Plots

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

Cross-Section 6 - Perry Branch Reach 4



Bankfull Dimensions

22.9	x-section area (ft.sq.)
16.0	width (ft)
1.4	mean depth (ft)
2.7	max depth (ft)
17.3	wetted perimeter (ft)
1.3	hydraulic radius (ft)
11.2	width-depth ratio

Survey Date: 10/2021

Field Crew: Wildlands Engineering



View Downstream

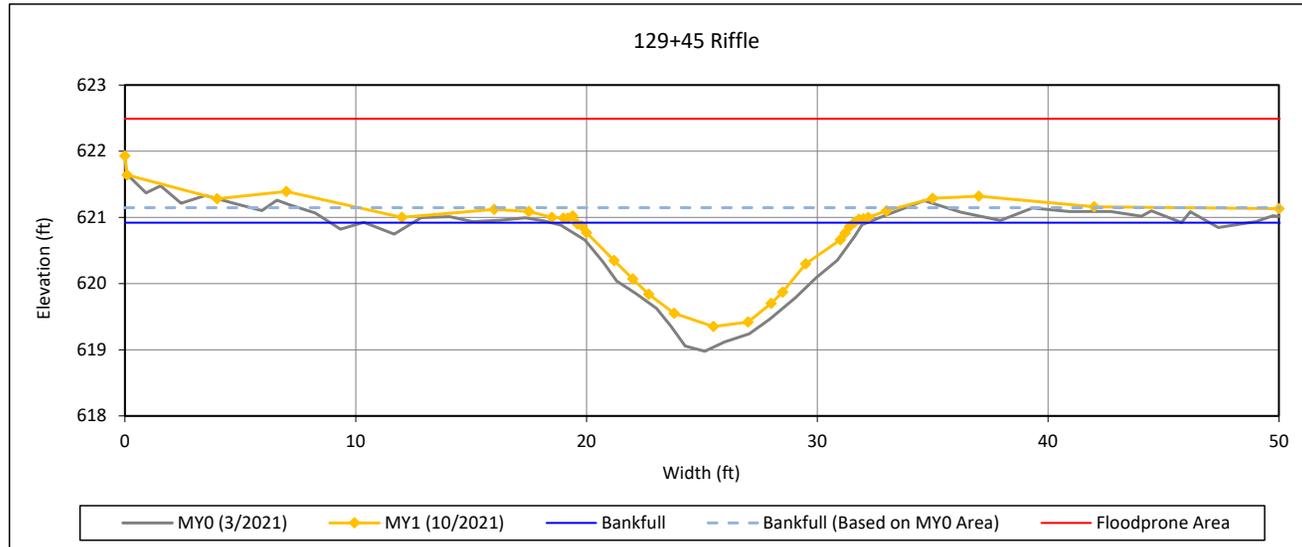
Cross-Section Plots

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

Cross-Section 7 - Perry Branch Reach 4



Bankfull Dimensions

11.3	x-section area (ft.sq.)
12.0	width (ft)
0.9	mean depth (ft)
1.6	max depth (ft)
12.5	wetted perimeter (ft)
0.9	hydraulic radius (ft)
12.8	width-depth ratio
125.0	W flood prone area (ft)
10.4	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 10/2021

Field Crew: Wildlands Engineering



View Downstream

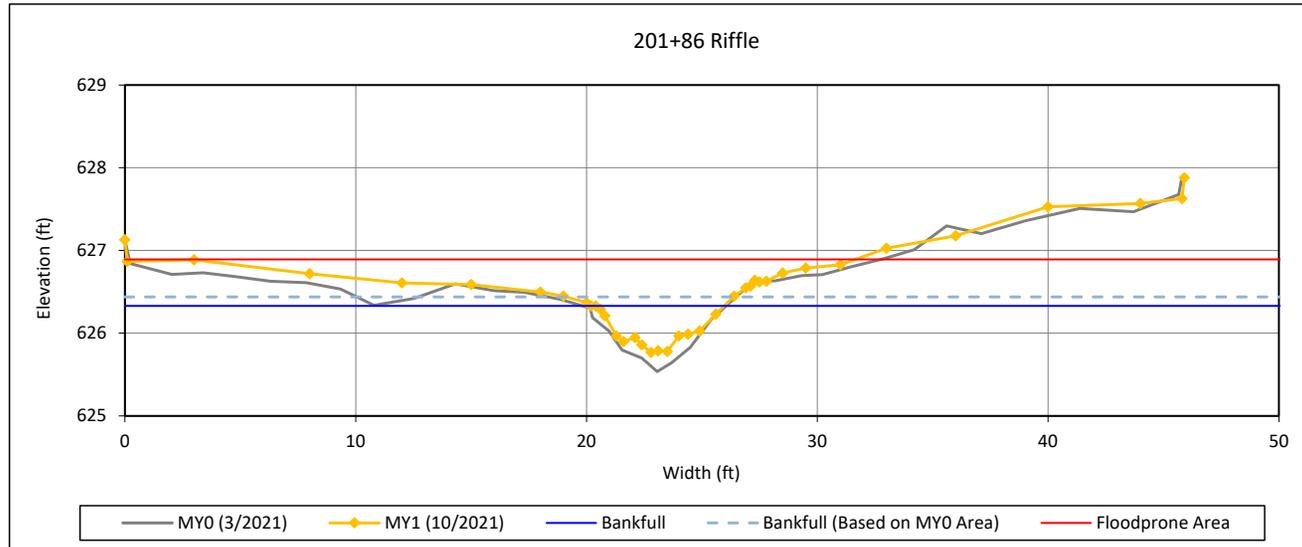
Cross-Section Plots

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

Cross-Section 8 - UT1 Reach 1



Bankfull Dimensions

1.9	x-section area (ft.sq.)
5.6	width (ft)
0.3	mean depth (ft)
0.6	max depth (ft)
5.8	wetted perimeter (ft)
0.3	hydraulic radius (ft)
16.6	width-depth ratio
50.0	W flood prone area (ft)
9.0	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 10/2021

Field Crew: Wildlands Engineering



View Downstream

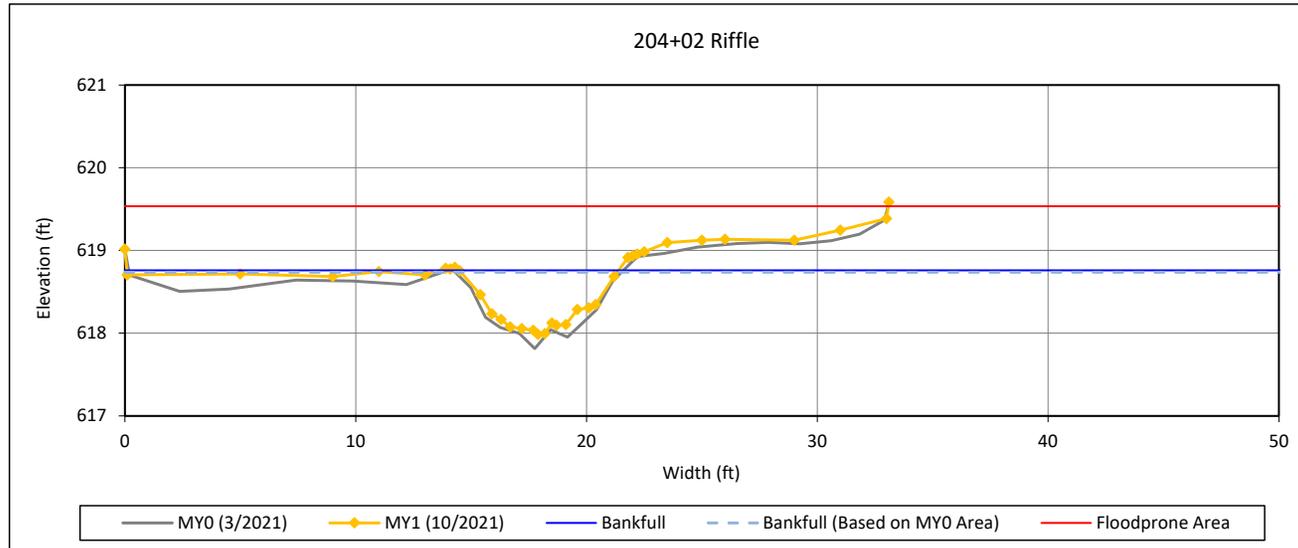
Cross-Section Plots

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

Cross-Section 9 - UT1 Reach 2



Bankfull Dimensions

3.4	x-section area (ft.sq.)
6.9	width (ft)
0.5	mean depth (ft)
0.8	max depth (ft)
7.2	wetted perimeter (ft)
0.5	hydraulic radius (ft)
14.2	width-depth ratio
175.0	W flood prone area (ft)
25.4	entrenchment ratio
1.0	low bank height ratio

Survey Date: 10/2021

Field Crew: Wildlands Engineering



View Downstream

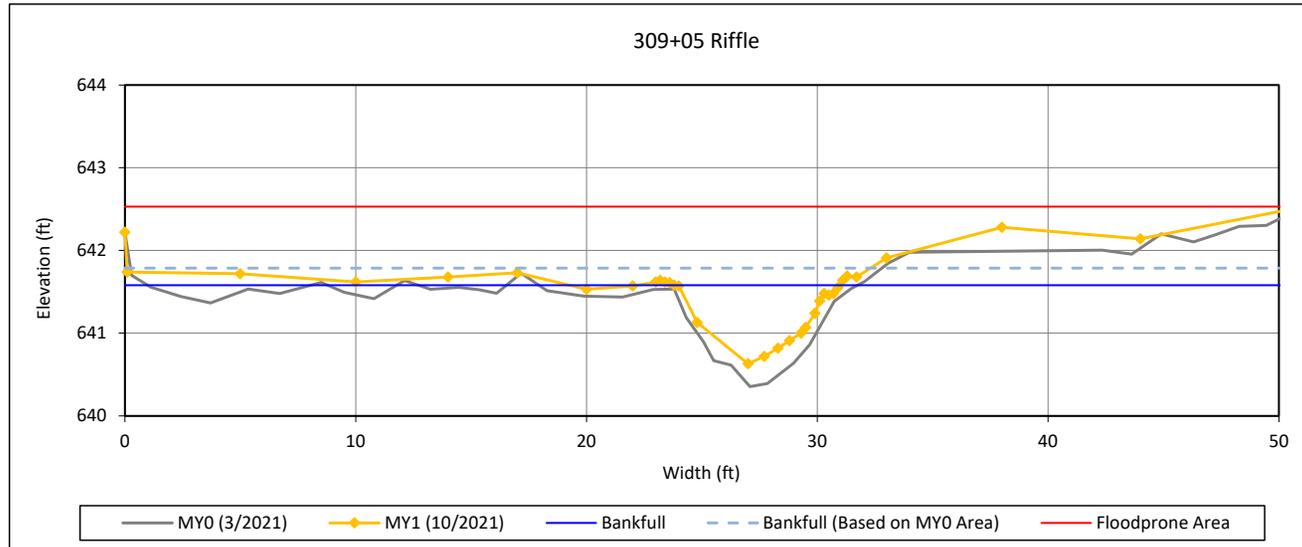
Cross-Section Plots

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

Cross-Section 10 - UT2 Reach 2



Bankfull Dimensions

3.9	x-section area (ft.sq.)
7.1	width (ft)
0.6	mean depth (ft)
1.0	max depth (ft)
7.4	wetted perimeter (ft)
0.5	hydraulic radius (ft)
12.8	width-depth ratio
100.0	W flood prone area (ft)
14.1	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 10/2021

Field Crew: Wildlands Engineering



View Downstream

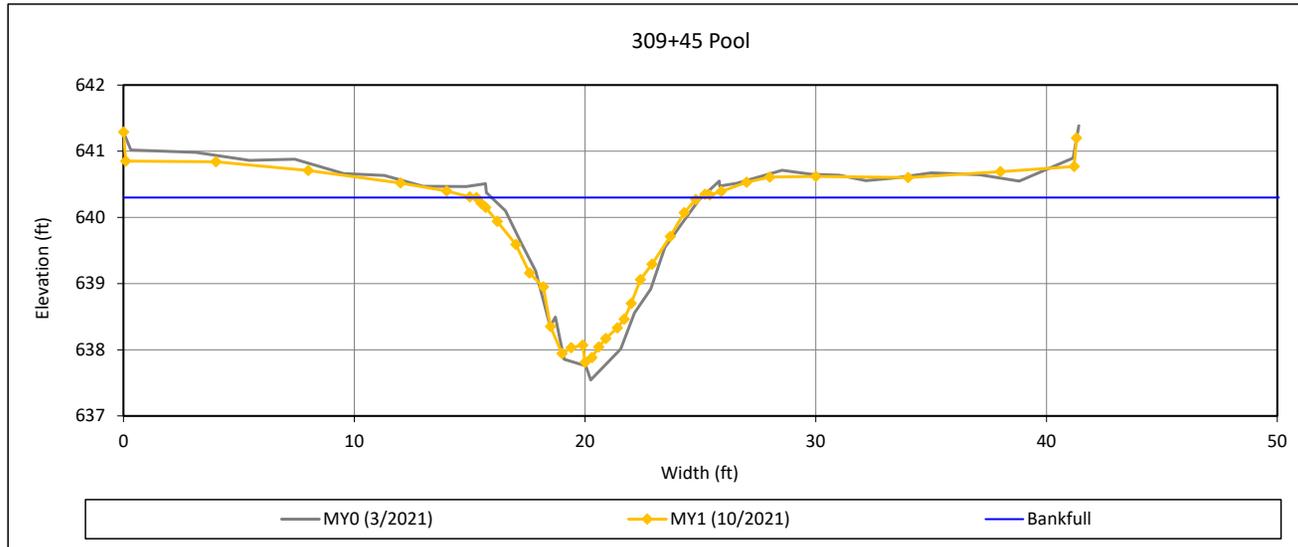
Cross-Section Plots

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

Cross-Section 11 - UT2 Reach 2



Bankfull Dimensions

12.0	x-section area (ft.sq.)
9.7	width (ft)
1.2	mean depth (ft)
2.5	max depth (ft)
11.3	wetted perimeter (ft)
1.1	hydraulic radius (ft)
7.7	width-depth ratio

Survey Date: 10/2021

Field Crew: Wildlands Engineering



View Downstream

Table 8. Baseline Stream Data Summary

Perry Hill Mitigation Site
 DMS Project No. 100093
 Monitoring Year 1 - 2021

Parameter	PRE-EXISTING CONDITIONS					DESIGN		MONITORING BASELINE (MY0)		
	Perry Branch Reach 1									
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Max	Min	n
Bankfull Width (ft)	2.7	2.9	2.9	3.1	2	8.0		9.2		1
Floodprone Width (ft)	4	4	4	4	2	61		80		1
Bankfull Mean Depth	0.4	0.5	0.5	0.6	2	0.6		0.7		1
Bankfull Max Depth	0.6	0.7	0.7	0.8	2	1.0		1.4		1
Bankfull Cross Sectional Area (ft ²)	1.1	1.6	1.6	2.0	2	5.0		6.8		1
Width/Depth Ratio	5.2	6.0	6.0	6.8	2	12.8		12.6		1
Entrenchment Ratio	1.3	1.4	1.4	1.4	2	7.6		8.7		1
Bank Height Ratio	2.1	2.4	2.4	2.7	2	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	29					36		39		
Rosgen Classification	G4c					C4		C4		
Bankfull Discharge (cfs)	2.8	4.4	4.4	5.9	2	14.9		22.0		1
Sinuosity	1.10					1.16		1.13		
Watersurface Slope (ft/ft)	0.0129					0.0127		0.0128		
Other	---					---		---		
Parameter	Perry Branch Reach 3									
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	5.3	5.7	5.7	6.1	2	9.6		11.0		1
Floodprone Width (ft)	11.0	12.5	12.5	14.0	2	156		100		1
Bankfull Mean Depth	0.6	0.7	0.7	0.7	2	0.8		0.6		1
Bankfull Max Depth	0.7	0.8	0.8	0.8	2	1.2		1.2		1
Bankfull Cross Sectional Area (ft ²)	3.4	3.5	3.5	3.6	2	7.2		6.3		1
Width/Depth Ratio	8.7	8.8	8.8	8.8	2	12.8		19.2		1
Entrenchment Ratio	2.1	2.2	2.2	2.2	2	16.3		9.1		1
Bank Height Ratio	1.9	2.1	2.1	2.3	2	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	35					46		32		
Rosgen Classification	G4c					C4		C4		
Bankfull Discharge (cfs)	9.1	9.7	9.7	10.2	2	25.1		17.9		1
Sinuosity	1.15					1.12		1.12		
Watersurface Slope (ft/ft)	0.0155					0.0135		0.0130		
Other	---					---		---		
Parameter	Perry Branch Reach 4									
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	5.7	6.7	6.0	9.3	4	11.4		13.0	13.1	2
Floodprone Width (ft)	9	12	12	17	4	123		125	175	2
Bankfull Mean Depth	0.6	0.8	0.8	1.0	4	0.9		1.0	1.1	2
Bankfull Max Depth	0.9	1.2	1.2	1.4	4	1.4		1.8	1.9	2
Bankfull Cross Sectional Area (ft ²)	4.0	5.1	5.2	5.9	4	10.1		12.8	14.1	2
Width/Depth Ratio	6.3	9.2	7.9	14.6	4	12.9		12.1	13.1	2
Entrenchment Ratio	1.4	1.9	1.8	2.7	4	10.8		9.6	13.5	1
Bank Height Ratio	1.2	2.2	2.3	3.0	4	1.0	1.1	1.0		2
Max part size (mm) mobilized at bankfull	33					46		48		
Rosgen Classification	F4					C4		C4		
Bankfull Discharge (cfs)	10.8	15.1	14.4	20.7	4	35.5		48.3	56.4	2
Sinuosity	1.11					1.14		1.15		
Watersurface Slope (ft/ft)	0.0109					0.0111		0.0110		
Other	---					---		---		

Table 8. Baseline Stream Data Summary

Perry Hill Mitigation Site
 DMS Project No. 100093
 Monitoring Year 1 - 2021

Parameter	PRE-EXISTING CONDITIONS					DESIGN		MONITORING BASELINE (MYO)		
	UT1 Reach 1									
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	1.7		1.7	1.7	1	6.0		5.8		1
Floodprone Width (ft)	6		6.0	6.0	1	11		50		1
Bankfull Mean Depth	0.8		0.8	0.8	1	0.4		0.4		1
Bankfull Max Depth	1.1		1.1	1.1	1	0.6		0.8		1
Bankfull Cross Sectional Area (ft ²)	1.4		1.4	1.4	1	2.5		2.5		1
Width/Depth Ratio	2.1		2.1	2.1	1	14.3		13.2		1
Entrenchment Ratio	3.3		3.3	3.3	1	1.8		8.7		1
Bank Height Ratio	1.9		1.9	1.9	1	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	22					111		94		
Rosgen Classification	E6b					B4		B4		
Bankfull Discharge (cfs)	7.5		7.5	7.5	1	9.4		11.7		1
Sinuosity	1.04					1.06		1.04		
Watersurface Slope (ft/ft)	0.0473					0.0522		0.0508		
Other	---					---		---		
Parameter	PRE-EXISTING CONDITIONS					DESIGN		MONITORING BASELINE (MYO)		
	UT1 Reach 2									
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Max	Min	n
Bankfull Width (ft)	3.7	4.6	4.6	5.4	2	6.0		6.4		1
Floodprone Width (ft)	7	8	8	9	2	113		175		1
Bankfull Mean Depth	0.3	0.4	0.4	0.4	2	0.5		0.5		1
Bankfull Max Depth	0.6	0.7	0.7	0.7	2	0.8		0.8		1
Bankfull Cross Sectional Area (ft ²)	1.4	1.5	1.5	1.6	2	2.9		3.2		1
Width/Depth Ratio	9.3	14.0	14.0	18.7	2	12.5		13.0		1
Entrenchment Ratio	1.6	1.8	1.8	2.0	2	18.8		27.2		1
Bank Height Ratio	2.6	2.8	2.8	3.0	2	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	22					51		48		
Rosgen Classification	F4b					C4b		C4b		
Bankfull Discharge (cfs)	3.2	3.5	3.5	3.7	2	7.6		11.0		1
Sinuosity	1.14					1.15		1.14		
Watersurface Slope (ft/ft)	0.0204					0.0221		0.0233		
Other	---					---		---		
Parameter	PRE-EXISTING CONDITIONS					DESIGN		MONITORING BASELINE (MYO)		
	UT2 Reach 2									
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	3.2	3.8	4.0	4.0	3	6.0		7.7		1
Floodprone Width (ft)	20	44	42	69	3	44		100		1
Bankfull Mean Depth	0.6	0.7	0.7	0.8	3	0.5		0.7		1
Bankfull Max Depth	1.0	1.1	1.0	1.2	3	0.7		1.2		1
Bankfull Cross Sectional Area (ft ²)	2.0	2.7	2.7	3.0	3	2.7		5.4		1
Width/Depth Ratio	5.0	5.4	5.2	5.9	3	13.2		10.8		1
Entrenchment Ratio	6.2	11.3	10.3	17.3	3	7.3		13.0		1
Bank Height Ratio	1.2	1.4	1.3	1.6	3	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	52					37		51		
Rosgen Classification	E4					C4		C4		
Bankfull Discharge (cfs)	6.2	8.7	9.0	10.9	3	8.2		20.7		1
Sinuosity	1.13					1.11		1.11		
Watersurface Slope (ft/ft)	0.0187					0.0177		0.0179		
Other	---					---		---		

Table 9. Cross-Section Morphology Monitoring Summary

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 1 - 2021

	Perry Branch Reach 1						Perry Branch Reach 3																	
	Cross-Section 1 (Riffle)						Cross-Section 2 (Riffle)						Cross-Section 3 (Pool)											
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7						
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	650.73	650.88					637.59	637.66					637.17	N/A										
Bank Height Ratio - Based on AB Bankfull ¹ Area	1.0	1.0					1.0	<1.0					N/A	N/A										
Thalweg Elevation	649.33	649.60					636.38	636.56					634.49	634.71										
LTOB ² Elevation	650.73	650.83					637.59	637.45					637.17	637.32										
LTOB ² Max Depth (ft)	1.4	1.2					1.2	0.9					2.7	2.6										
LTOB ² Cross-Sectional Area (ft ²)	6.8	6.3					6.3	5.2					16.3	16.3										
	Perry Branch Reach 4																							
	Cross-Section 4 (Riffle)						Cross-Section 5 (Pool)						Cross-Section 6 (Pool)						Cross-Section 7 (Riffle)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	634.12	634.26					633.73	N/A					621.17	N/A					620.89	621.15				
Bank Height Ratio - Based on AB Bankfull ¹ Area	1.0	1.0					N/A	N/A					N/A	N/A					1.0	<1.0				
Thalweg Elevation	632.30	632.49					630.33	630.62					618.34	618.60					618.98	619.35				
LTOB ² Elevation	634.12	634.20					633.73	633.76					621.17	621.28					620.89	620.92				
LTOB ² Max Depth (ft)	1.8	1.7					3.4	3.1					2.8	2.7	3.1				1.9	1.6				
LTOB ² Cross-Sectional Area (ft ²)	12.8	12.0					28.6	26.5					26.1	22.9					14.1	11.3				
	UT1 Reach 1						UT1 Reach 2						UT2 Reach 2											
	Cross-Section 8 (Riffle)						Cross-Section 9 (Riffle)						Cross-Section 10 (Riffle)						Cross-Section 11 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	626.30	626.44					618.63	618.74					641.54	641.79					640.51	N/A				
Bank Height Ratio - Based on AB Bankfull ¹ Area	1.0	<1.0					1.0	1.0					1.0	<1.0					N/A	N/A				
Thalweg Elevation	625.54	625.77					617.81	617.99					640.35	640.63					637.54	637.81				
LTOB ² Elevation	626.30	626.33					618.63	618.76					641.54	641.58					640.51	640.30				
LTOB ² Max Depth (ft)	0.8	0.6					0.8	0.8					1.2	1.0					3.0	2.5				
LTOB ² Cross-Sectional Area (ft ²)	2.5	1.9					3.2	3.4					5.4	3.9					15.0	12.0				

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

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

Reachwide Pebble Count Plots

Perry Hill Mitigation Site

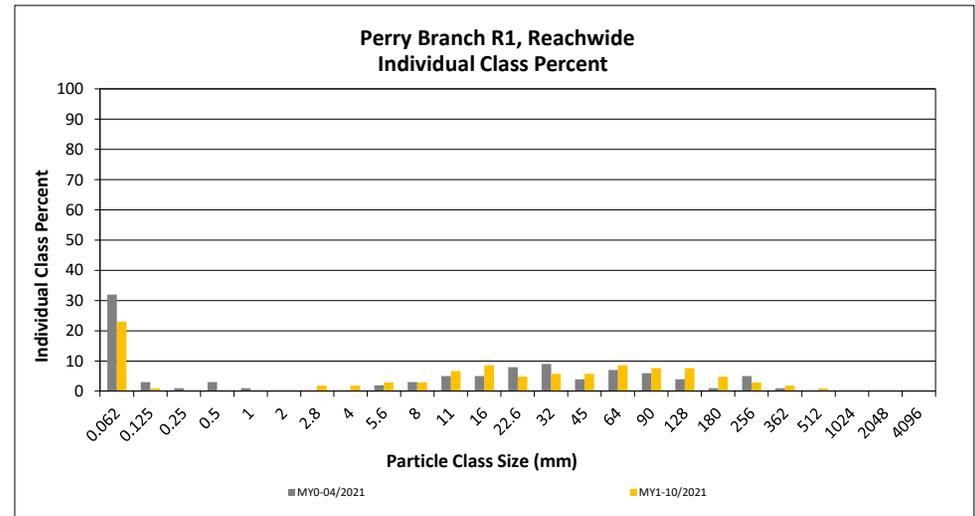
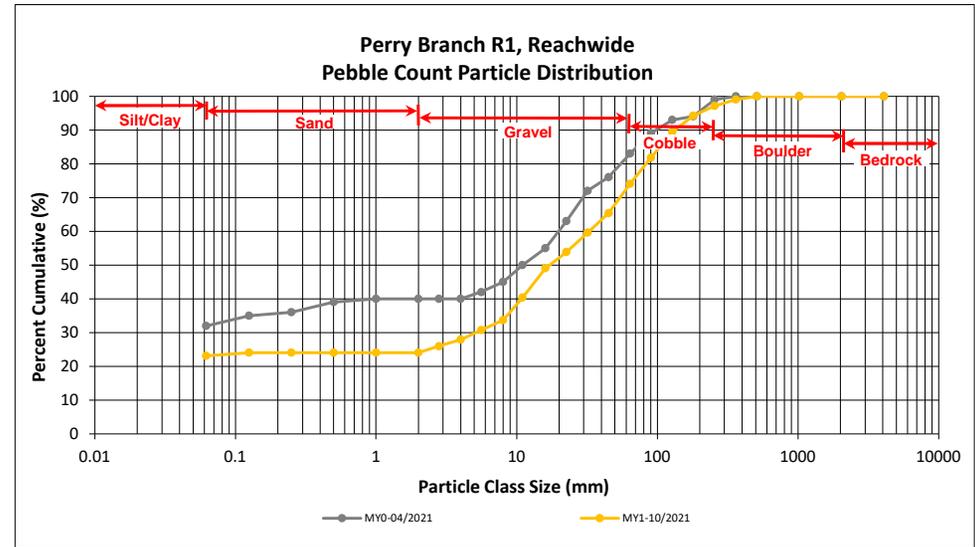
DMS Project No. 100093

Monitoring Year 1 - 2021

Perry Branch 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	6	18	24	23	23
SAND	Very fine	0.062	0.125		1	1	1	24
	Fine	0.125	0.250					24
	Medium	0.25	0.50					24
	Coarse	0.5	1.0					24
	Very Coarse	1.0	2.0					24
GRAVEL	Very Fine	2.0	2.8	1	1	2	2	26
	Very Fine	2.8	4.0		2	2	2	28
	Fine	4.0	5.6		3	3	3	31
	Fine	5.6	8.0		3	3	3	34
	Medium	8.0	11.0	2	5	7	7	40
	Medium	11.0	16.0	3	6	9	9	49
	Coarse	16.0	22.6	2	3	5	5	54
	Coarse	22.6	32		6	6	6	60
	Very Coarse	32	45	5	1	6	6	65
	Very Coarse	45	64	8	1	9	9	74
COBBLE	Small	64	90	7	1	8	8	82
	Small	90	128	7	1	8	8	89
	Large	128	180	5		5	5	94
	Large	180	256	3	3	3	3	97
BOULDER	Small	256	362	2	2	2	2	99
	Small	362	512	1	1	1	1	100
	Medium	512	1024					100
Large/Very Large	Large/Very Large	1024	2048					100
	Large/Very Large	2048	>2048					100
BEDROCK		Bedrock						100
Total				52	52	104	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	8.53
D ₅₀ =	17.1
D ₈₄ =	99.9
D ₉₅ =	197.7
D ₁₀₀ =	512.0



Reachwide Pebble Count Plots

Perry Hill Mitigation Site

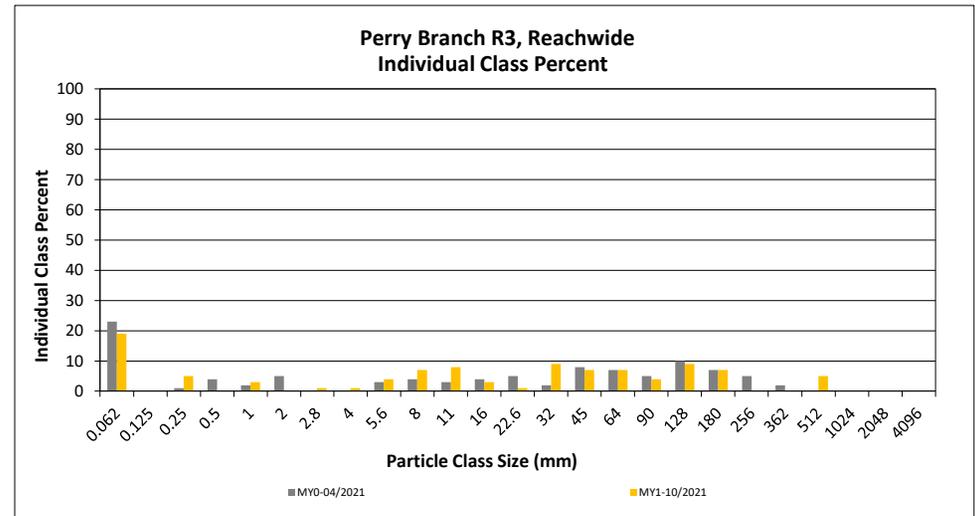
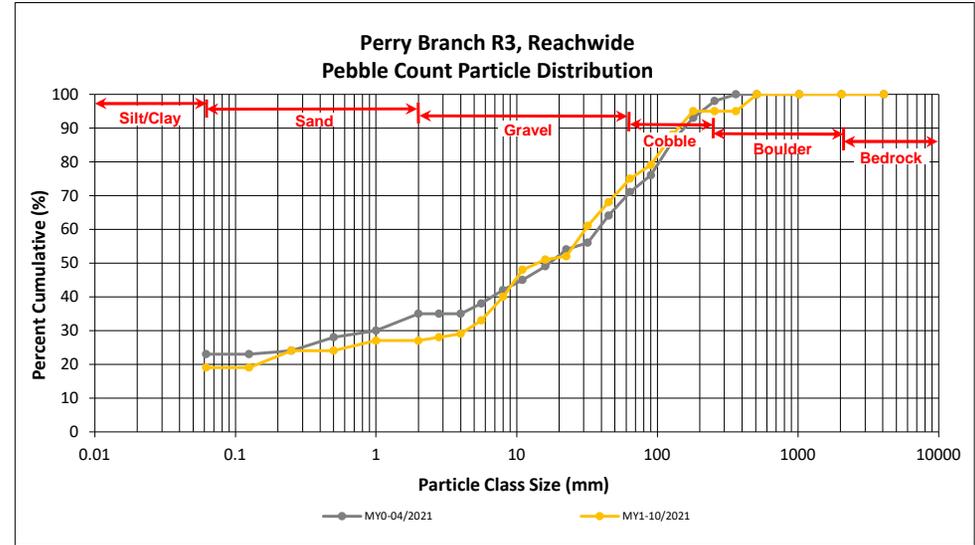
DMS Project No. 100093

Monitoring Year 1 - 2021

Perry Branch 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	3	16	19	19	19
SAND	Very fine	0.062	0.125					19
	Fine	0.125	0.250		5	5	5	24
	Medium	0.25	0.50					24
	Coarse	0.5	1.0		3	3	3	27
	Very Coarse	1.0	2.0					27
GRAVEL	Very Fine	2.0	2.8		1	1	1	28
	Very Fine	2.8	4.0		1	1	1	29
	Fine	4.0	5.6		4	4	4	33
	Fine	5.6	8.0	2	5	7	7	40
	Medium	8.0	11.0	4	4	8	8	48
	Medium	11.0	16.0	2	1	3	3	51
	Coarse	16.0	22.6		1	1	1	52
	Coarse	22.6	32	4	5	9	9	61
	Very Coarse	32	45	4	3	7	7	68
	Very Coarse	45	64	6	1	7	7	75
COBBLE	Small	64	90	4		4	4	79
	Small	90	128	9		9	9	88
	Large	128	180	7		7	7	95
	Large	180	256					95
BOULDER	Small	256	362					95
	Small	362	512	5		5	5	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 =	6.20
D ₅₀ =	14.1
D ₈₄ =	109.5
D ₉₅ =	180.0
D ₁₀₀ =	512.0



Reachwide Pebble Count Plots

Perry Hill Mitigation Site

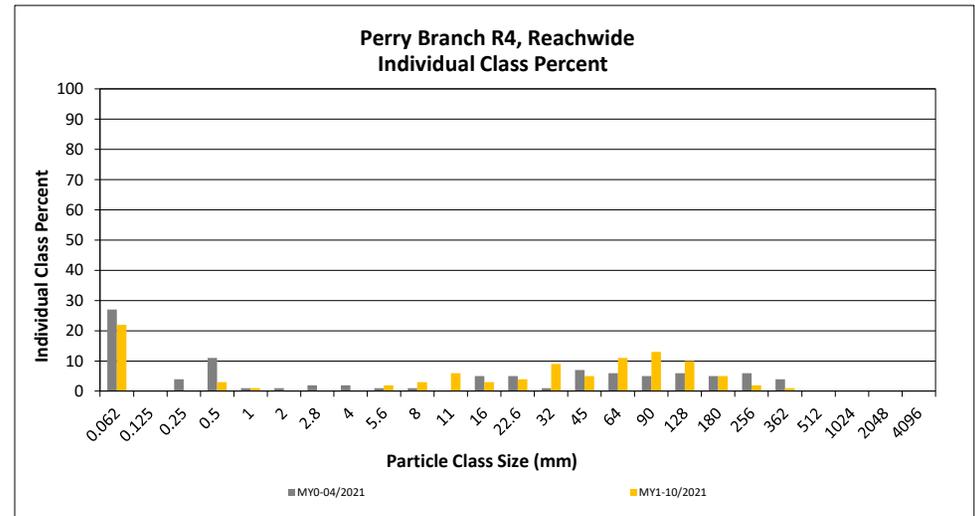
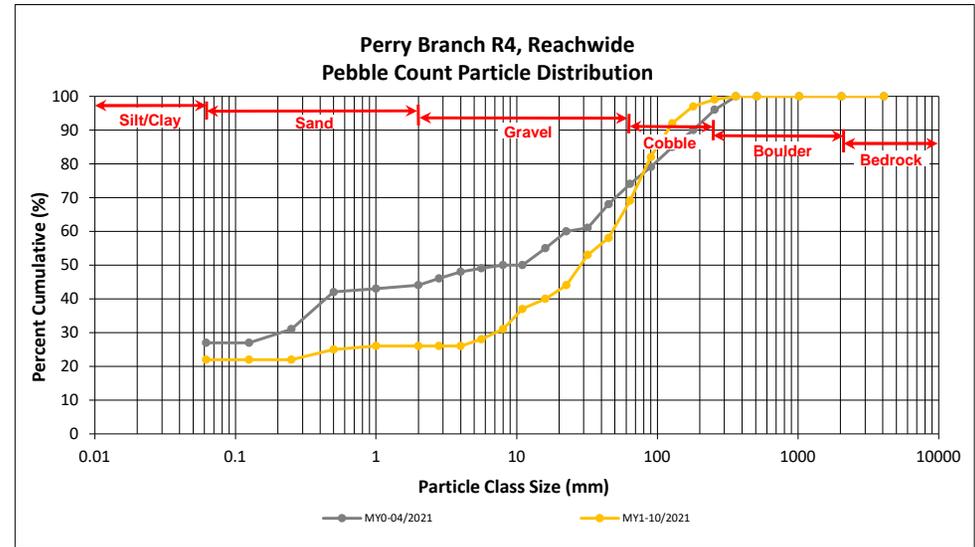
DMS Project No. 100093

Monitoring Year 1 - 2021

Perry Branch 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	1	21	22	22	22
SAND	Very fine	0.062	0.125					22
	Fine	0.125	0.250					22
	Medium	0.25	0.50		3	3	3	25
	Coarse	0.5	1.0		1	1	1	26
	Very Coarse	1.0	2.0					26
GRAVEL	Very Fine	2.0	2.8					26
	Very Fine	2.8	4.0					26
	Fine	4.0	5.6	1	1	2	2	28
	Fine	5.6	8.0	1	2	3	3	31
	Medium	8.0	11.0		6	6	6	37
	Medium	11.0	16.0	2	1	3	3	40
	Coarse	16.0	22.6	3	1	4	4	44
	Coarse	22.6	32	4	5	9	9	53
	Very Coarse	32	45	2	3	5	5	58
	Very Coarse	45	64	6	5	11	11	69
COBBLE	Small	64	90	12	1	13	13	82
	Small	90	128	10		10	10	92
	Large	128	180	5		5	5	97
	Large	180	256	2		2	2	99
BOULDER	Small	256	362	1		1	1	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 =	9.89
D ₅₀ =	28.5
D ₈₄ =	96.6
D ₉₅ =	157.1
D ₁₀₀ =	362.0



Reachwide Pebble Count Plots

Perry Hill Mitigation Site

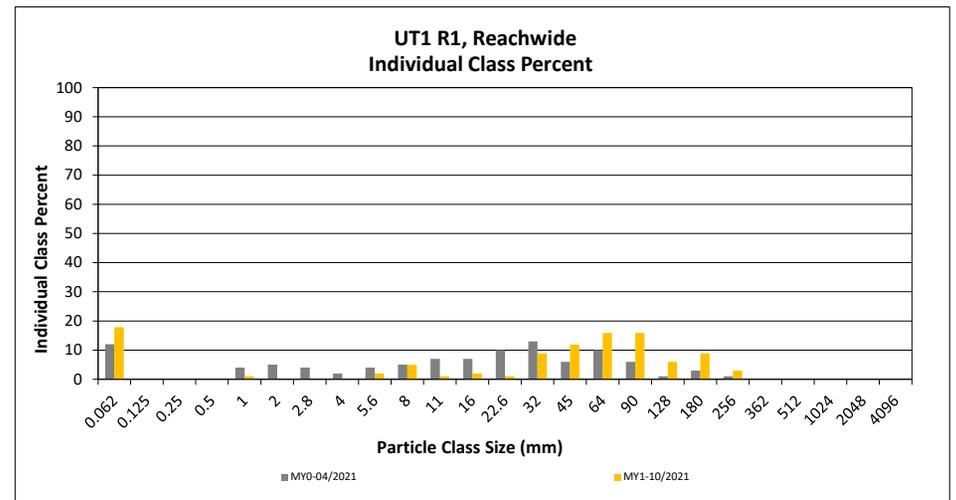
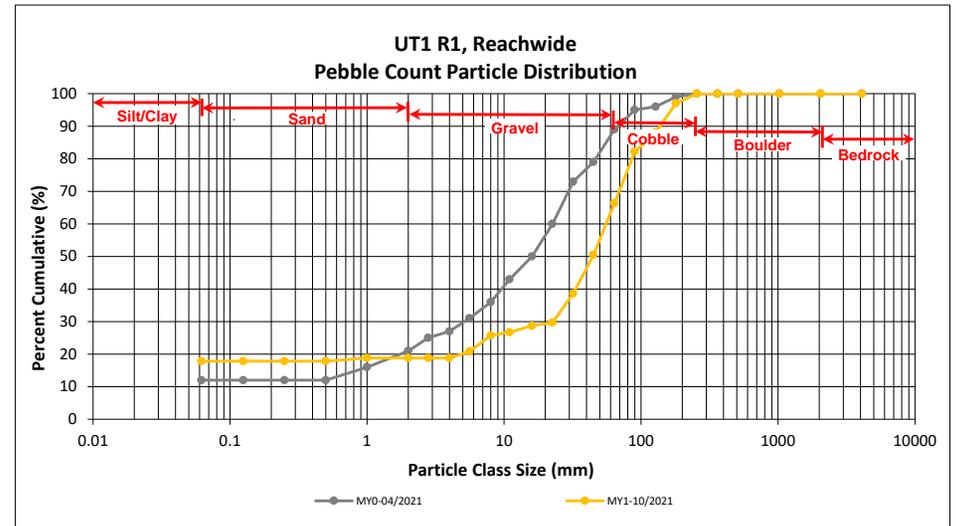
DMS Project No. 100093

Monitoring Year 1 - 2021

UT1 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	6	12	18	18	18
SAND	Very fine	0.062	0.125					18
	Fine	0.125	0.250					18
	Medium	0.25	0.50					18
	Coarse	0.5	1.0		1	1	1	19
	Very Coarse	1.0	2.0					19
GRAVEL	Very Fine	2.0	2.8					19
	Very Fine	2.8	4.0					19
	Fine	4.0	5.6	1	1	2	2	21
	Fine	5.6	8.0	3	2	5	5	26
	Medium	8.0	11.0		1	1	1	27
	Medium	11.0	16.0	1	1	2	2	29
	Coarse	16.0	22.6	1		1	1	30
	Coarse	22.6	32	6	3	9	9	39
	Very Coarse	32	45	9	3	12	12	50
	Very Coarse	45	64	13	3	16	16	66
COBBLE	Small	64	90	11	5	16	16	82
	Small	90	128	3	3	6	6	88
	Large	128	180		6	6	6	94
	Large	180	256	3		3	3	97
BOULDER	Small	256	362	3		3	3	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				60	41	101	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	27.79
D ₅₀ =	44.4
D ₈₄ =	100.3
D ₉₅ =	201.2
D ₁₀₀ =	362.0



Reachwide Pebble Count Plots

Perry Hill Mitigation Site

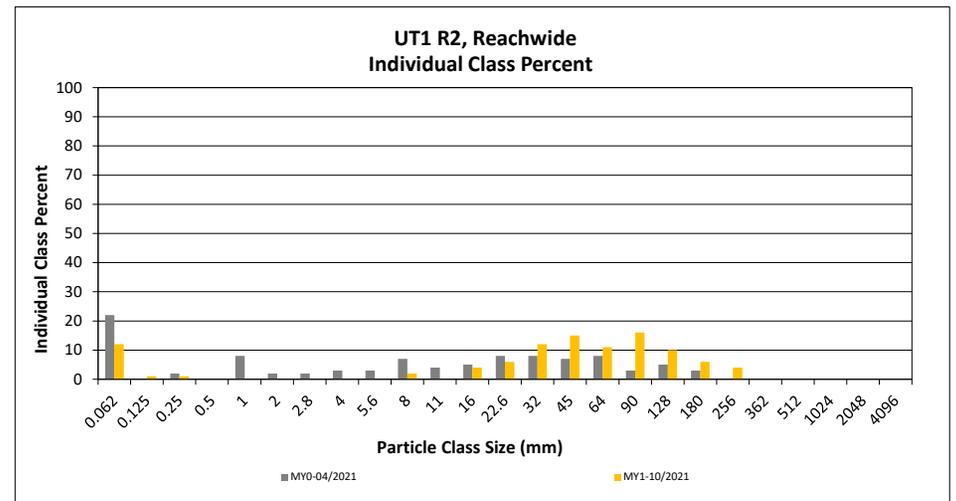
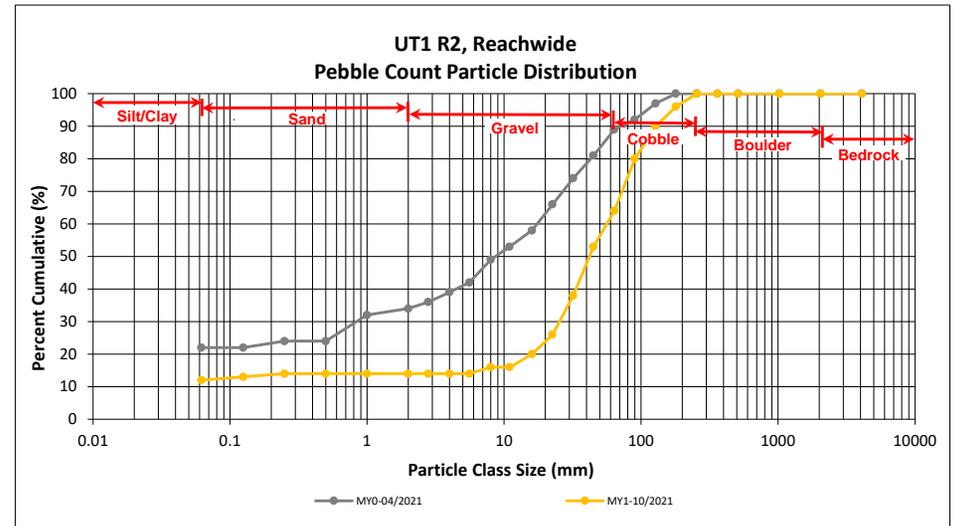
DMS Project No. 100093

Monitoring Year 1 - 2021

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		12	12	12	12
SAND	Very fine	0.062	0.125		1	1	1	13
	Fine	0.125	0.250		1	1	1	14
	Medium	0.25	0.50					14
	Coarse	0.5	1.0					14
	Very Coarse	1.0	2.0					14
GRAVEL	Very Fine	2.0	2.8					14
	Very Fine	2.8	4.0					14
	Fine	4.0	5.6					14
	Fine	5.6	8.0		2	2	2	16
	Medium	8.0	11.0					16
	Medium	11.0	16.0	1	3	4	4	20
	Coarse	16.0	22.6	1	5	6	6	26
	Coarse	22.6	32	6	6	12	12	38
	Very Coarse	32	45	9	6	15	15	53
Very Coarse	45	64	8	3	11	11	64	
COBBLE	Small	64	90	10	6	16	16	80
	Small	90	128	7	3	10	10	90
	Large	128	180	5	1	6	6	96
	Large	180	256	3	1	4	4	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 =	8.00
D ₃₅ =	29.34
D ₅₀ =	42.0
D ₈₄ =	103.6
D ₉₅ =	170.1
D ₁₀₀ =	256.0



Reachwide Pebble Count Plots

Perry Hill Mitigation Site

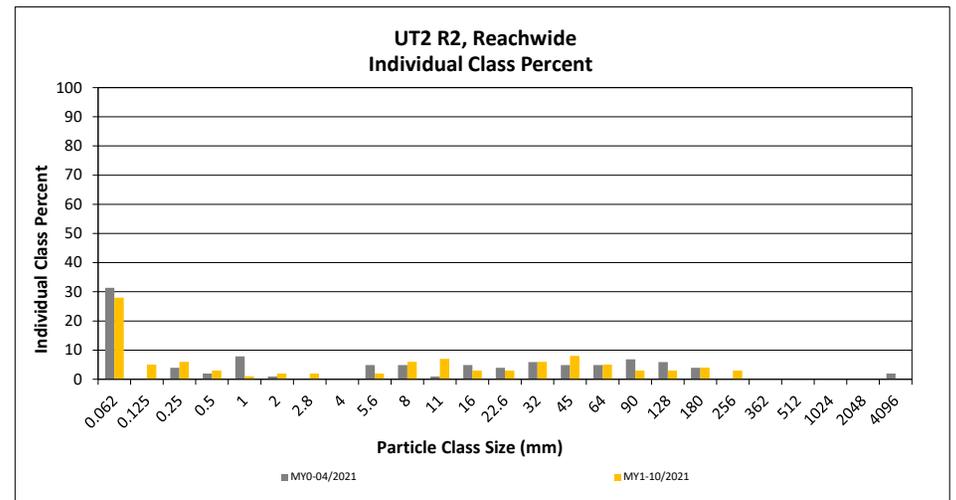
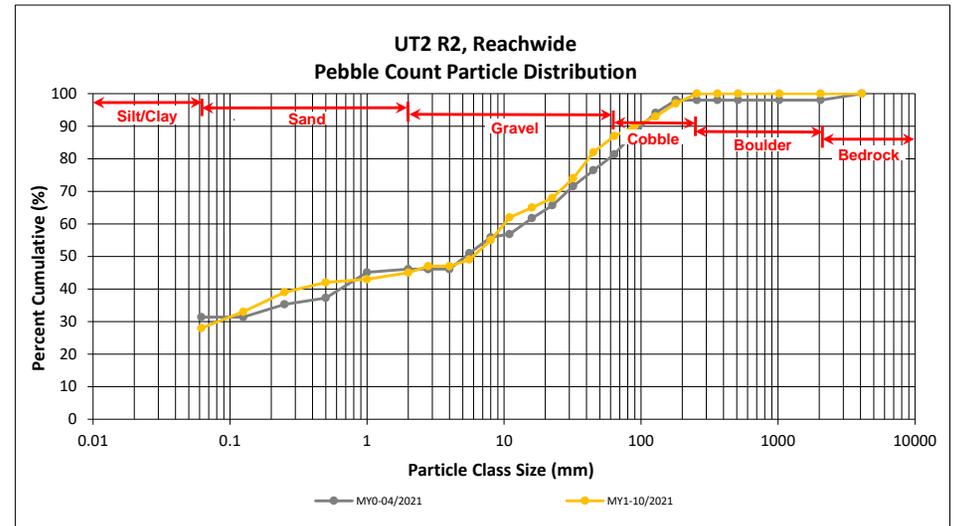
DMS Project No. 100093

Monitoring Year 1 - 2021

UT2 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	8	20	28	28	28
	Very fine	0.062	0.125	1	4	5	5	33
SAND	Fine	0.125	0.250		6	6	6	39
	Medium	0.25	0.50		3	3	3	42
	Coarse	0.5	1.0		1	1	1	43
	Very Coarse	1.0	2.0		2	2	2	45
	Very Fine	2.0	2.8		2	2	2	47
GRAVEL	Very Fine	2.8	4.0					47
	Fine	4.0	5.6		2	2	2	49
	Fine	5.6	8.0	2	4	6	6	55
	Medium	8.0	11.0	4	3	7	7	62
	Medium	11.0	16.0	1	2	3	3	65
	Coarse	16.0	22.6	3		3	3	68
	Coarse	22.6	32	6		6	6	74
	Very Coarse	32	45	8		8	8	82
	Very Coarse	45	64	5		5	5	87
	Very Coarse	64	90	3		3	3	90
COBBLE	Small	90	128	3		3	3	93
	Large	128	180	3	1	4	4	97
	Large	180	256	3		3	3	100
	Large	256	362					100
BOULDER	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
	Large/Very Large	2048	>2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	0.16
D ₅₀ =	5.9
D ₈₄ =	51.8
D ₉₅ =	151.8
D ₁₀₀ =	256.0



APPENDIX D. HYDROLOGY DATA

Table 10. Bankfull Events

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 1 - 2021

Reach	MY1 (2021)*	MY2 (2022)	MY3 (2023)	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
Perry Branch Reach 1	N/A						
Perry Branch Reach 4	N/A						
UT1 Reach 2	7/19/2021						
UT2 Reach 2	7/19/2021						

*Gauges were installed mid-March 2021 and data was collected mid-March through mid-November. Data from the remainder of MY1 will be updated in MY2.

Table 11. Rainfall Summary

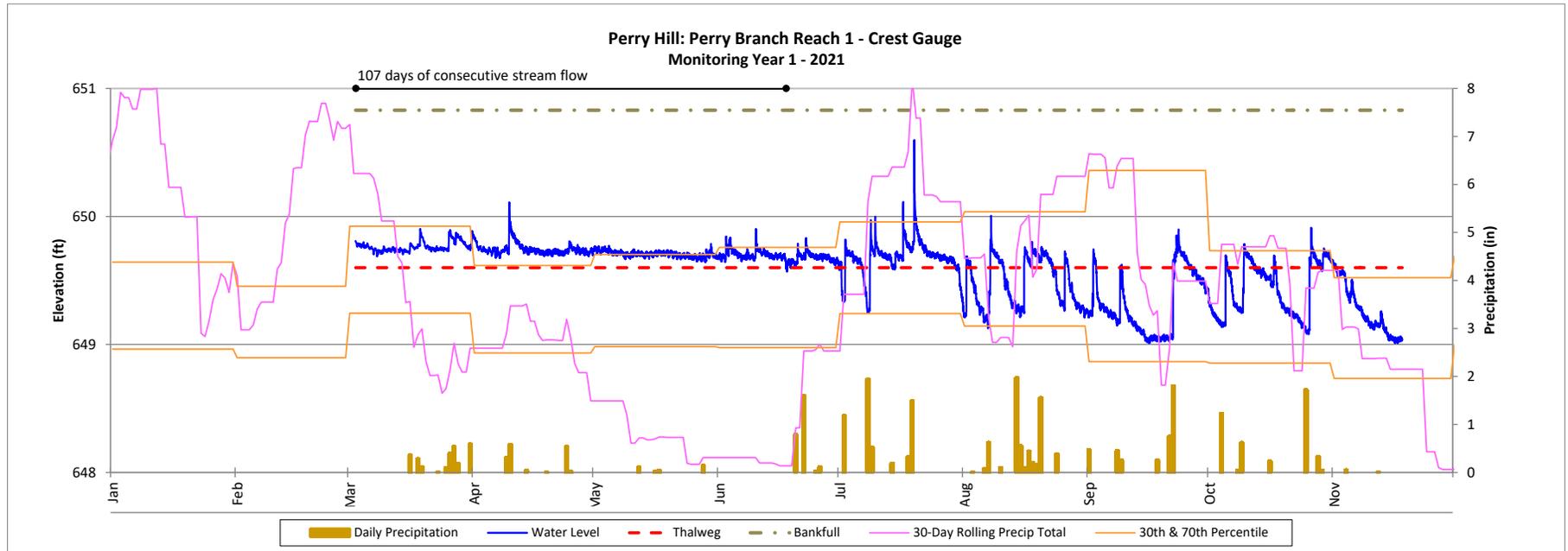
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 1 - 2021

	MY1 (2021)	MY2 (2022)	MY3 (2023)	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
Annual Precip Total	44.5*						
WETS 30th Percentile	31.57						
WETS 70th Percentile	57.06						
Normal	*						

*Annual precipitation total includes data from 1/1/2021 to 11/17/2021. Data from the remainder of MY1 will be updated in MY2.

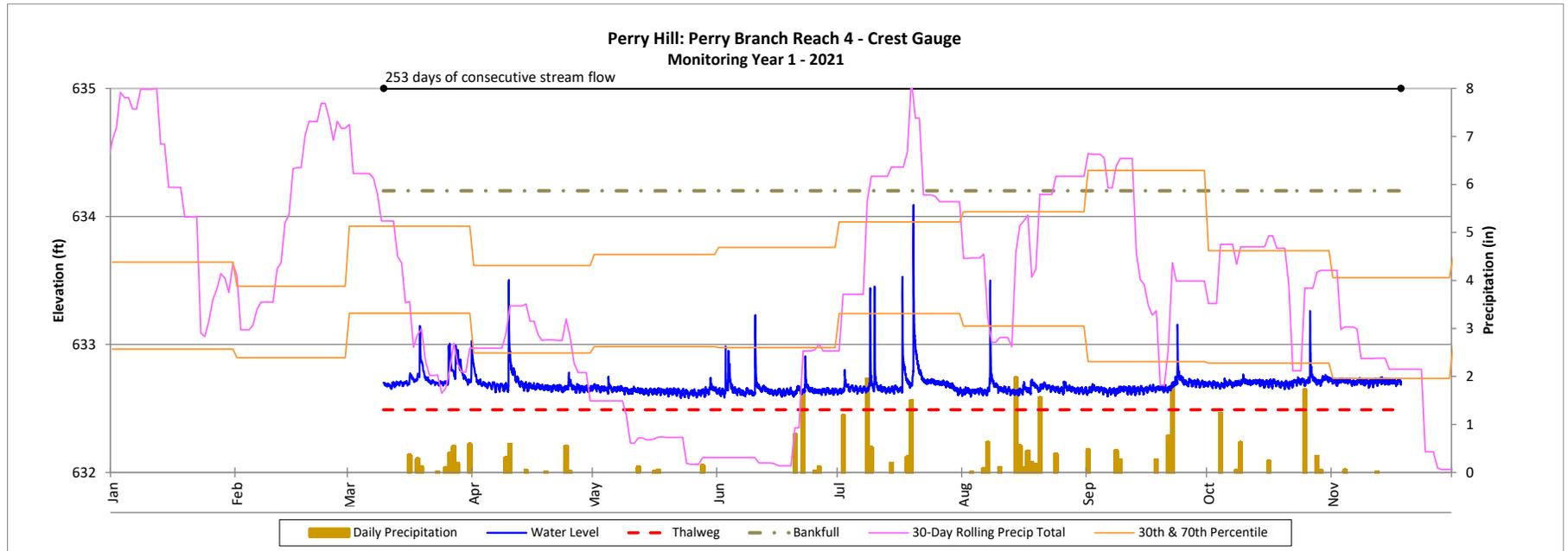
Recorded Bankfull Events

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 1 - 2021



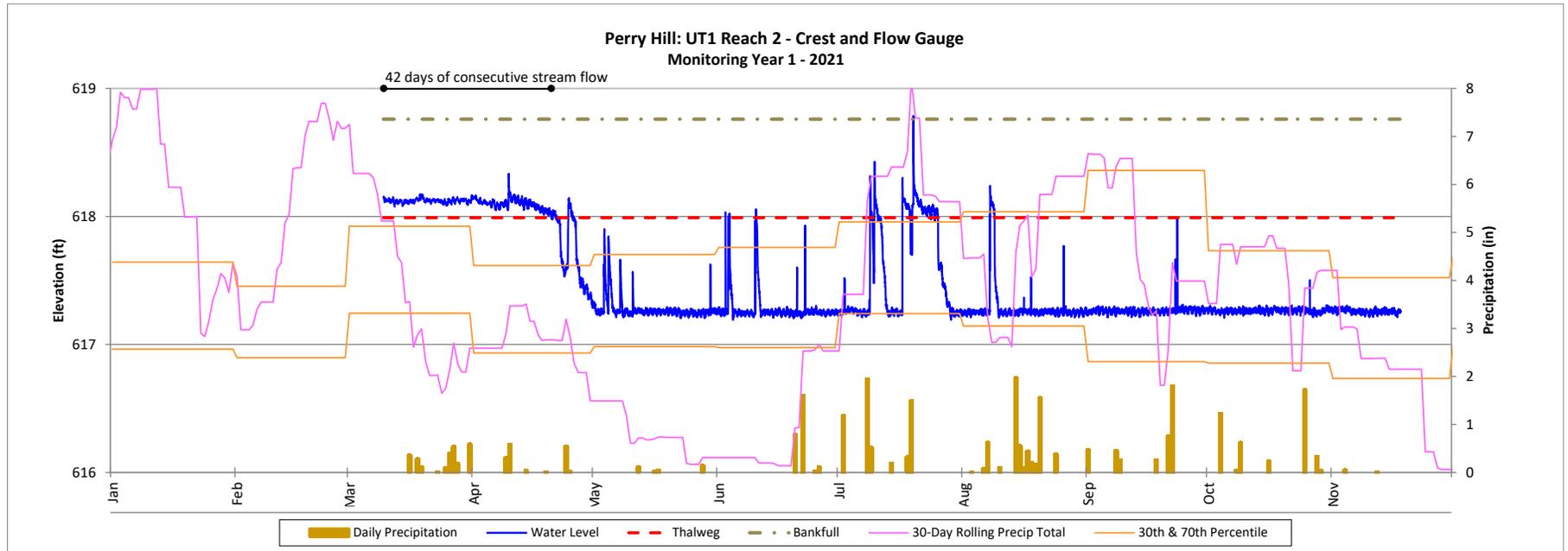
Recorded Bankfull Events

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 1 - 2021



Recorded Bankfull Events

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 1 - 2021



Recorded Bankfull Events

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 1 - 2021

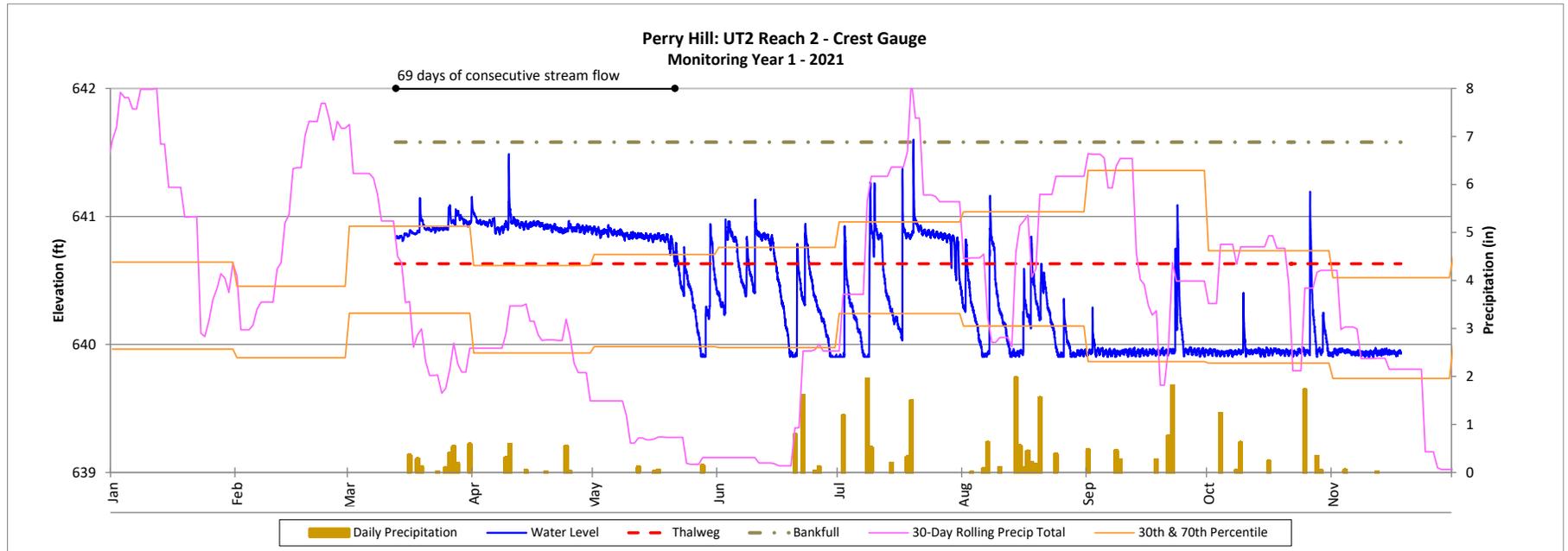


Table 12. Recorded In-Stream Flow Events Summary

Perry Hill Mitigation Site
 DMS Project No. 100093
Monitoring Year 1 - 2021

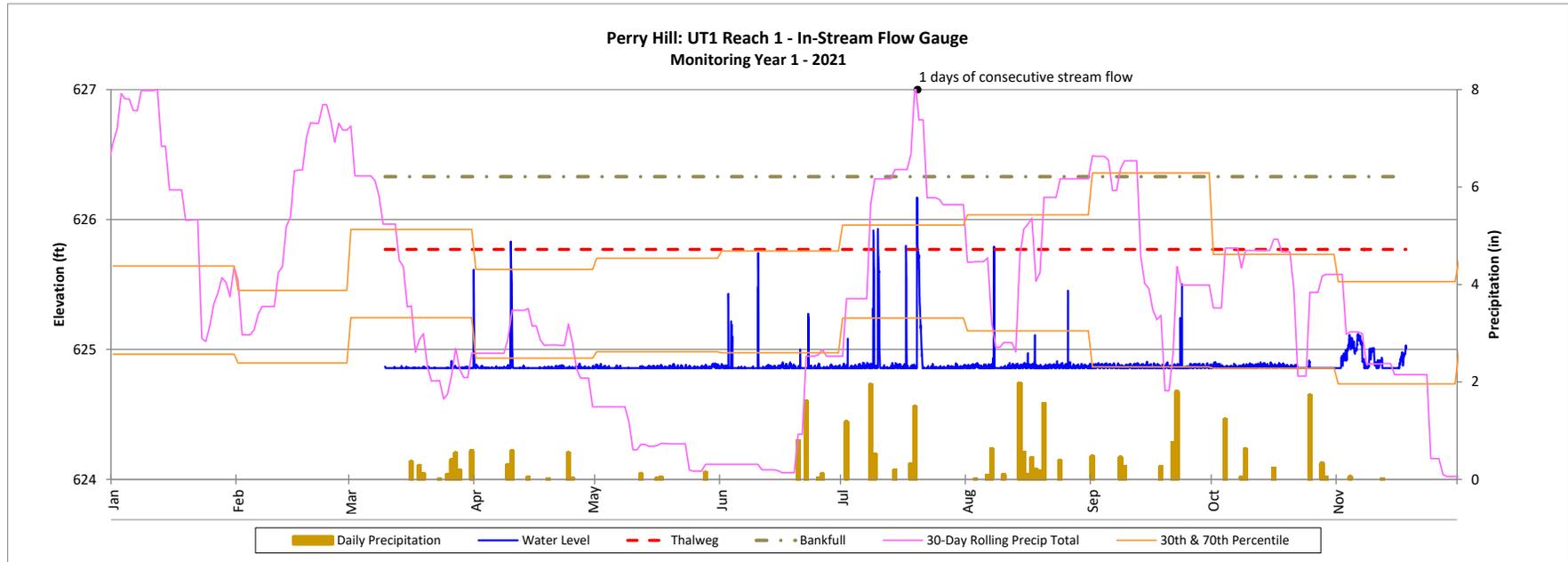
Reach	Max Consecutive Days/Total Days of Baseflow*						
	MY1 (2021) ¹	MY2 (2022)	MY3 (2023)	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
UT1 Reach 1	1 Day/ 1 Day						
UT2 Reach 2	98 Days/ 154 Days						

*Success criterion is presence of baseflow for a minimum of 30 consecutive days.

¹Gauges were installed mid-March 2021. Data was collected mid-March through mid-November. Data from the remainder of MY1 will be updated in MY2.

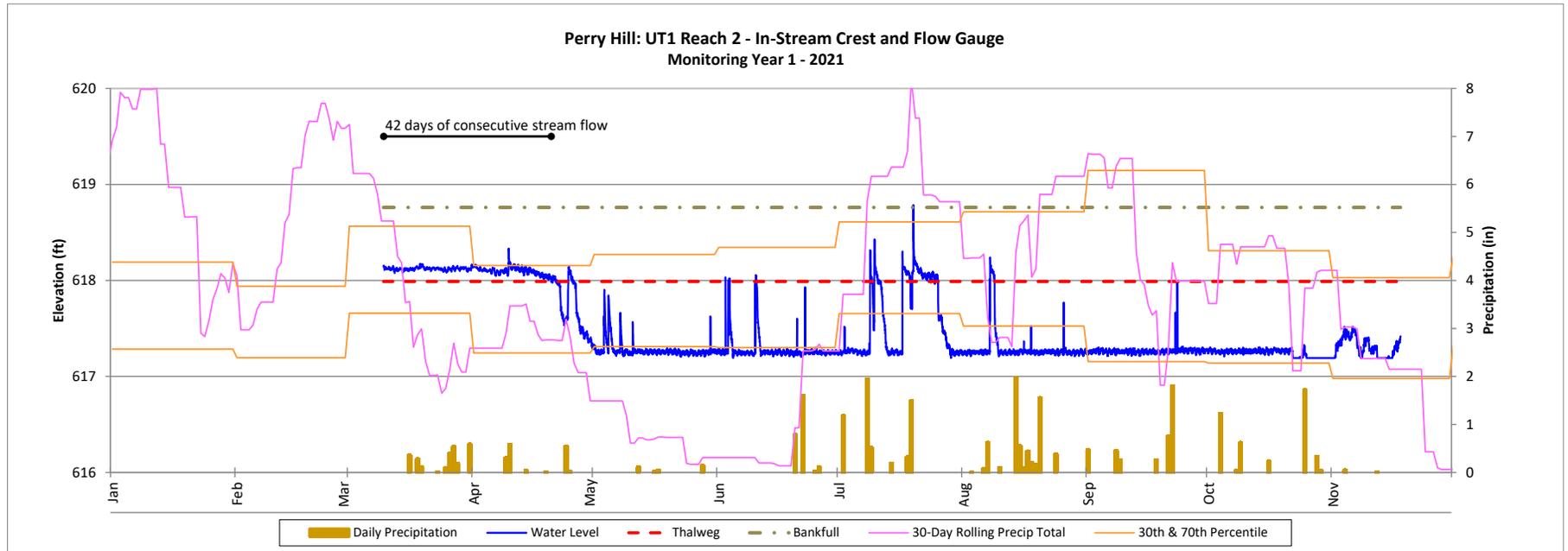
Recorded In-Stream Flow Events

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 1 - 2021



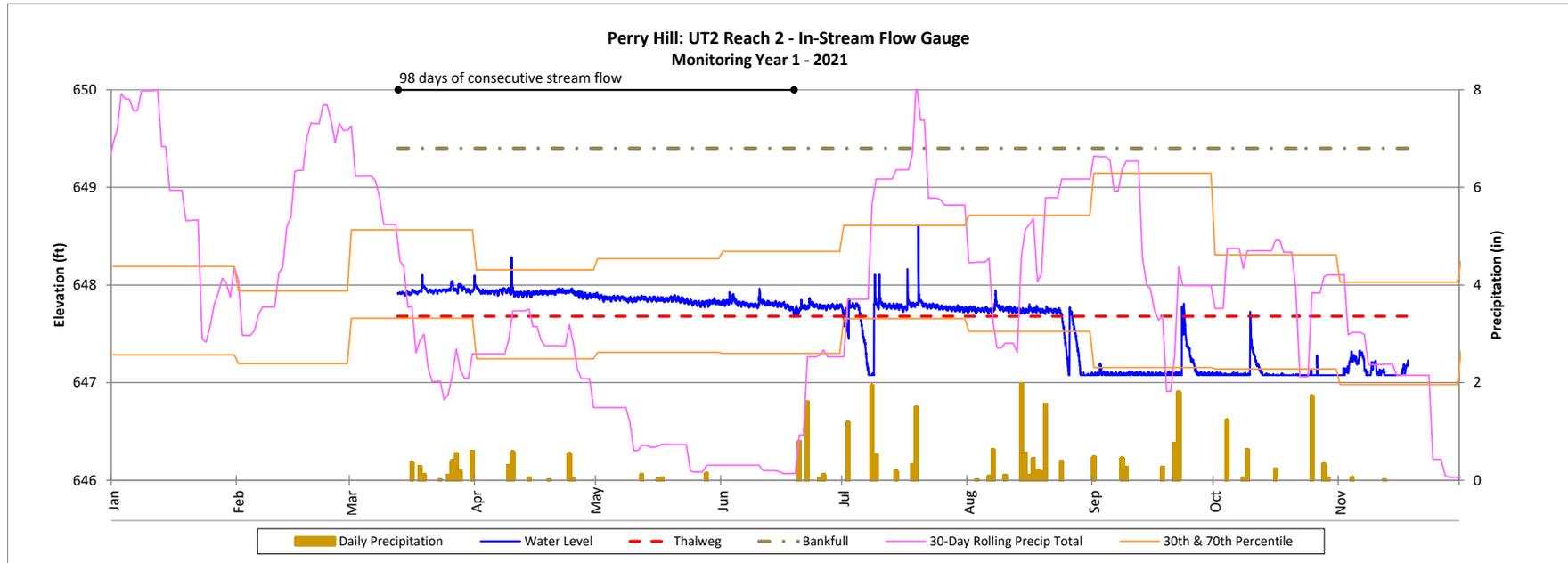
Recorded In-Stream Flow Events

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 1 - 2021



Recorded In-Stream Flow Events

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 1 - 2021



APPENDIX E. PROJECT TIMELINE AND CONTACT INFO

Table 13. Project Activity and Reporting History

Perry Hill Mitigation Site
 DMS Project No. 100093
Monitoring Year 1 - 2021

Activity or Report		Data Collection Complete	Completion or Scheduled Delivery
Project Instituted		NA	December 2018
Mitigation Plan Approved		July 2020	July 2020
Invasive Vegetation Treatment			November 2020
Construction (Grading) Completed		NA	March 2021
As-Built Survey Completed		April 2021	April 2021
Competitive Vegetation Treatment ¹			April 2021
Baseline Monitoring Document (Year 0)	Stream Survey	March 2021	May 2021
	Vegetation Survey	April 2021	
Invasive Vegetation Treatment			October 2021
Easement Encroachment			October 2021
Year 1 Monitoring	Stream Survey	October 2021	December 2021
	Vegetation Survey	October 2021	
Year 2 Monitoring	Stream Survey	2022	December 2022
	Vegetation Survey	2022	
Year 3 Monitoring	Stream Survey	2023	December 2023
	Vegetation Survey	2023	
Year 4 Monitoring		2024	December 2024
Year 5 Monitoring	Stream Survey	2025	December 2025
	Vegetation Survey	2025	
Year 6 Monitoring		2026	December 2026
Year 7 Monitoring	Stream Survey	2027	December 2027
	Vegetation Survey	2027	

¹Herbicide ring sprays around the base of planted stems.

Table 14. Project Contact Table

Perry Hill Mitigation Site
 DMS Project No. 100093
Monitoring Year 1 - 2021

Designer Geoff Smith, PE	Wildlands Engineering, Inc. 497 Bramson Ct, Suite 104 Mt. Pleasant, SC 29464 843.277.6221
Construction Contractor	Main Stream Earthwork, Inc. 631 Camp Dan Valley Rd Reidsville, NC 27320
Monitoring Performers Monitoring, POC	Wildlands Engineering, Inc. Jason Lorch 919.851.9986

APPENDIX F. ADDITIONAL DOCUMENTATION



November 30, 2021

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 Perry Hill Mitigation Site As-Built Report and Record Drawings
NCDMS Perry Hill, SAW-2019-00125, DMS Project Number 100093

Dear Ms. Browning,

We have reviewed the comments on the MY0 Report for the above referenced project dated July 28, 2021. Below are responses to each of the comments. For your convenience, the comments are reprinted with responses in italics.

DWR Comments, Erin Davis:

1. The redline drawings did not show any changes in the species/quantities installed from the mit plan approved plant list and seed mixes. Please confirm.

Seed mixes/quantities remained the same as listed in the Mitigation Plan. However, there were a few minor changes in the tree species because of sourcing issues at the time of planting. The lack of changes on the As-Built Planting Plan was an oversight.

Cherrybark Oak (Quercus pagoda) was substituted for Swamp Chestnut Oak (Quercus michauxii) because of lack of availability. Strawberry bush was also not available for the Forested Buffer Planting Zone so the other species in the planting zone were increased to replace the 21 stems. The Possumhaw Viburnum (Viburnum nudum) listed in the Wetland Planting Zone – Forested is a typo, the species is Arrowwood Viburnum (Viburnum dentatum).

2. In the mitigation plan review comments, the IRT expressed concern about UT1 Reach 1 flow. Based on channel vegetation and dryness shown in the March/April photos and drone footage, DWR is still concerned about flow for this reach at this time.

Wildlands understands this concern, appreciates this discussion, and will install an additional flow gauge on UT1. The reach will continue to be monitored and actions taken if necessary. Surface flow data will be included in each annual monitoring report.



3. Besides lunker log, were any other stabilization treatment options considered before riprapping the slope above UT1?

During construction the project engineer and construction supervisor decided that lunker logs would have a high probability of being undermined due to the amount of drop at the head cut. In order to reduce channel slope to an acceptable range for this structure type, a sizeable section of the channel would have to be filled with high clay content soil. Filling the channel would have likely impacted the spring head and create poor flow conditions in the channel. The decision was then made to shift to washed stone wrapped in filter fabric to allow for subsurface/spring fed flows to freely enter the channel. The riprap was added above this to provide vertical stability for overland flows entering from the field upstream during high flow events.

4. While photo points 7 and 8 are located in the vicinity of the Reach 4 crossing, the distance and angle makes it difficult to get a clear view of the double culverts. Please add a photo point at the downstream culvert crossing in future monitoring reports.

Wildlands plans to include a photo log of the upstream and downstream ends of both culvert crossings on site with each yearly monitoring report to allow for a clear view.

5. DWR appreciated the drone video provided. It was very helpful for this review. All of the wood added to the channels looked great.

Wildlands appreciates this comment and has noted the information.

6. Drone video 15:52 - How are the logs laying above the brush anchored to the bank?

The ends of the logs, as well as the branches that extend into the stream bank, are buried.

7. Drone video 25:14 - It appeared multiple log sills were notched, is this a common practice during initial construction? Do notches typically extend across the majority of the exposed log?

Wildlands' contractors have notched log sills in the past. Often, it is to help concentrate base flow into the center of the channel which will encourage pool scour and reduce constant shear stress on the toe of the channel banks. In this case, the wider notches make for a constant elevation across the stream bed. This also helps reduce water flow into channel banks which may cause scour and potential structure issues.

USACE Comments, Casey Haywood:

1. I appreciate the consideration that was given to planting zones and having the wetland indicators listed for planted species. The drone video was also helpful.

Wildlands appreciates this comment and has noted the information.





2. There are concerns about flow on UT1 R1. Stream photos and drone video indicated that the channel was dry and it had grass growing throughout the entire channel.

Wildlands understands this concern, appreciates this discussion, and will install an additional flow gauge on UT1. The reach will continue to be monitored and actions taken if necessary. Surface flow data will be included in each annual monitoring report.

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 be "J. Lorch".